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

by

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DRAFT
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Abstract

In a series of earlier papers we considered the accumulation of retirement assets of future retirees. In this paper we begin to develop a parallel analysis for home equity, the other key asset of most households. To structure the analysis we distinguish two phases of housing equity accumulation. The first phase is the home equity that household have as they approach retirement, assuming that this is the home equity component of wealth at 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 for which they were conserving home equity. The second goal is to explore how one might project the trend in the home equity of younger cohorts as they approach retirement.

We begin by describing the change over time in the relationships between age, home ownership, and home values. The relationships illustrate how substantial errors in projections—that rely on historical empirical regularities—can occur. We find that the age profile of home ownership rates has changed little over the past two decades. This stability suggests that predictions of how demographic trends will affect the *number* of homeowners can be made with some confidence. On the other hand, there have been very large increases in the *value* of owner-occupied homes and in home equity over the past two decades. 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.

Using cohorts attaining retirement age in 1990 and in 2010, we simulate the evolution of home values over the course of a typical retirement to explore the relationship between home equity at retirement and home equity at older ages, when home equity tends to be drawn down. Because real home prices rose during the sample period we use to forecast future price patterns, for both cohorts, our projections suggest that home equity at older ages is likely to be much greater than equity at retirement. Even when we truncate our sample of house price changes before the most recent market declines, however, our projections suggest a non-trivial probability, between 10 and 14 percent, that real home equity will decline between the ages of 59 and 79. That probability rises substantially when we expand our sample of housing returns to include the experience of the most recent two years.

Cross-section and cohort data also show that over a 20-year period marked by very large fluctuations in the growth rate of home value, very large increases in household wealth, and a large decline in mortgage rates, the ratio of home equity to total non-pension wealth remained remarkably stable. 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 recent turmoil in the housing market adds interest to such projections but also, by drawing attention to the large changes in

home value and home equity that can occur over a short period of time, raises speculation about whether the past empirical regularity will continue in the future.

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. 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 as they approach retirement, assuming that this is the home equity component of wealth at 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 for which they were conserving home equity. 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 comments 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 total wealth

	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 non-retirement wealth

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

In the first four sections of the paper, we 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. We show both cohort and cross-section representations of the data and consider which relationships changed over time and which ones have remained relatively unchanged for several decades. In section 1 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. In section 2 we combine ~~trends in~~ the profile of home ownership by age with demographic projections to obtain projections of the aggregate <u>number</u> 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. In section 3 we discuss the <u>value</u> 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. In section 4, to check our estimates of home values,

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.

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 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). In section 5 we consider the relationship between non-pension wealth and home equity between 1984 and 2004, based on cross-section comparisons. 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 ratio did vary over the intervening years, largely as a function of stock market values. In section 6 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. But the mortgage debt of younger cohorts also increased. Because the percent increase in equity was less than the percent increase in home values and 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.

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. For illustration, we consider two cohorts—one attaining retirement age in 1990 and the other in 2010--whose member entered retirement with very different levels of home equity. For each of these cohorts we simulate home equity late in retirement by randomly drawing future house price changes from the historical distribution of price changes. The younger cohort is projected to have substantially more home equity late in retirement. However, both cohorts face a moderate risk of a decline in real home equity following retirement,

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. We find that over the 1984 to 2004 period—during which mortgage rates declined by half, home prices fluctuated substantially, and household wealth doubled—the ratio of home equity to total wealth remained surprisingly stable. The stability in this empirical relationship prompts us to raise the possibility that it might be used to judge the likely home equity of future cohorts of retirees.

In section 9 we summarize our findings and discuss future research plans.

1. Trends in Home Ownership

We begin with a cohort description of home ownership. The data are from the Survey of Income and Program Participation (SIPP). The SIPP asks each household respondent if the housing unit in which they are living is owned or rented. If the unit is owned then up to three owners can be designated. We use this information to classify each person as an owner, a renter, or living in a unit owned by another person. We also distinguish "families' within a living unit using the same rules as the tax code. Thus, for example, a house owned by a married couple also containing their adult son contains two "families" in our analysis: a married couple (owners) and a single male (a non-owner living in a unit owned by another person). Our analysis focuses on home owners.

The SIPP is a series of short panels that survey respondents for 32 to 48 months. New panels were introduced in most years between 1984 and 1995 and every four years after 1996. We disregard the short time-series component of the SIPP and treat survey data in each calendar year as independent cross-sections. We make use of data on home ownership for seventeen years: 1984, 1985, 1987, 1988, 1991-1995, and 1997-2004. From the random samples from each for these years we create cohort data. For example, to trace the average home ownership rate of the cohort that attained age 40 in 1984, we calculate the ownership rate for persons age 40 in the 1984 cross-section, age 41 in the 1985 cross-section, age 43 in the 1987 cross-section, and so forth. The last observation for this cohort will be at age 60 in 2004. We follow the same procedure for all cohorts that are between the ages of 21 and 80 at anytime between 1984 and 2004. For most cohorts this procedure yields 17 observations. However, fewer observations are available for some older cohorts (attaining age 80 before 2004) and for some younger cohorts (attaining age 21 after 1984).

The home ownership rates of couples from selected cohorts are shown in Figure 1-1. The data show essentially no cohort effects, except at older ages. The cohort data suggest that cross-section data for any year would look much like the pieced-together cohorts. For example, the 1984 data for different ages lie essentially on the age-ownership profile described by the cohort data. So do the data for 2004, the last year for which SIPP data are available. The cross-section data for 1984 and 2004 are shown for couples, single men, and single women in Figures 1-4 to 1-6 respectively. The ownership rates by age changed very little for couples between 1984 and 2004, except perhaps at older ages—80 and above. The ownership rate of single men age 60 and

younger was about the same in 2004 as in 1984 but for those over 60 the ownership rate was higher in 2004 than in 1984. The ownership rate of single women changed little between 1984 and 2004. Because of the increasing proportion of single persons at younger ages, however, the number of all "households" (single persons and couples) who owned homes declined at younger ages between 1984 and 2004, as shown in Figure 1-7. On balance, ownership rates at older ages were somewhat higher in 2004 than in 1984.

Considering both the cohort and the cross-section data it appears that the ownership rate of older households will likely be higher in future years than it is today.

Figure 1-1. Percent owning for two-person households: eight selected cohorts identified by year members of cohort attain age 65

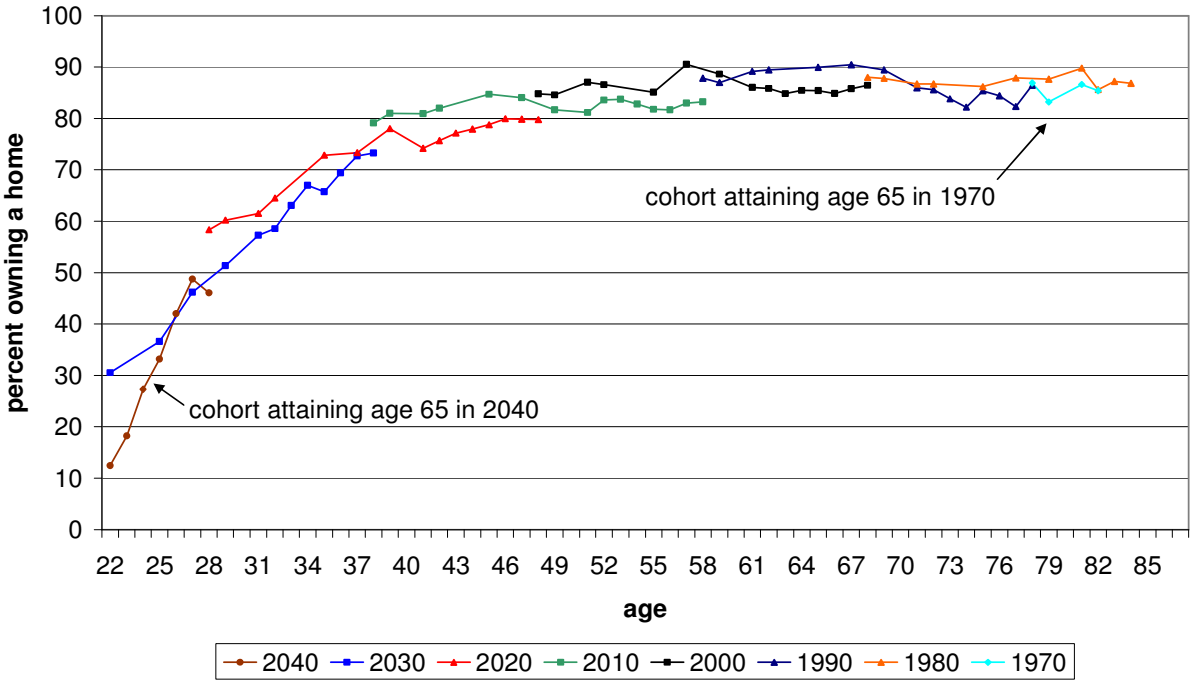


Figure 1-2. Percent owning for single males: eight selected cohorts identified by year members of cohort attain age 65

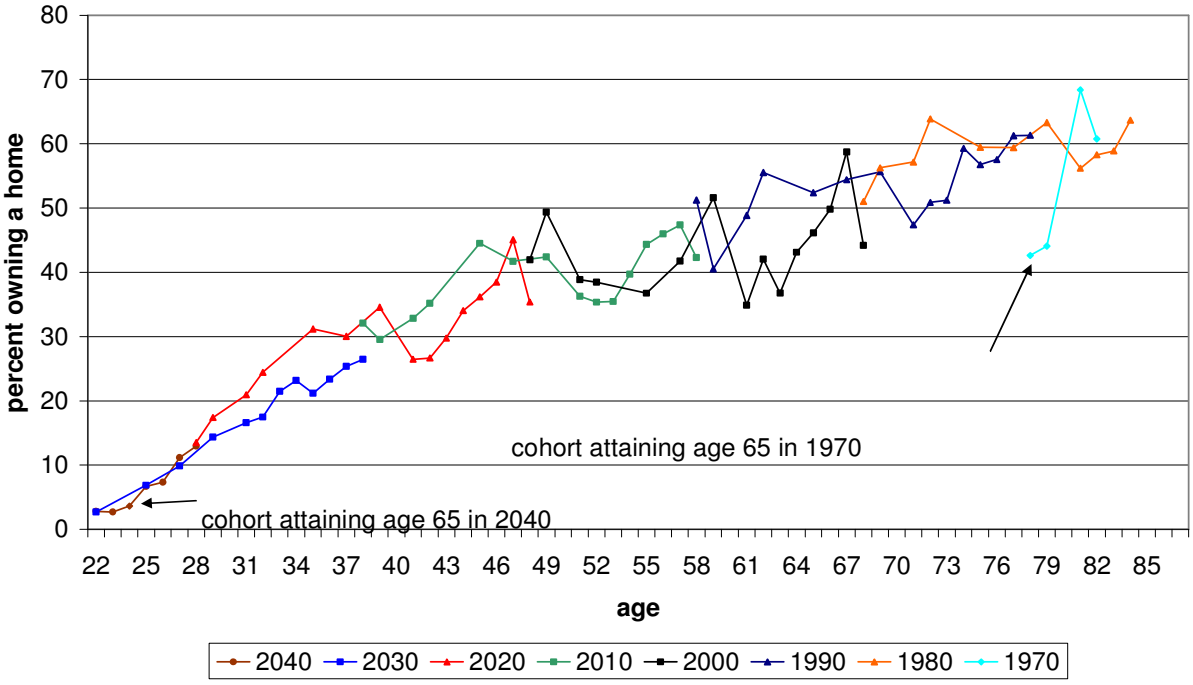


Figure 1-3. Percent owning for single females: eight selected cohorts identified by year members of cohort attain age 65

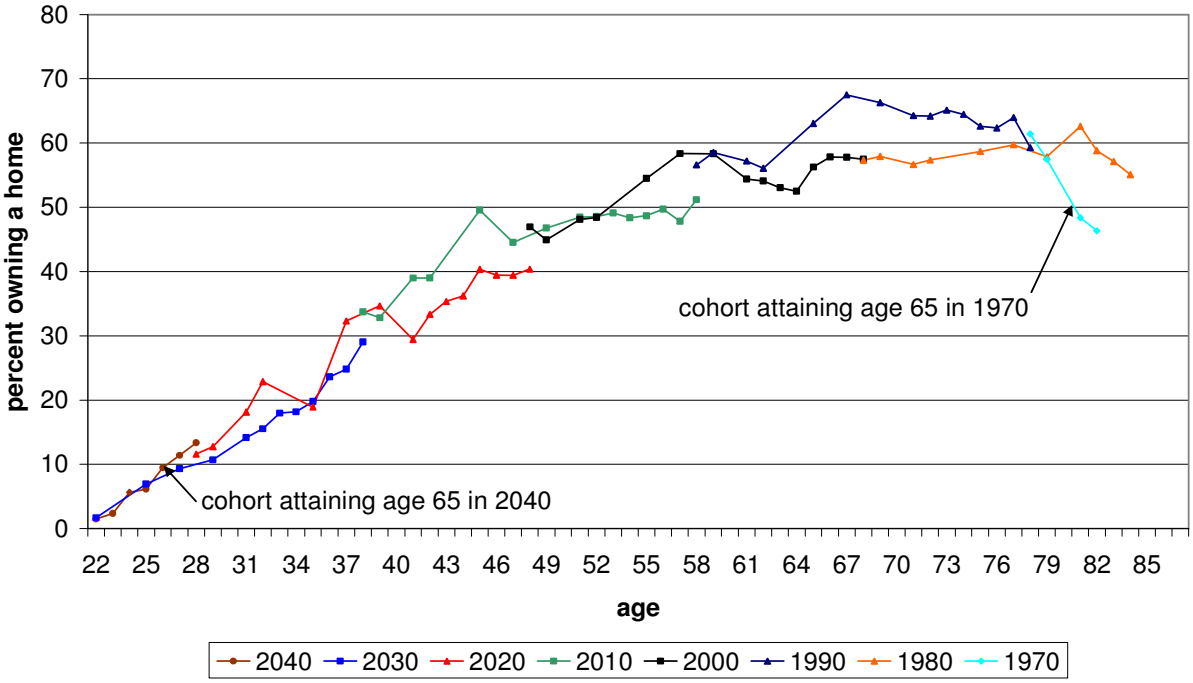


Figure 1-4. Percent of couples that owned homes, 1984 and 2004, SIPP data

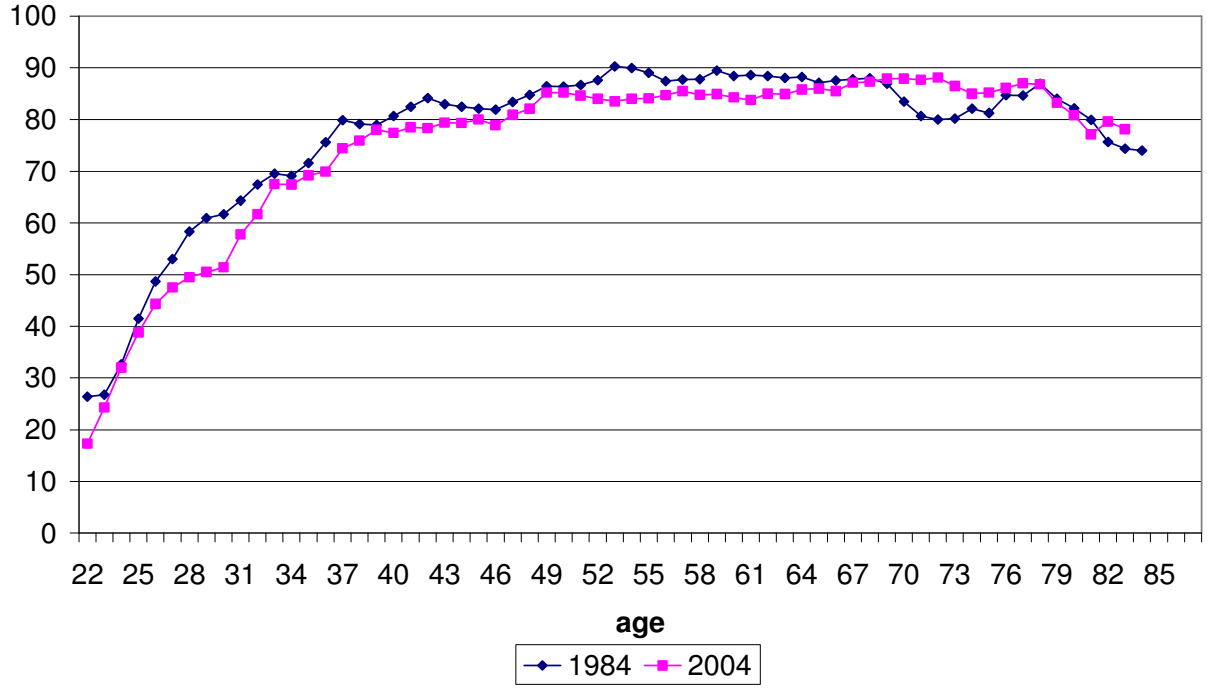


Figure 1-5. Percent of single men that owned homes, 1984 and 2004, SIPP data

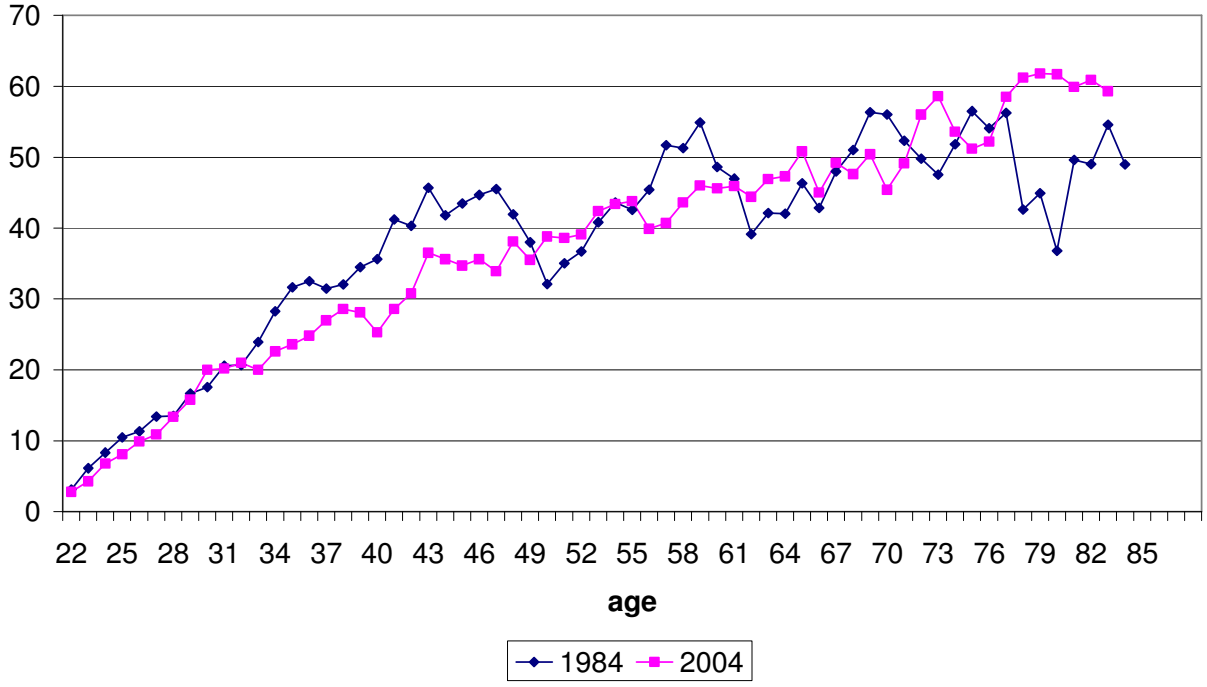


Figure 1-6. Percent of single women that owned homes in 1984 and 2004, SIPP data

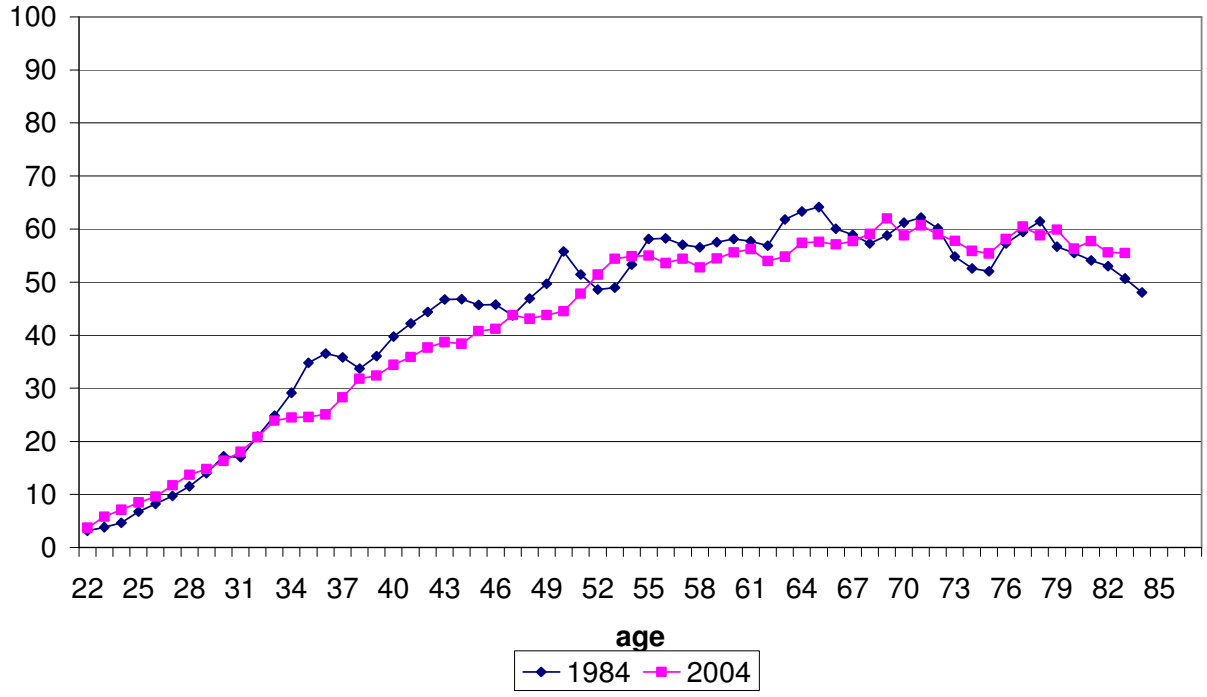
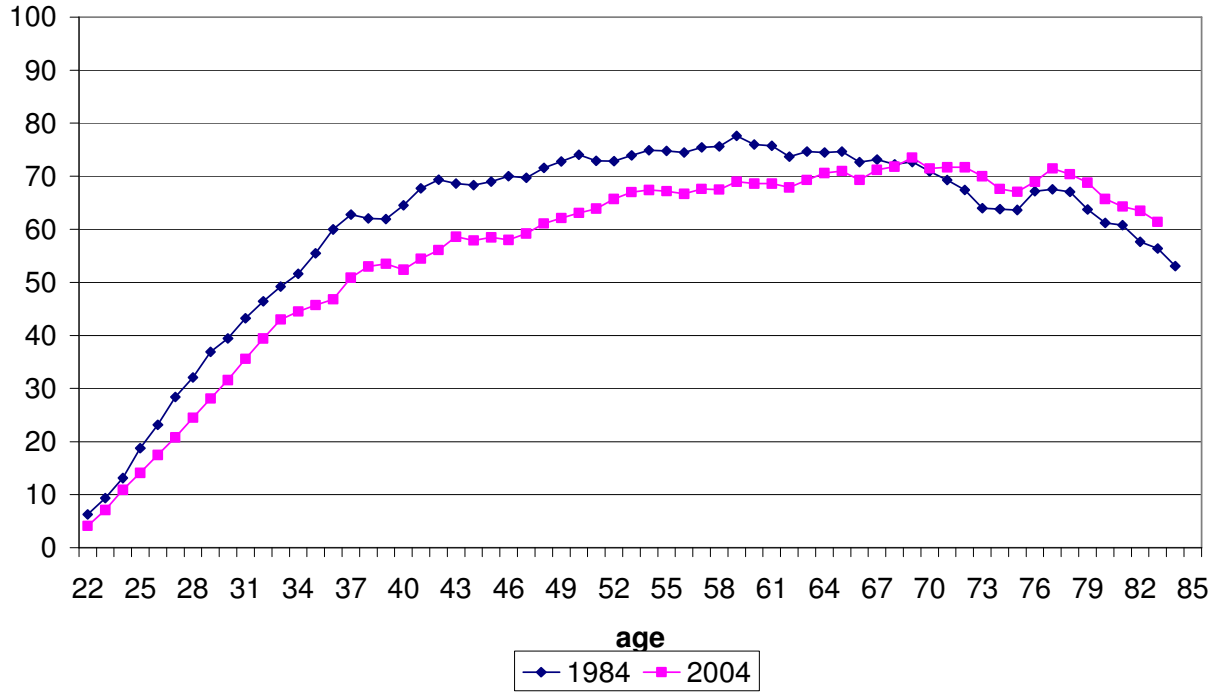


Figure 1-7. Percent of all households that owned homes in 1984 and 2004, SIPP data



2. The Aggregate Number of Homes

The previous section showed that the age profile of homeownership for couples, single males, and single females changed little between 1984 and 2004. We combine these age profiles with demographic data on the number of couples and single persons at each age in each year to obtain projections of the aggregate number of home owners (or the number of owner-occupied homes) in each year.

Projections are shown for the years 1982 to 2040 in Figure 2-1. These projections use the 2004 age profiles of homeownership shown in figures 1-4, 1-5, and 1-6 above. Thus the projections show what homeownership would be if the age profile of home ownership was the same as the 2004 profile over the entire period. The projection uses population forecasts by age, year, gender, and marital status that were provided by the Office of the Actuary of the Social Security Administration.1 In each year and for each age, the SIPP ownership rate for couples is weighted by the number of couples in the population to obtain an estimate of the number of couple homeowners. A similar calculation is made at each age for each year for single males and for single females. The projected aggregate number of homeowners shown in Figure 2-1 is the sum over all ages and over all demographic groups in each year.

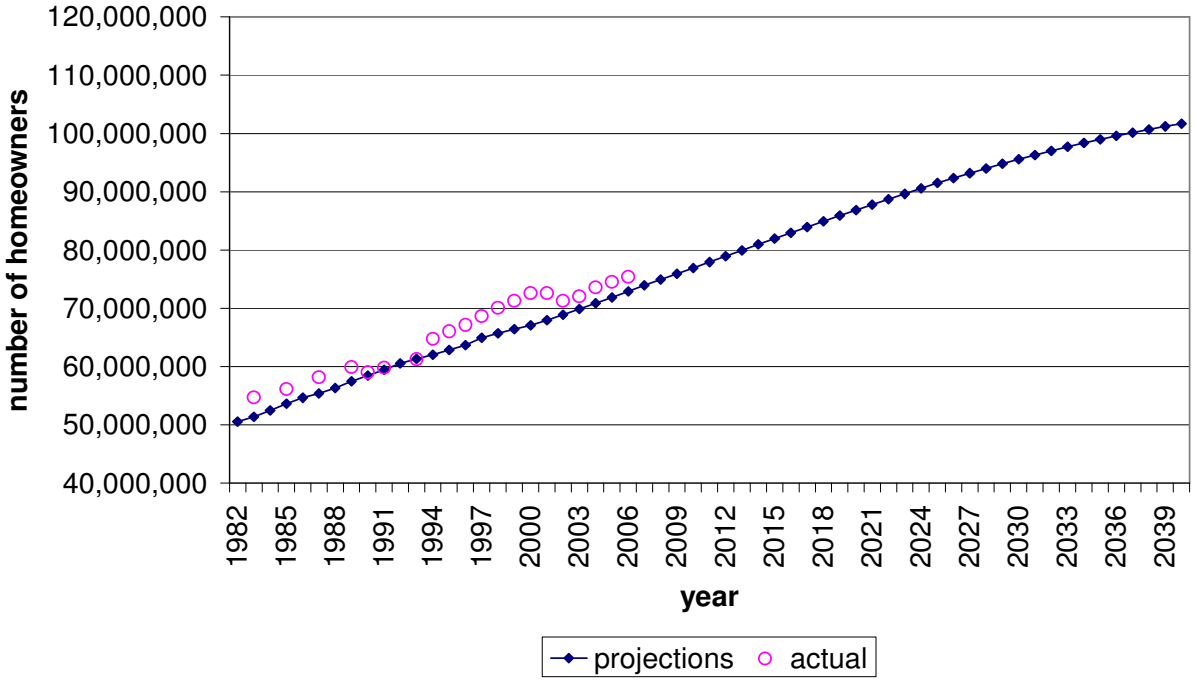
The projected number of homeowners mirrors the pace of underlying demographic change. For the years 1982 to 2006 the figure also shows the actual number of owner-occupied housing units obtained from the Census estimate of the housing inventory in each year. The two series are quite close, although there is more fluctuation in the Census series. The projected number of homes increases essentially linearly from about 51 million in 1982 to about 102 million in 2040.

The projections suggest a substantial slowdown in the rate of increase in the number of homeowners. Figure 2-2 shows the implied rate of growth which declines from about 2 percent in the early 1980s to about ½ percent by 2040. The figure also shows the "actual" growth rates implied by the Census estimates of the number of home owners. On average the decline in the growth rate implied by the Census data essentially matches the decline implied by the projections. And the decline in the projected growth rates after 2006 essentially continues the path of decline between

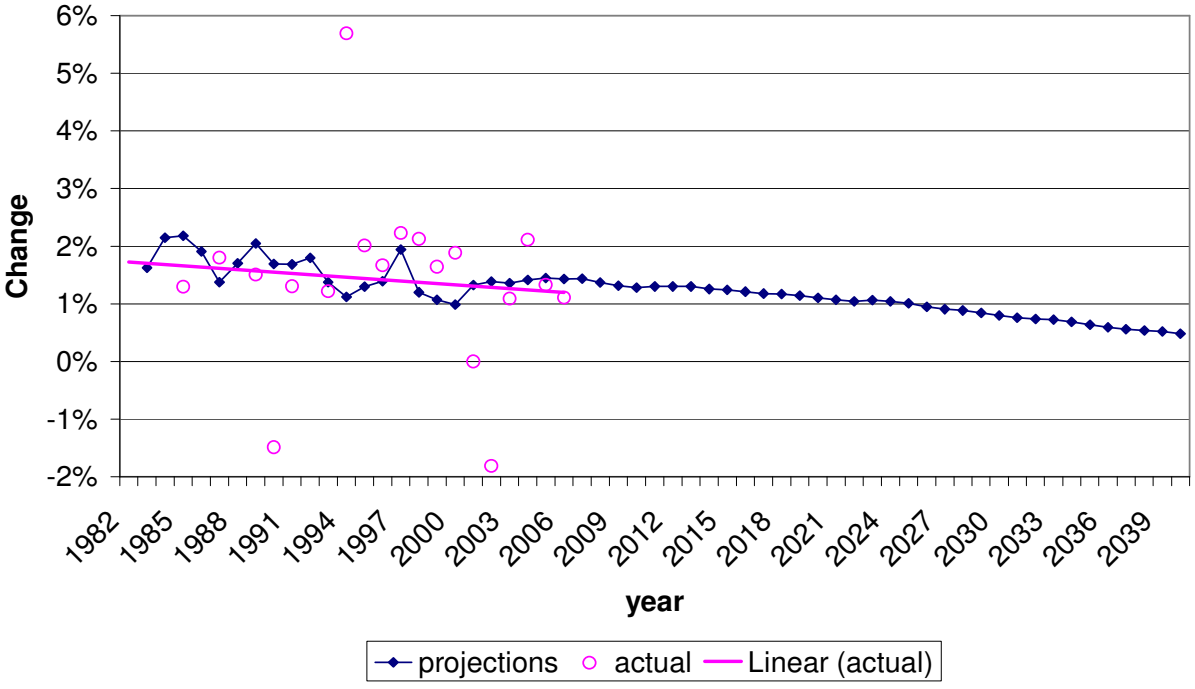
1 Population estimates for 1980 to 1999 are from the U.S. Census. Population projections from the Social Security Administration (SSA) are used for the years 2000 through 2040. The two sources differ slightly in coverage. The Census data exclude persons in the military and persons living abroad. These two groups are included in the SSA data. We have adjusted the SSA data by the ratio of Census estimates to SSA projections in the year 2000 for each of the gender and marital status groups.

1982 and 2006.

F2-1. Projected and actual number of owner-occupied units



F2-2. Projected and actual percent change in the number of owner-occupied units



3. The Value of Owned Homes and Housing Equity

The data above show that the profiles of home ownership by age for couples, single men, and single women changed little between 1984 and 2004. But the value of homes and home equity increased substantially over this time period. Figures 3-1, 3-2, and 3-3 show the age profiles of the value of homes by age for couples, single men, and single women respectively. For each of the groups the home values (in 2000 dollars using the GDP price deflator) increased approximately two-fold between 1984 and 2004. For households between ages 60 and 70, real home values of couples increased by 110 percent, home values of single men increased 136 percent and home values of single women increased 93 percent.

In addition, home equity increased substantially for each of the groups. The age profiles of home equity for couples, single men, and single women are shown in Figure 3-4, 3-5, and 3-6 respectively. For households between 60 and 70, real home equity increased by 95 percent for couples, 119 percent for single men, and 77 percent for single women. Figure 3-7 shows the differences in the profiles of home values given ownership for couples between 1970 and 2000. The differences are even greater than the differences between 1984 and 2004.

There are several possible reasons for the increase in home values and home equity between 1984 and 2004. One explanation is that household investment patterns changed over this time period, and that households chose to invest more in housing assets. Another is that home prices increased so that both home values and home equity increased while owners remained in the same home. In sections 5 and 7 below, we find that the increase in housing equity and housing values is strongly correlated with the increase in household wealth over this time period. This is consistent with either the hypothesis that (i) a broad-gauge increase in asset values, triggered for example by falling risk premia or required returns, resulted in rising stock, housing, and other asset values, or (ii) that increases in non-housing asset values stimulated greater housing demand and thereby increased house values.

These data highlight the difficulty of projecting home prices and home values based on past empirical relationships, as many projections have been. 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. These results also have implications for the oft-made suggestion that personal retirement accounts such as 401(k) plans and IRAs were funded in part by increasing home equity loans and reducing home equity. In this case, however, these data are not by themselves definitive. As discussed more fully below, as home equity increased, so did mortgage debt. In principle, home equity loans could have been used to fund 401(k) and other personal accounts. Greenspan and Kennedy (2007), however, show that increasing home equity loans and home refinancing in recent years were used largely to pay off short-term debt. Thus home

equity loans were apparently not used in large part to fund personal retirement accounts.

Figure 3-1. Home value given ownership, couples, 1984 and 2004 (in year 2000 dollars)

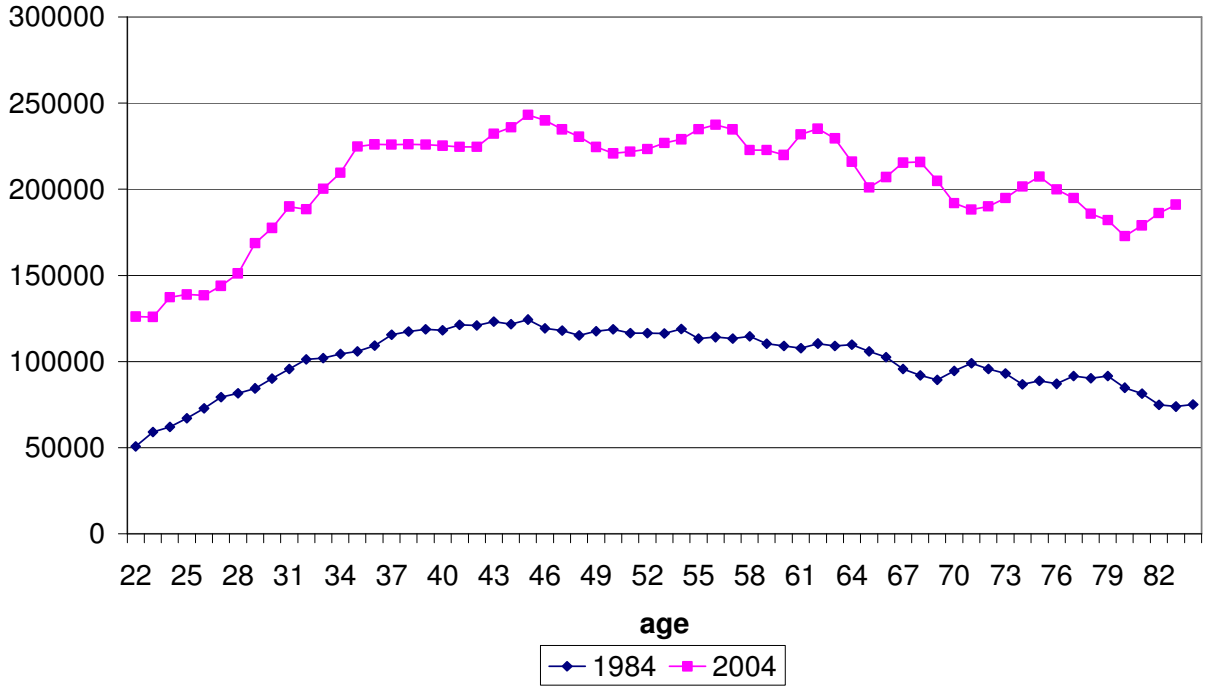


Figure 3-2. Home value given ownership, single males, 1984 and 2004 (in year 2000 dollars)

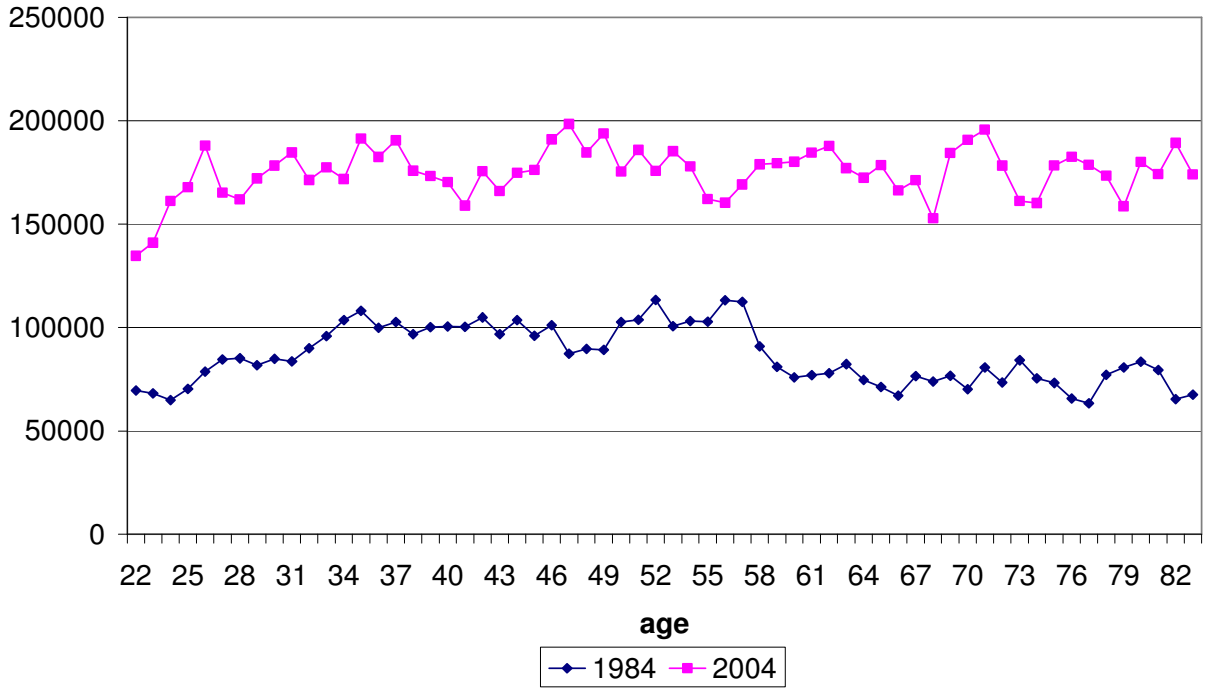


Figure 3-3. Home value given ownership, single females, 1984 and 2004 (in year 2000 dollars)

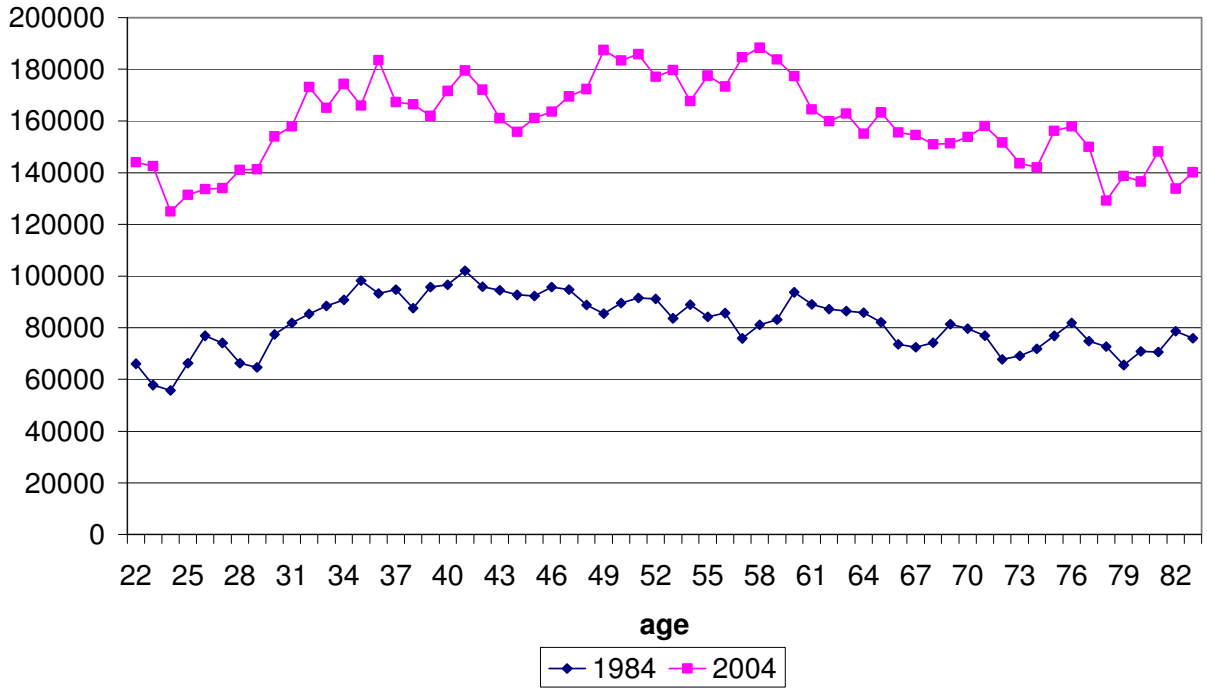


Figure 3-4. Home equity given ownership, couples, 1984 and 2004 (in year 2000 dollars)

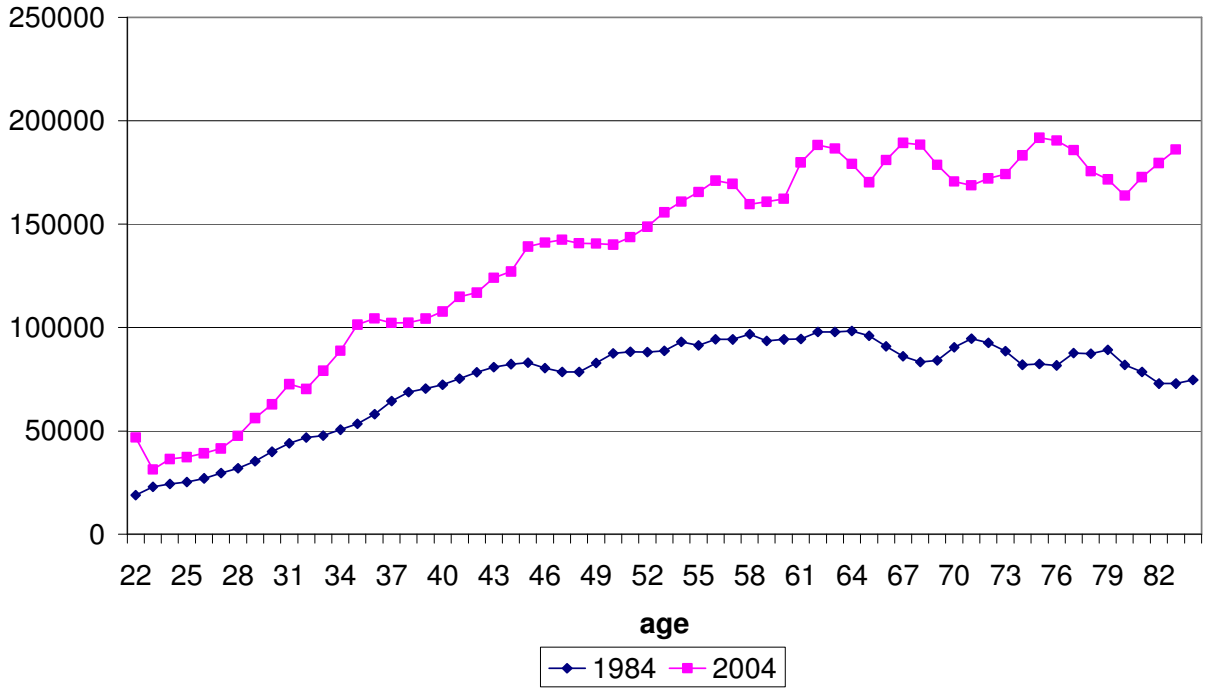


Figure 3-5. Home equity given ownership, single males, 1984 and 2004 (in year 2000 dollars)

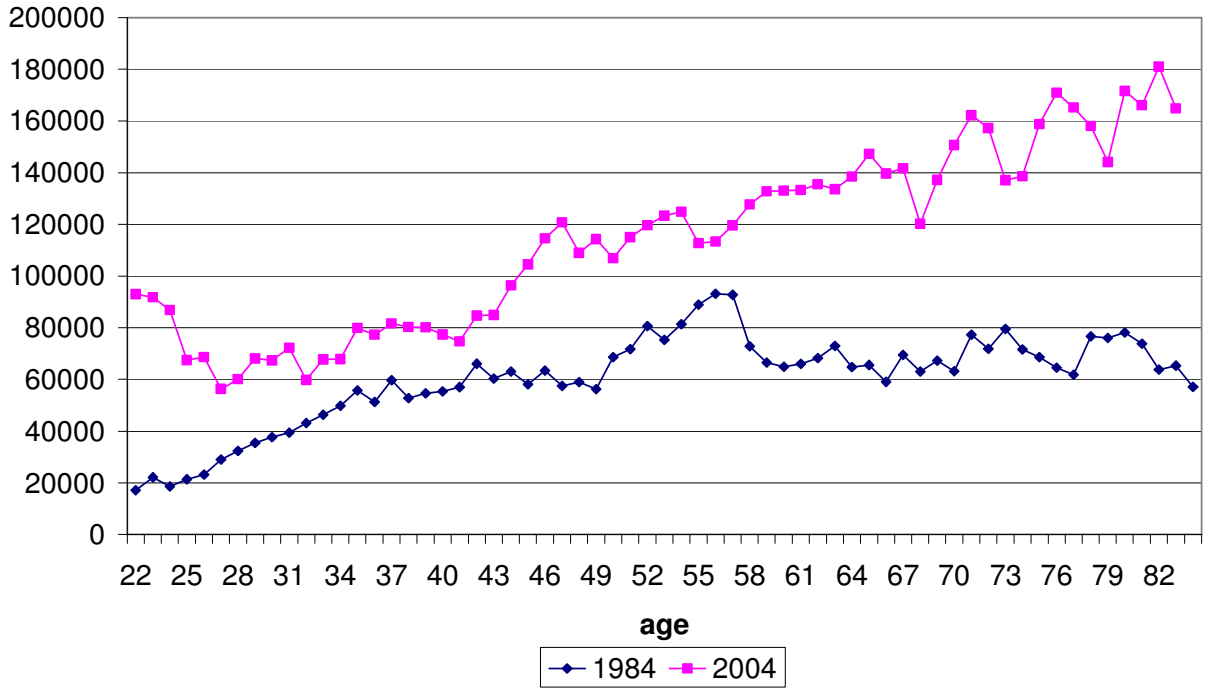


Figure 3-6. Home equity given ownership, single females, 1984 and 2004 (in year 2000 dollars)

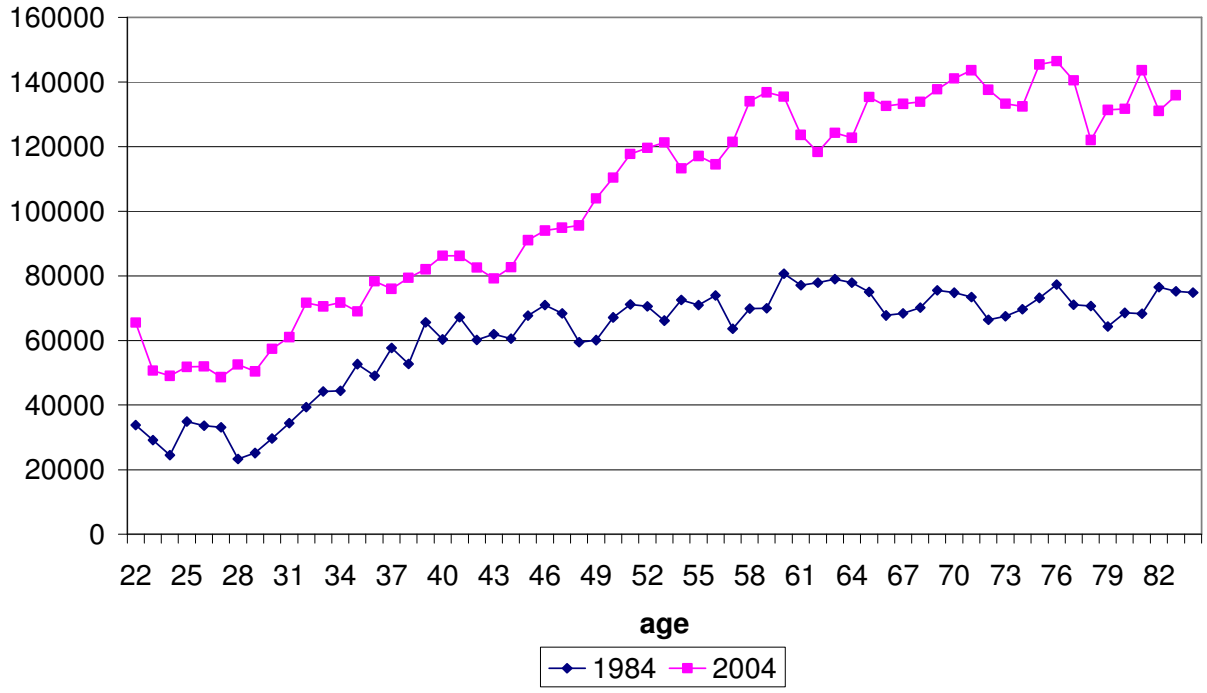
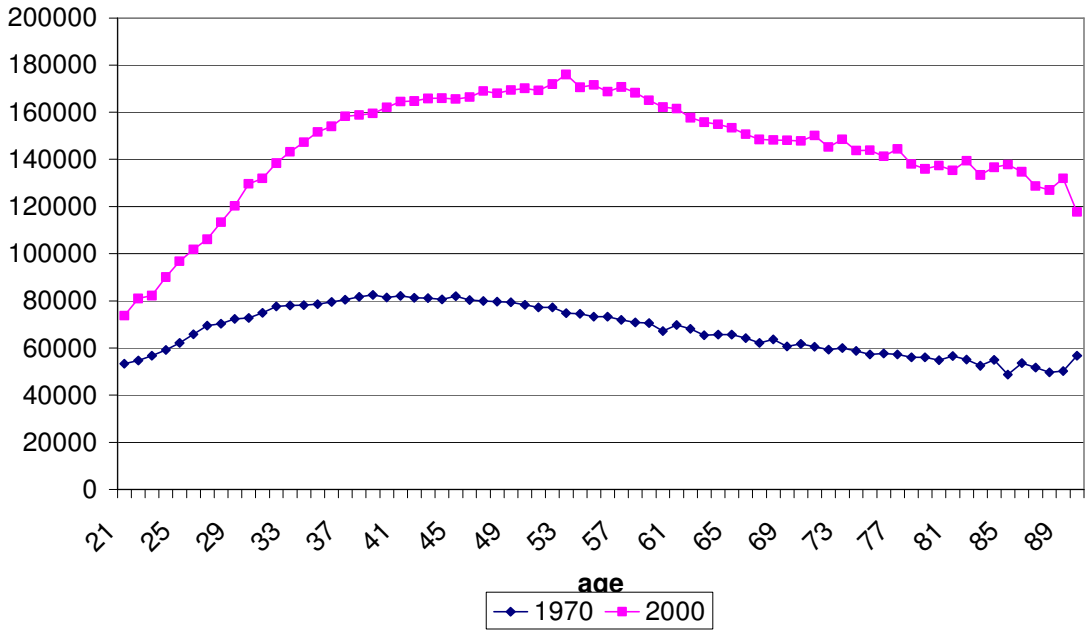


Figure 3-7. Home value of couples given own, 1970 & 2000, Census data (2000 dollars)



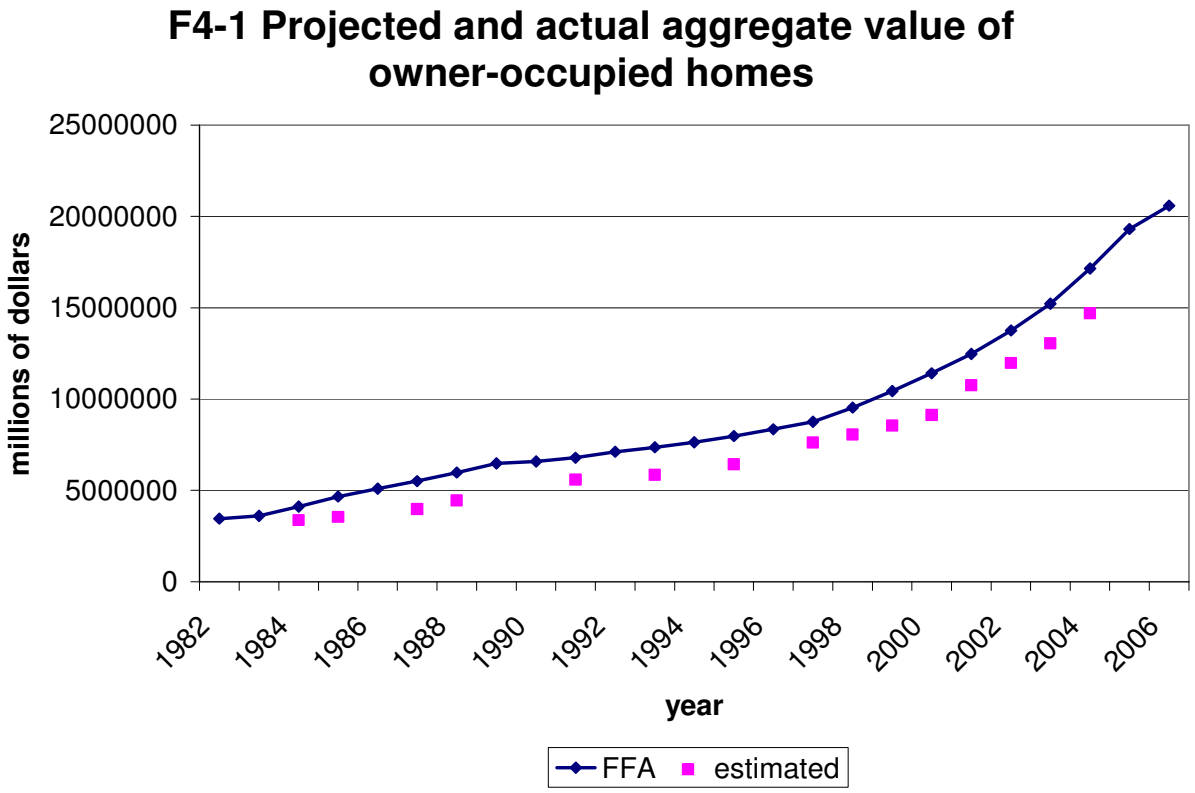
4. The Aggregate Value of Housing and Home Equity between 1984 and 2004

To check our results on home ownership and home values, we predict the aggregate value of housing based on our data and compare our estimates with Flow of Funds Accounts (FFA) aggregate data. We find a close correspondence between our estimates and the FFA aggregates. Our calculations for the 1984 to 2004 period are based on the observed pattern of home values and home ownership by age. We cannot assume, however, that the profile of home values by age will remain stable in the future. Thus we are not confident that the method we have used here could be used to make reliable projections for future years.

The data above show that the home value of owners increased substantially between 1984 and 2004 based on SIPP data. The increase between 1970 and 2000, based on Census data, was even greater. Now we want to consider the change in the aggregate value of housing between 1984 and 2006. To do this, we build upon the estimates produced in section 3. There we combined SIPP estimates of ownership by age in 2004 with population estimates for each year to obtain an estimate of the number of homes (or homeowners) for each year 1984 through 2006. Separate calculations were made for each gender and marital status group because these groups had different ownership profiles and because these groups experienced different rates of population growth over the period.

The next step is to assign housing values to the estimated population of owners in each year. Because housing values changed so much between 1984 and 2004 we use separate age-home value profiles for each year that they are available in the SIPP. These profiles are shown in Figure 3-1 through Figure 3-3 for two of the years, 1984 and 2004, but we have estimates for 15 of the 21 years between 1984 and 2004.

The results are displayed as square markers in Figure 4-1. For comparison we have also graphed the market value of household real estate from the Flow of Funds Accounts (FFA). The trends are strikingly similar for the two series, although our projections lie below the FFA estimates. This is likely the result of differences in coverage between the two series. The FFA data include several components (farm houses, second homes that are not rented, vacant homes for sale, and vacant land) that are not contained in our projections.



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

Various commentators have suggested a range of different explanations for the nationwide increase in home values between 1984 and 2004. Glaeser, Gyourko, and Saks (2004) suggest that land use restrictions constraining the supply of housing in key markets has played a role in rising house prices. Green and Wachter (2007) point to major changes in the home finance system and falling mortgage rates that reduced the user cost of housing, which stimulated the demand for housing. Real incomes rose over this period as well. Himmelfard, Mayer, and Sinai (2005) discuss the role of expectations of continued real house price appreciation. These factors, and others, may have offset the downward effect of demographic pressures on house prices that Mankiw and Weil (1989) identified in their projections.

One potential explanation of rising house values is that they were the result of rising demand for housing assets, driven in turn by rising non-housing wealth. It is difficult to test this potential explanation for the observed pattern, since housing values and other asset values are simultaneously determined in general equilibrium. As a first step in considering this explanation for rising house values, one must explore the relationship between housing wealth and non-housing wealth. To do that, we begin by comparing wealth in 2004 with wealth in 1984, and the ratio of home values to wealth and the ratio of home equity to wealth in these two years. We show that wealth in 2004 was much higher then wealth in 1984. In addition, we show that both the ratio of

housing value to wealth and the ratio of home equity to wealth were about the same in 2004 as in 1984. Differences between the two years were largely concentrated among young households. The ratio of mortgage debt to wealth was greater in 2004 than in 1984, essentially at all ages. We then consider the ratio of home value to wealth, the ratio of home equity to wealth, and the ratio of mortgage debt to wealth in each of the intervening years for which SIPP data are available between 1984 and 2004. We find in particular that the ratios vary with the stock market fluctuations over this period, although the ratio of home equity to wealth was essentially the same in 2004 as in 1984

Figure 5-1 shows that at each age mean total non-pension wealth, including housing equity, increased 1984 and 2004. Over all ages mean wealth increased 69.1 percent between 1984 and 2004 (in year 2000 dollars). Figure 5-2 shows that at each age non-pension wealth excluding home equity also increased between 1984 and 2004. Over all ages this measure of wealth increased 58.8 percent between 1984 and 2004.

We are particularly interested in the relationship between home values and home equity on the one hand and household wealth on the other. Figure 5-3 shows that the ratio of home value to wealth was somewhat higher in 2004 than in 1984 at ages 40 and over, but was substantially higher in 2004 than in 1984 for younger ages. Figure 5-4 shows that the ratio of mean home mortgage to household wealth increased between 1984 and 2004 for all ages. Figure 5-5 shows that on balance the ratio of home equity to wealth was very similar in 1984 and 2004, except at ages 30 and younger. Thus due to an increase in mortgage levels, the ratio of home equity to wealth remained the same when the ratio of home values to wealth increased. This is the “home equity extraction” process that was widely cited as a factor supporting consumer spending during the decade between 1995 and 2004. Sinai and Souleles (2007) focus their analysis of house values and mortgage debt among older households on the degree to which households increased borrowing in response to rises in house prices.

Figure 5-1. Mean total non-pension wealth (including housing equity) in 1984 and 2004 (in 2000 dollars)

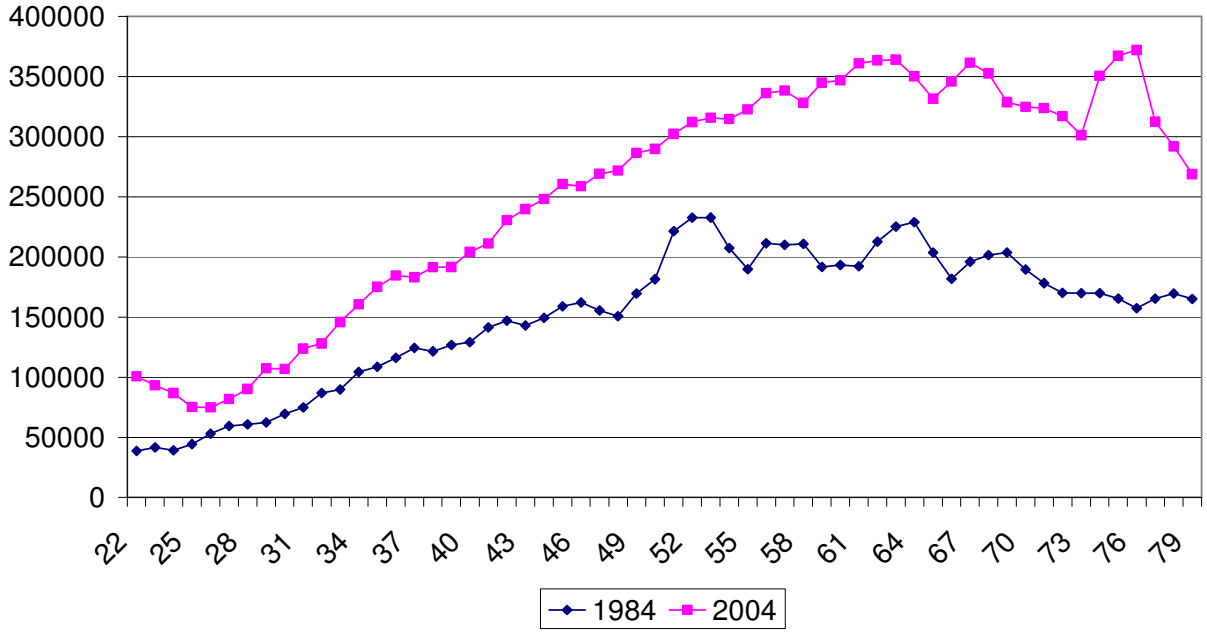


Figure 5-2. Mean total non-pension wealth (excluding housing equity) in 1984 and 2004 (in 2000 dollars)

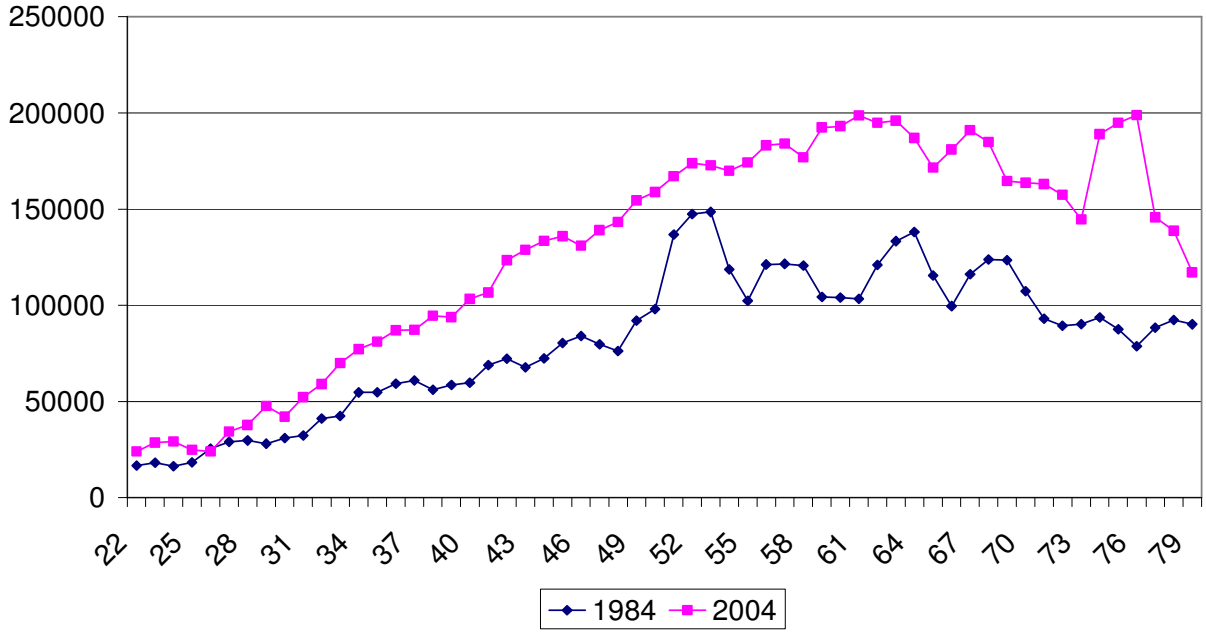


Figure 5-3. Ratio of house value to non-pension-wealth (excluding housing equity)

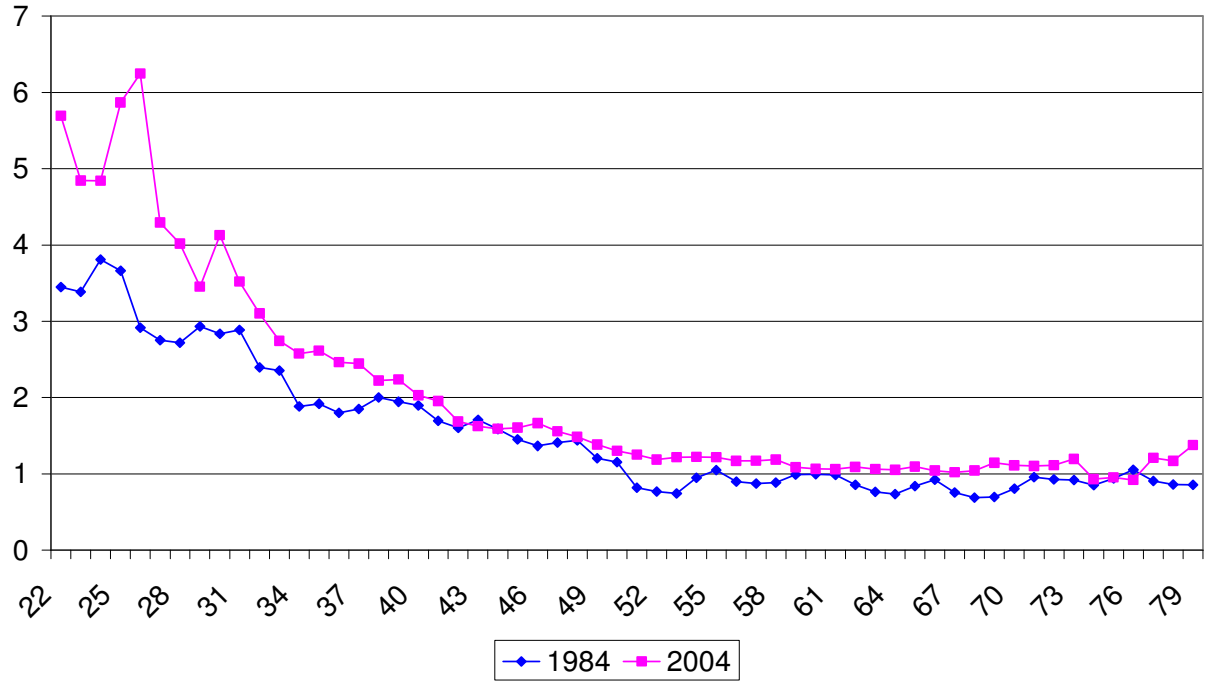


Figure 5-4. Ratio of mortgage debt to non-pension wealth (excluding housing equity)

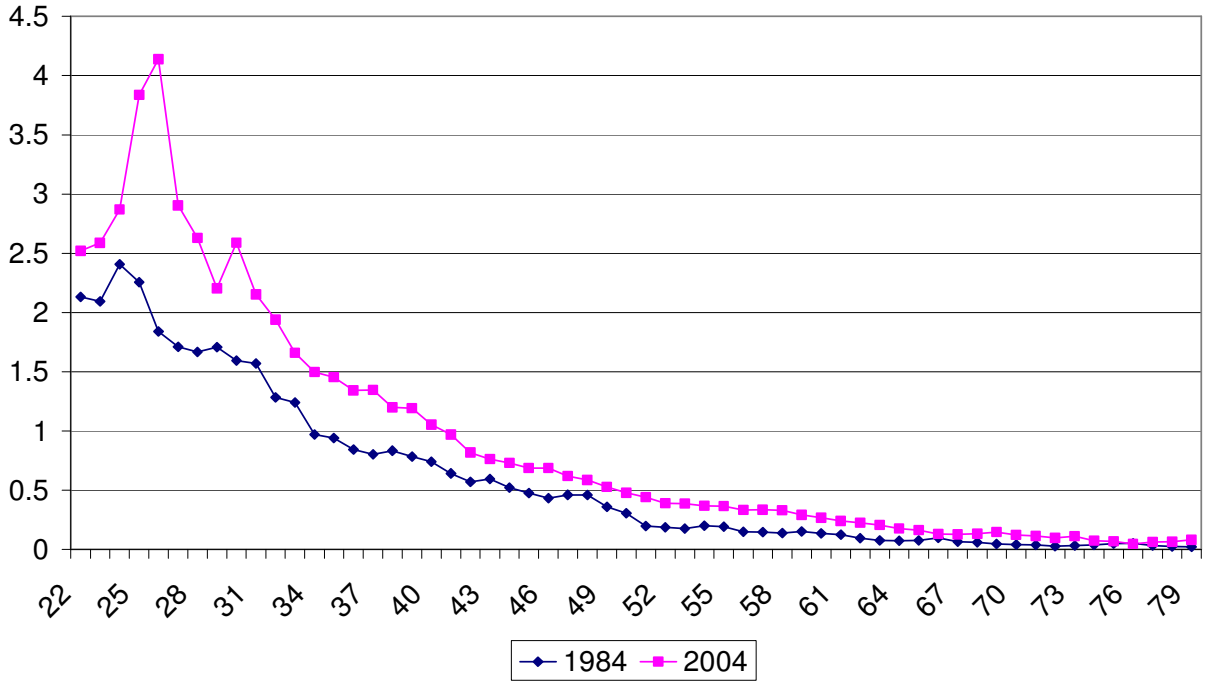
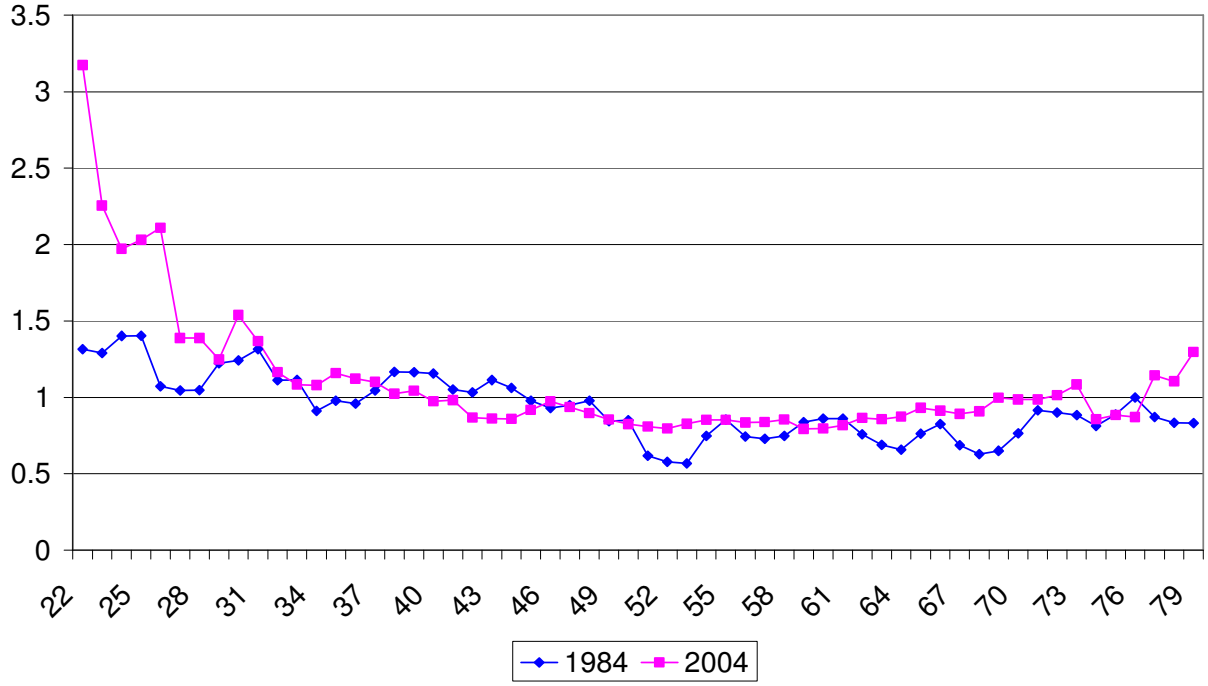


Figure 5-5. Ratio of home equity to non-pension wealth (excluding housing equity)



Although the ratio of home equity to wealth was about the same in 2004 as in 1984, except at younger ages—which we suspect can be attributed to the explosion of sub-prime mortgages—there were substantial changes in household wealth over the intervening years, as well as changes in the ratio of home equity to household wealth. To understand these changes, we consider household wealth and the ratios of home value, mortgage debt, and home equity to wealth for each of the years between 1984 and 2003. We consider the changes in each of these ratios for four geographic regions—mid-west, northeast, south and west. Figure 5-6 shows nominal non-housing wealth in each of the four regions. There was a substantial increase in all of the regions, especially beginning in 1995. On average there was about a three-fold increase in wealth over this period. The pattern of increase was essentially the same in each of the regions.

Figure 5-7 shows that the ratio of housing value to wealth varied over the period, with a dip about at the peak of the stock market bubble. Home values, however, were higher at the end than at the beginning of the period. Figure 5-8 shows that the ratio of mortgage debt to wealth increased over the period in all geographic regions. Figure 5-9 shows that the net effect was a ratio of home equity to wealth that was, on average, about the same in 2004 as in 1984. Like the ratio of home value to wealth, home equity also changed over intervening years, with a dip at about the peak of the stock market bubble. Although the ratio tends be higher in the Northeast and the West, the basic

trend if the same in all four regions. We return to more formal analysis of this "regularity" in section 8.

Figure 5-6. Mean nominal non-housing wealth for owners, by region,1994 to 2004, SIPP

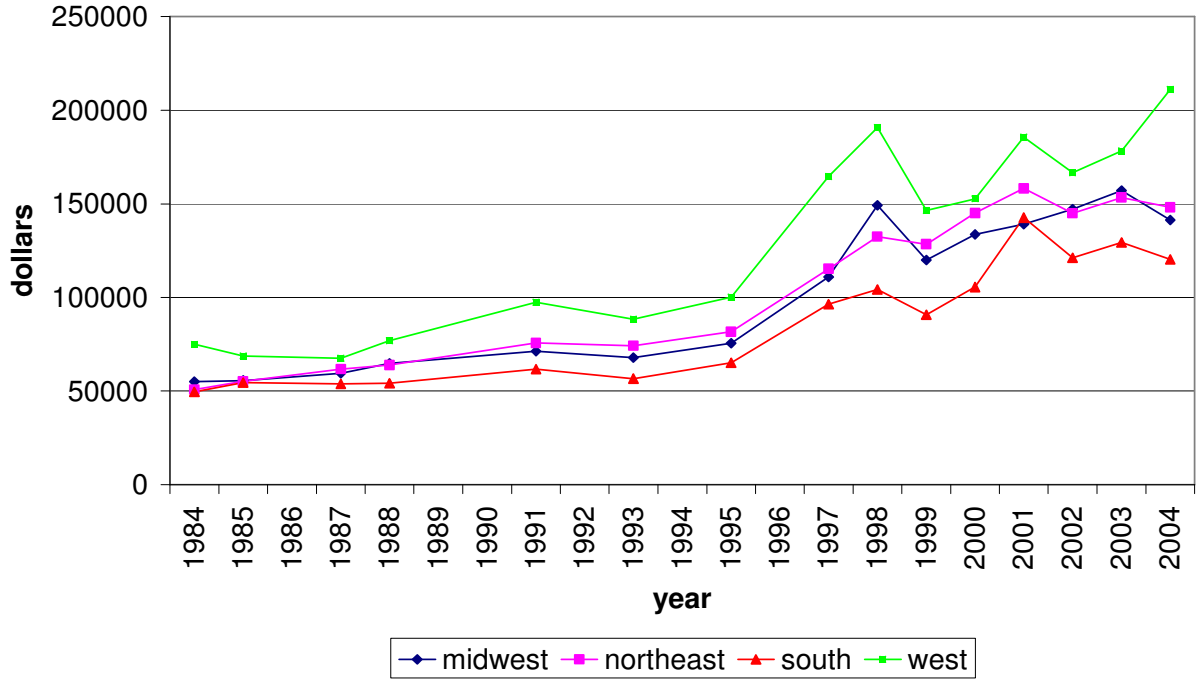


Figure 5-7. Ratio of home value to non-pension wealth for owners, by region, 1984 to 2004, SIPP

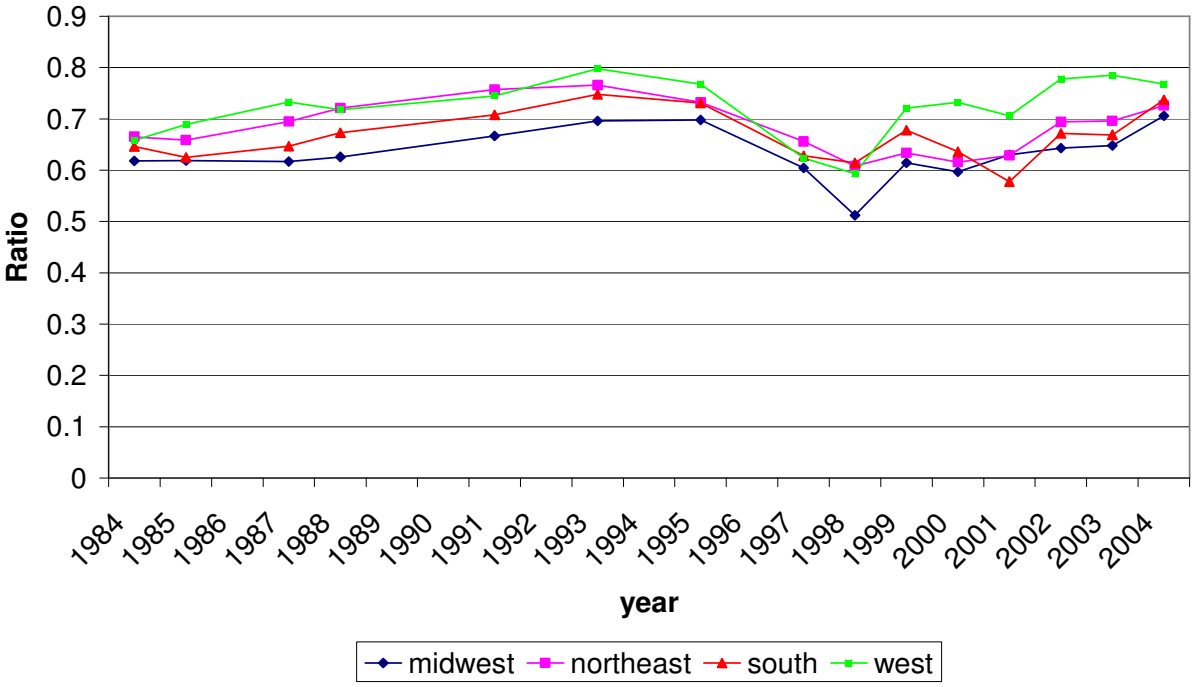


Figure 5-8. Ratio of mortgage debt to non-pension wealth for owners, by region, 1984 to 2004, SIPP

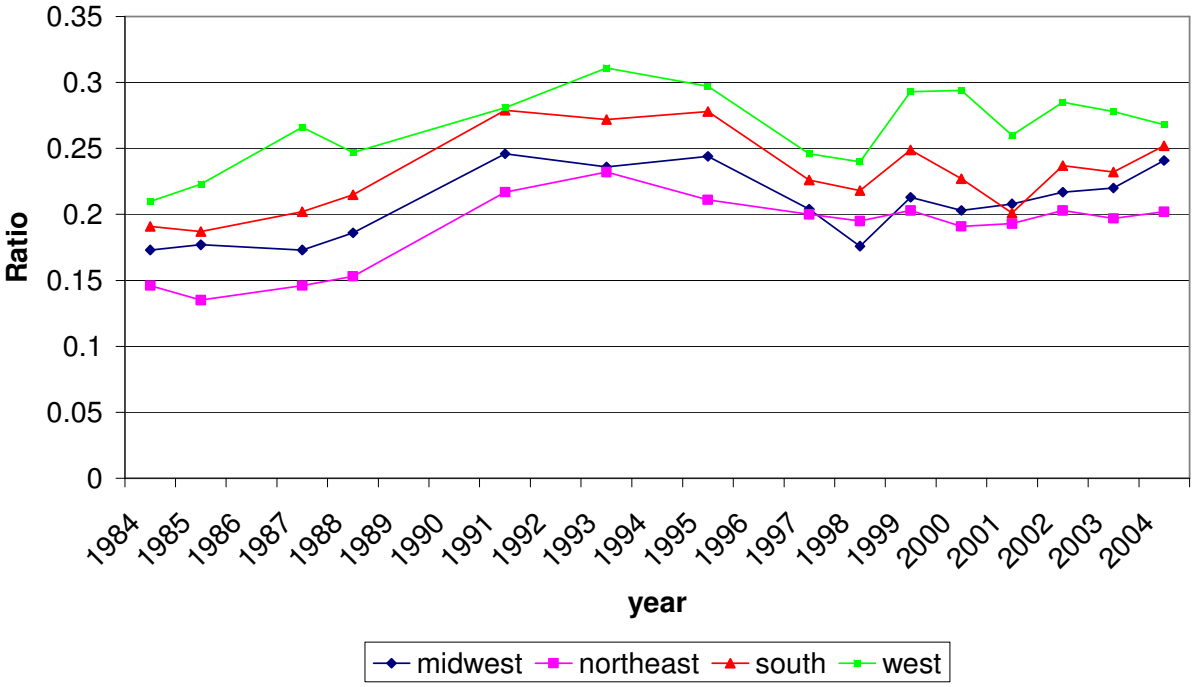


Figure 5-9. Ratio of housing equity to non-pension wealth for owners, by region, 1984 to 2004, SIPP

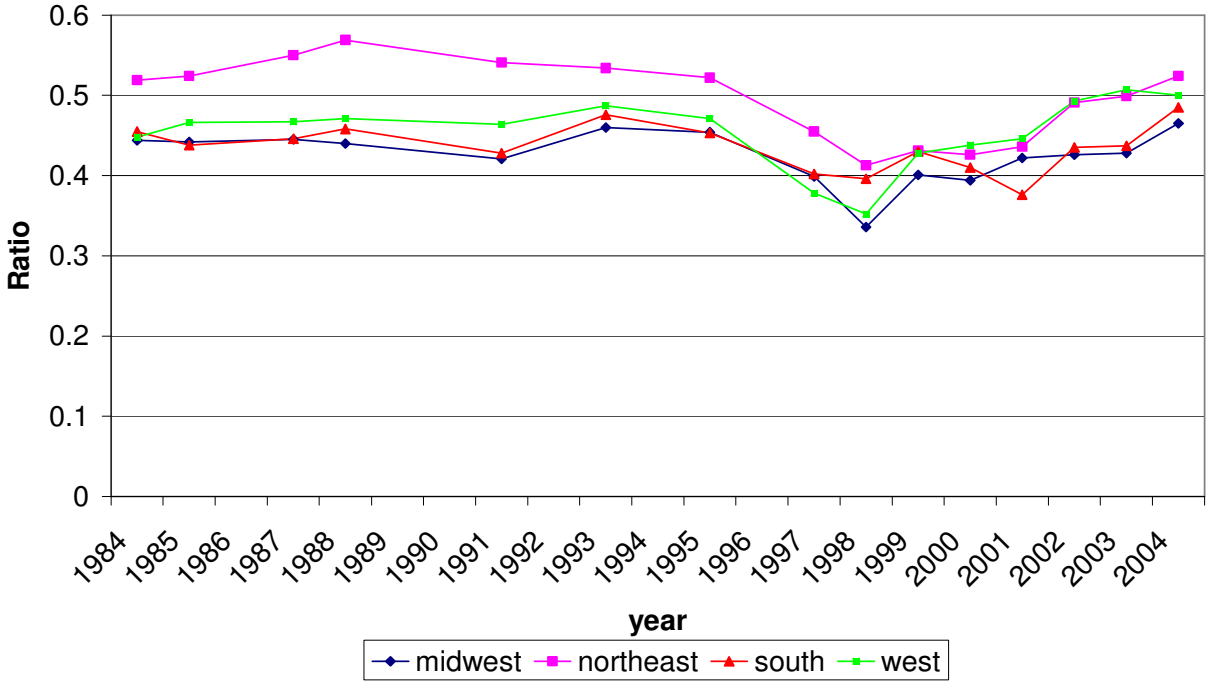


Figure 5-10. Ratio of home value, home equity, and mortgage debt to non-pension wealth for owners, all regions, 1984 to 2004, SIPP

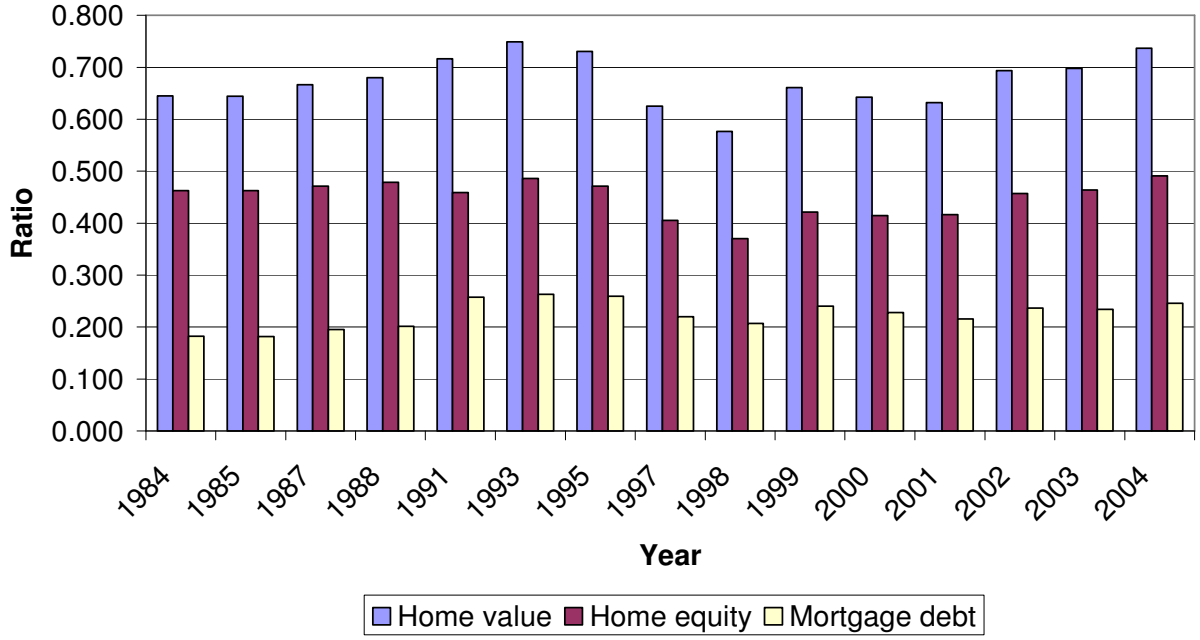


Figure 5-10 shows the ratios of home value, mortgage debt, and home equity to wealth for all regions combined. The combined data show the ratio of home value to wealth followed the wealth profile over the period, with a dip when stock market values reached their peak. The ratio of home value to wealth was somewhat higher in 2004 than in 1984. The ratio of mortgage debt to wealth, however, also increased substantially over the period, from 0.182 to 0.246, an increase of 35 percent. On net, the ratio of housing equity to wealth followed a pattern similar to the ratio of home value to wealth. But the ratio of home equity to wealth was essentially the same in 2004 as in 1984—0.462 versus 0.491.

Table 5-1 shows summary data, including these same ratios, for home owners aged 60 to 70. Total wealth, home value, and home equity all increased substantially between 1984 and 2004 (in 2000 dollars)—72.5 percent, 107 percent, and 91 percent respectively. Of the $147,355 increase in wealth, $102,222, about 69 percent, was accounted for by the increase in home values. Of the increase in home value $78,137, or 76 percent, was reflected in home equity and $24,085, or 26 percent was offset by an increase in mortgage debt.

Table 5-1. Means and percentage changes for all owners age 60 to 70, 1984 and 2004, in year 2000 dollars

Measure	1984	2004	Change
Total wealth	$203,343	$350,698	$147,355
House value	$95,661	$197,883	$102,222
Home equity	$86,032	$164,169	$78,137
Mortgage debt	$9,629	$33,714	$24,085
Ratio to wealth			
House value	0.470	0.564	0.094
Home equity	0.423	0.468	0.045
Mortgage debt	0.047	0.096	0.049
Ratio to home value			
Home equity	0.899	0.830	-0.070
Mortgage debt	0.101	0.170	0.070

The growth in mortgage debt to home value at ages 60 to 70 likely reflects the run-up in late-age refinancing and the resulting residual mortgage debt on the household balance sheet at older ages. These data bring to the fore the question of the balance between housing equity and the mortgage debt of future retirees. To explore this question further, we consider in the next section cohort data on home values, home equity, and mortgage debt.

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

The data description in the last section is based on changes in the cross-section profiles of wealth, home values, mortgage debt, and home equity. Here we consider the cohort profiles of these same measures. These descriptions help to inform the possible financial implications of housing equity and housing debt for future retiree cohorts.

Figure 6-1 shows the increase in the mean home value of homeowners for selected cohorts. As described in Section 1, 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 than earlier cohorts.

Mortgage debt also increased for successively younger cohorts, as shown in Figure 6-2. In this case, there are also substantial cohort effects—each successively younger cohort has more mortgage debt than the cohort ten years earlier. For older cohorts, mortgage debt fell as the cohort aged. Figure 6-3 shows home equity profiles for the same cohorts and reflects the net effect of the increase in home values and the increase in mortgage debt. As is the case with home value, younger cohorts have substantially more home equity at each age than older cohorts. In each of these figures, the vertical line at age 59 is intended to emphasize the large differences between home values, mortgage debt, and home equity at age 59, depending on the year in which the cohort attained age 59. The 2010 cohort (green markers) attained age 59 in 2004, the 2000 cohort (black markers) in 1994 and the 1990 cohort (blue markers) in 1984.

Over the 1984 to 2004 period the rate of growth of mortgage debt exceeded that of home value. As a consequence, successively younger cohorts have lower ratios of home equity to value, but higher ratios of mortgage debt to value, as shown in Figures 6-4 and 6-5 respectively. Within each cohort, the ratio of home equity to value increased with age. But there are also cohort effects. On balance, the ratio of home equity to home value is lower for each successively younger cohort. For all cohorts, the mortgage debt burden declines steadily with age. Again, though, there are some noticeable cohort effects.

Below we will consider in more detail the implications of the data in Figures 6-1 to 6-5. But for future reference, we also show here the relationship between household wealth and home equity. Figure 6-6 shows total wealth (home equity plus non-pension wealth) profiles for the same set of cohorts. The increase in wealth corresponding to the stock market run-up is evident. For example, households that attained age 59 in 2004 had much more wealth than households who attained age 59 in 1984 (in year 2000 dollars).

Home equity increased over the same period. It is striking that with very large increases in wealth, home values, and mortgage debt, the trend of the ratio of home equity to wealth was quite stable over the period. Indeed, there appear to be no systematic cohort effects in the profile of home equity to wealth, as shown in Figure 6-7, although there are substantial within-cohort fluctuations. We return to this regularity below.

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

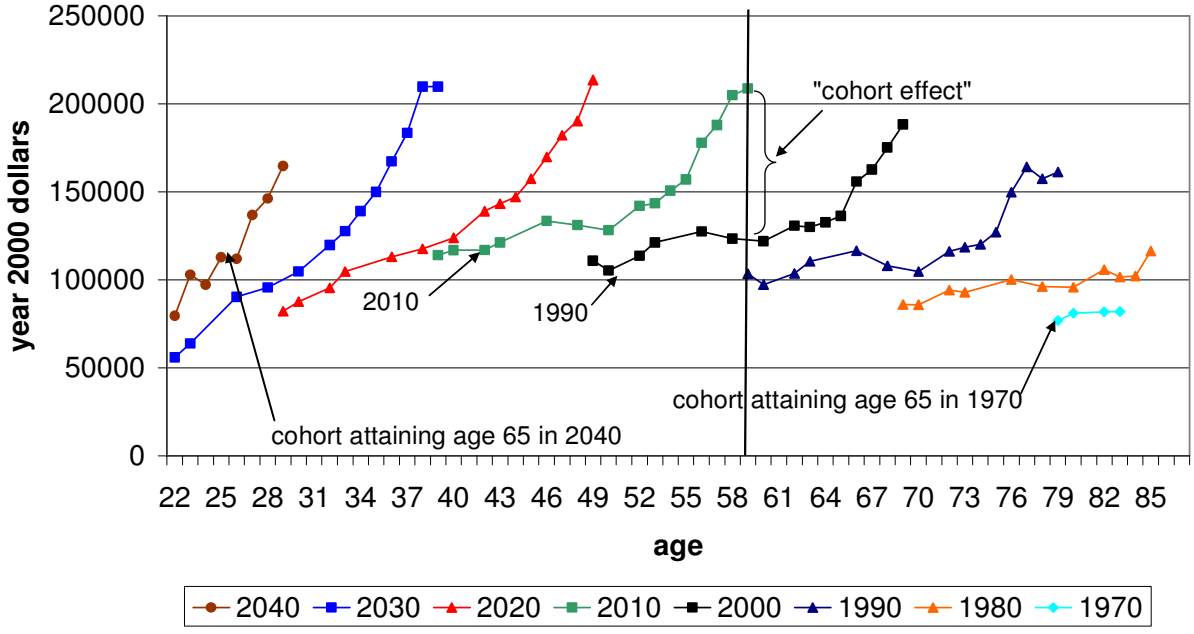


Figure 6-2. Mean mortgage debt for homeowners: eight selected cohorts identified by year members of cohort attain age 65

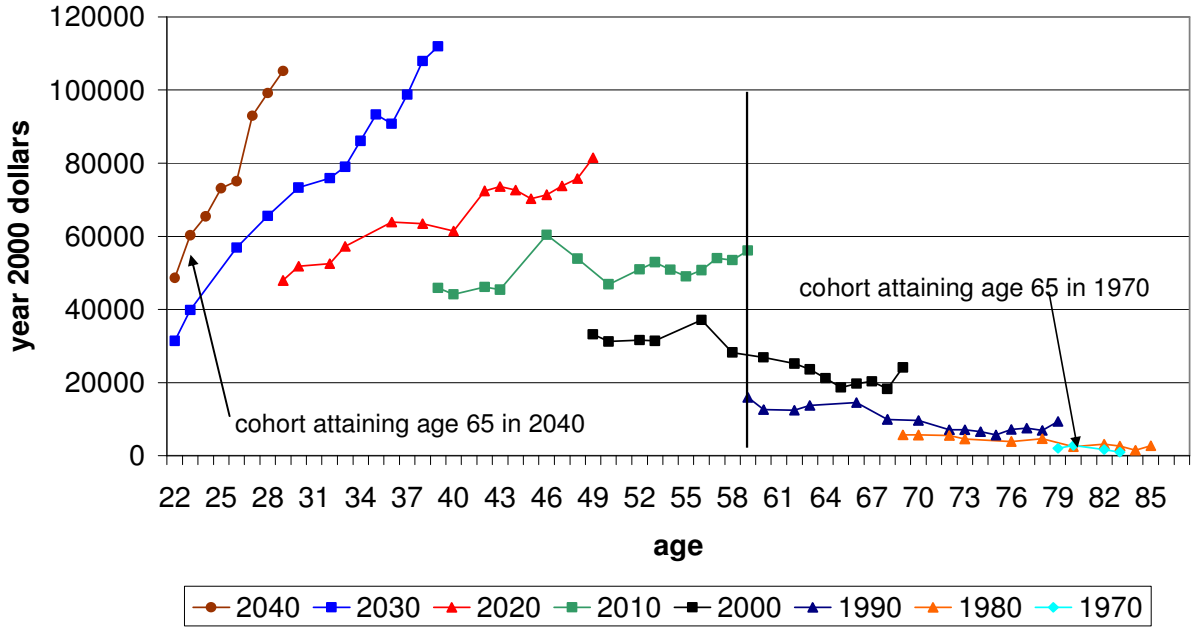


Figure 6-3. Mean home equity of homeowners: eight selected cohorts identified by year cohort attains age 65

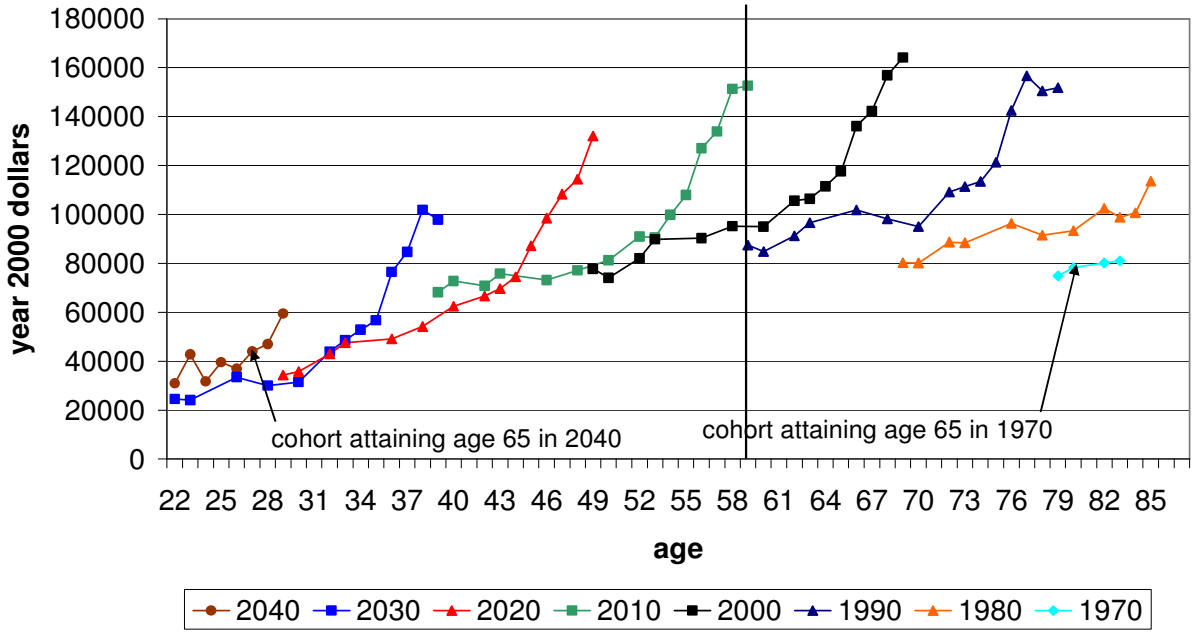


Figure 6-4. Mortgage debt to house value ratio for homeowners: eight selected cohorts identified by year cohort attains age 65

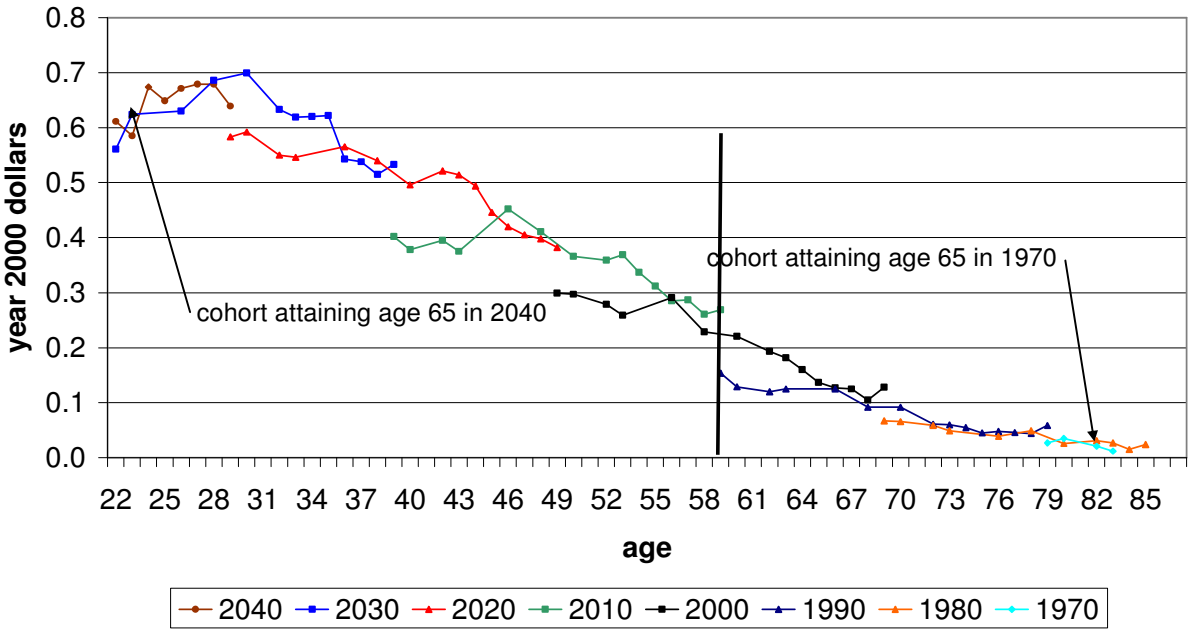


Figure 6-5. Home equity to house value ratio for homeowners: eight selected cohorts identified by year cohort attains age 65

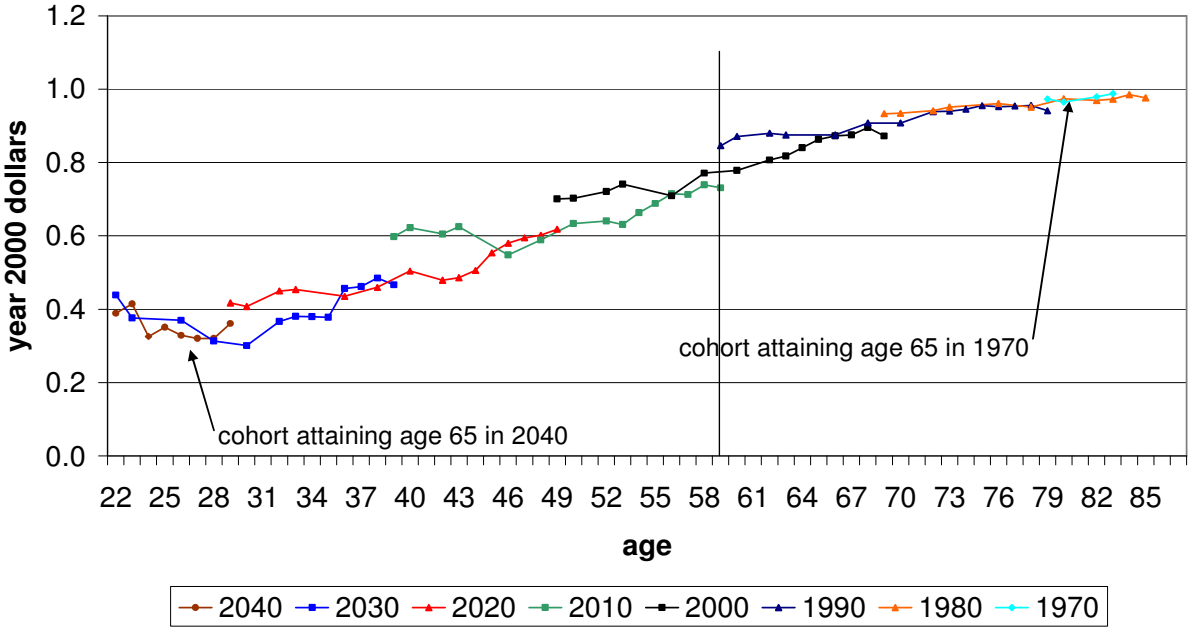


Figure 6-6. Mean total wealth of homeowners: eight selected cohorts identified by year cohort attains age 65

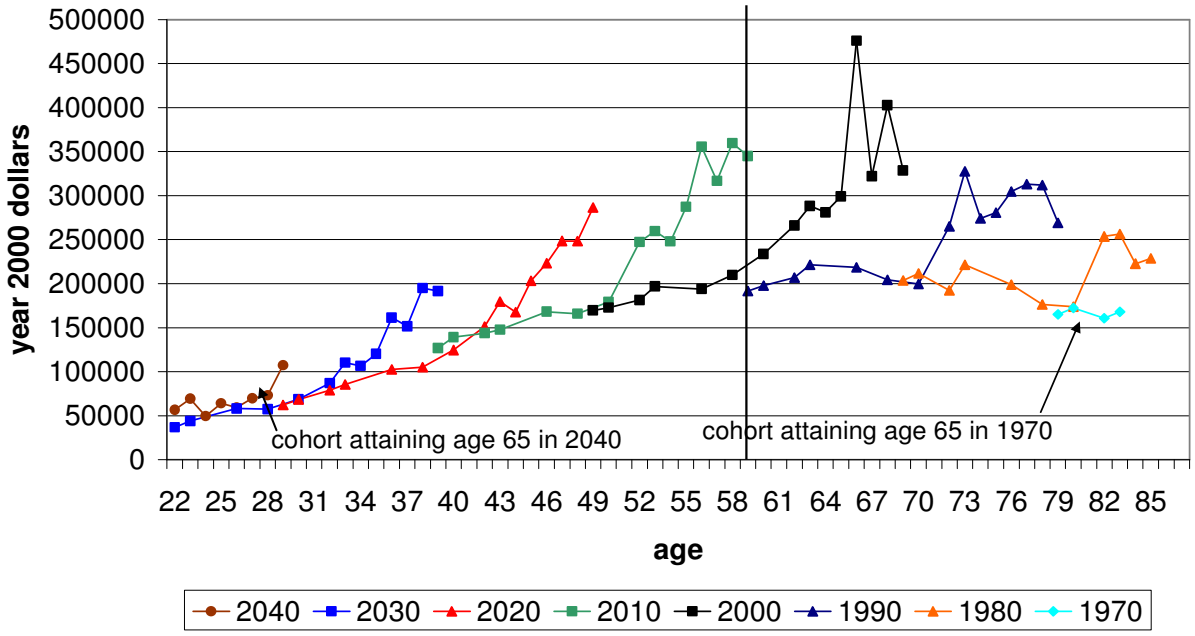


Figure 6-7. Home equity to wealth ratio for homeowners: eight selected cohorts identified by year cohort attains age 65

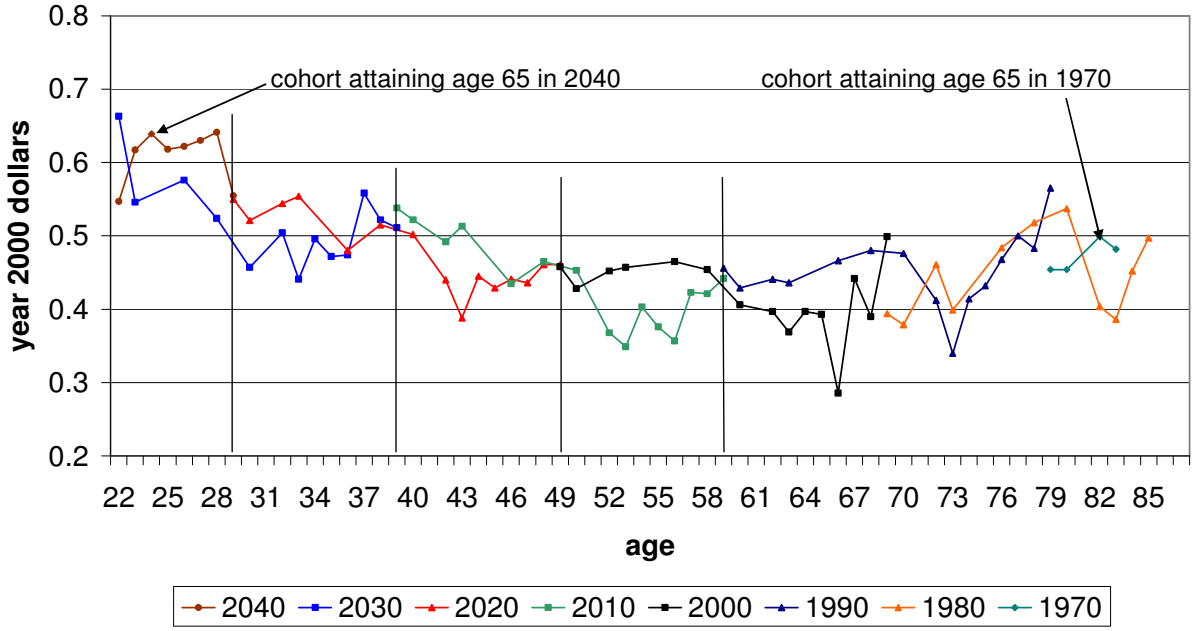


Fig 6-8. Housing value, home equity, and mortgage debt at age 59, by cohort (year attains age 65)

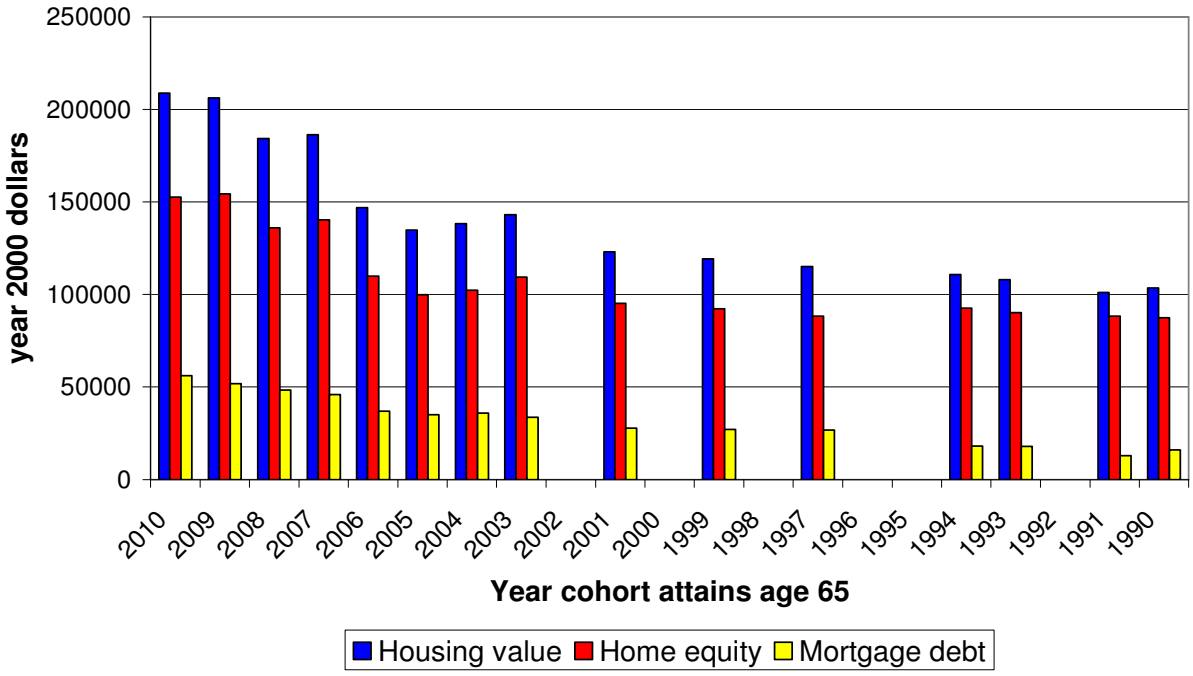
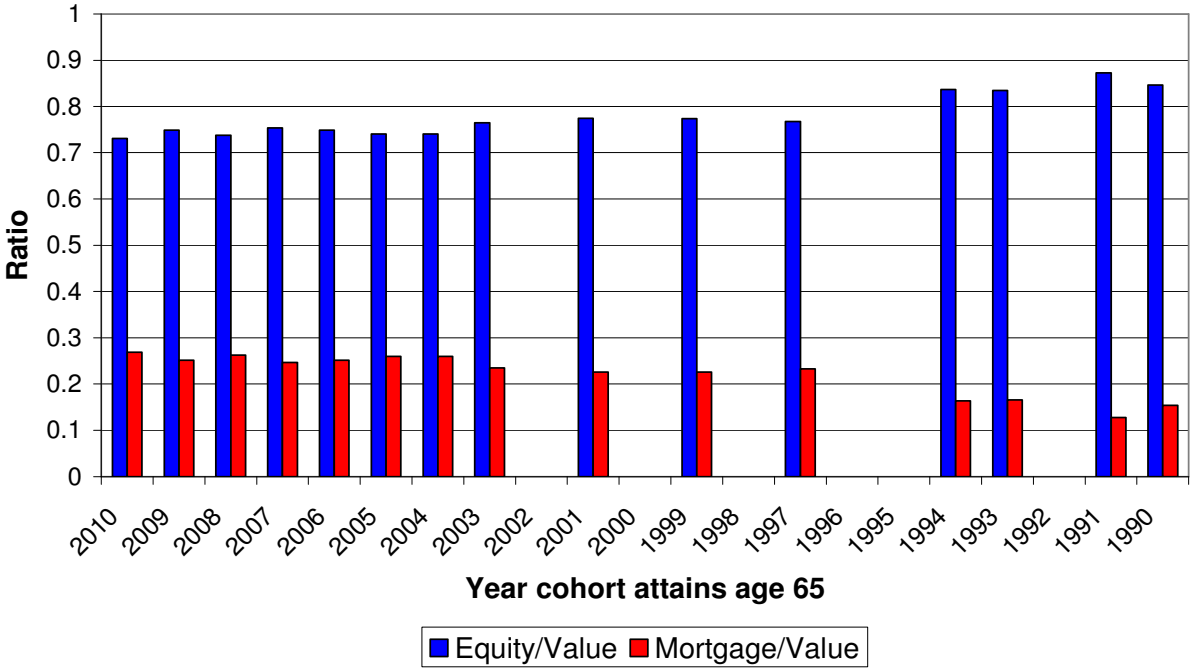


Fig 6-9. Ratio of home equity to value and ratio of mortgage debt to value at age 59, by cohort (year attains age 65)



To understand the implications of these trends we begin by examining data for persons who attained age 59 in different years. Figure 6-8 shows the average home value, the average equity, and the average mortgage debt at age 59 for the cohorts that attain age 59 between 1990 and 2010. Figure 6-9 shows the ratio of equity to home value and the ratio of mortgage debt to home value for these same cohorts. Average real home value nearly doubled over this period. But real home equity increased by only by a factor of 1.7. Real mortgage debt increased by a factor of 3.5. Thus as Figure 6-9 shows, the ratio of home equity to home value declined and the ratio of mortgage debt to value increased.

One of the reasons we have constructed the summary measures presented above is to gain some insight regarding the home equity positions of future retirees. It is clear that the answer to this question must depend on the unknown future path of house prices, and that it also depends on the behavior of homeowners before and after retirement. In the next section, we use historical house price data—subject to the usual concern that the future price paths may not be the same as the past—to project the housing equity at older ages for those who are currently near retirement. In the following section, we use various statistical tools to examine the relative constancy of the ratio of home equity to total wealth in more detail. We consider the implications of this relative constancy for our home equity projections.

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 subsequent analysis treats 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. 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

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	288,555	40,949	76,964
Equity	14,049	12,249	26,289
Mortgage	14,806	28,700	50,674
Equity to value	0.049	0.299	0.342
Mortgage to value	0.051	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

To understand the implications of these changes, 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 figures in section 6 highlight the differences in the home values, home mortgages, and the home equity of these two cohorts.

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 the change in the future changes in house values observed at 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. As shown in Table 6-1, mortgage debt is only about 26 percent of home value at age 59 in 2004. This declines to about 4 percent by age 79, on average. Because we simulate price changes 10,000 times for each cohort we are able to obtain rather precise estimates of low levels of home equity in the tails of the distributions.

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.

Our illustrative simulated results begin with the actual distribution of the home equity of homeowners at age 59 in R1990 and the R2010 cohorts. We choose these cohorts for illustration because, as Figure 6-1 shows, 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.

We walk through the simulation procedure we follow 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.

Because we are interested in this paper in risk that price fluctuations pose for the home equity of homeowners, it is of some interest to compare home price fluctuations with the fluctuation in the returns on financial assets. Figure 7-2 shows that since 1976 home prices have fluctuated less than stock and bond returns. With respect to the total assets of retirees it is also of interest that home price fluctuation are negatively correlated with the return on stocks and bonds over this period. The correlations are shown in Table 7-2. The correlations between the OFHEO home price index and the returns on stocks and bonds is around -0.20.

Figure 7-1. Three measures of year-to-year change in house prices

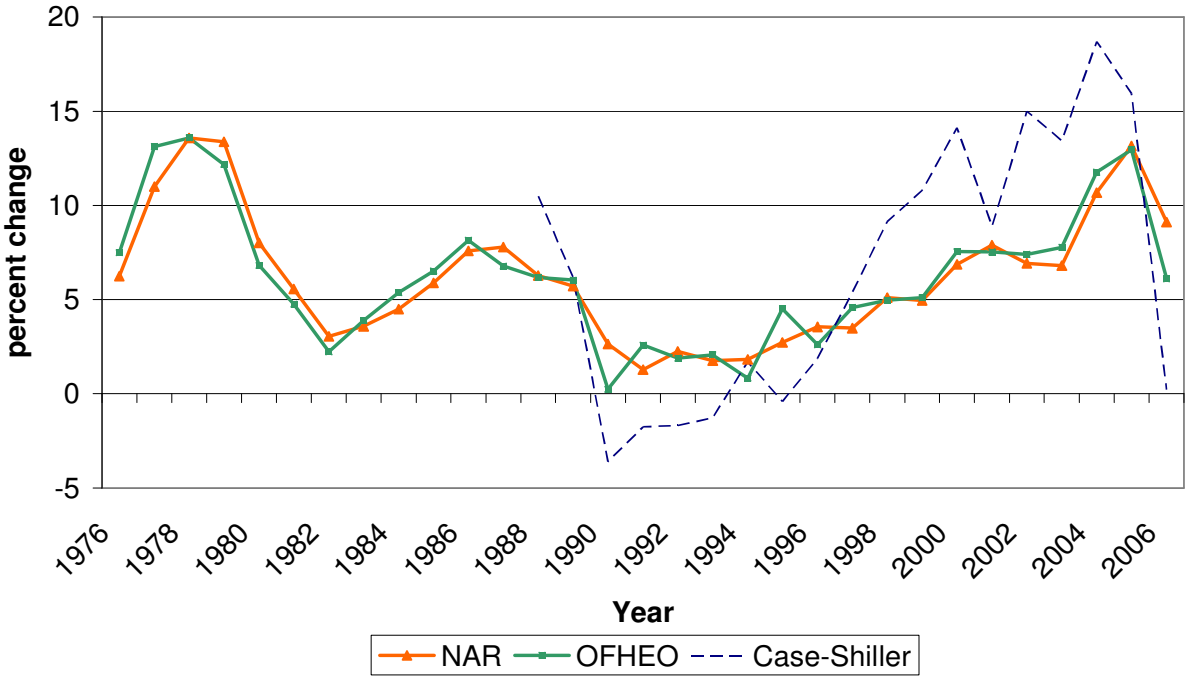


Table 7-2. Returns on stocks, bonds, and housing

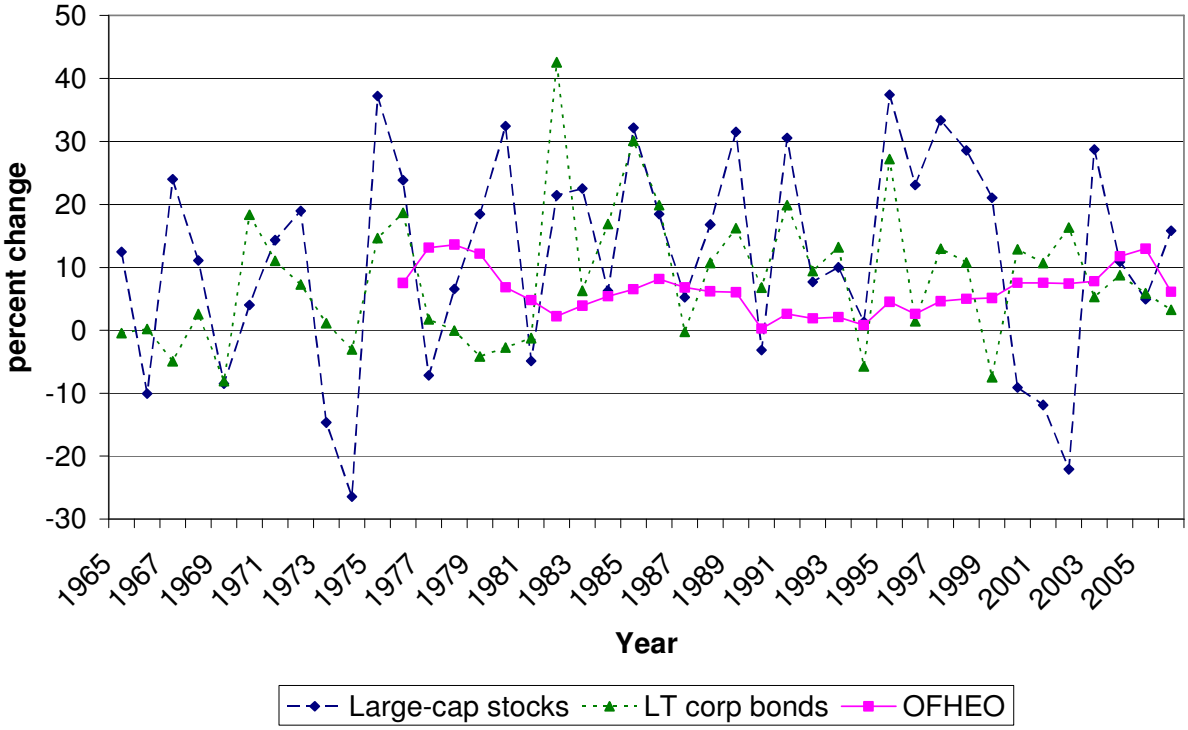


Table. 7-2. Correlation between stock and bond returns and change in home prices for 1976 through 2006.

Series	Large Co Stocks	LT Corp Bonds	LT Govt Bonds	NAR repeat sale % change	OFHEO house price index % change
Large Co Stocks	1.00				
LT Corp Bonds	0.26	1.00			
LT Govt Bonds	0.24	**0.96**	1.00		
NAR repeat sale % change house prices	-0.24	**-0.35**	**-0.32**	1.00	
OFHEO house price index % change	-0.18	-0.22	-0.18	**0.95**	1.00

BOLD significant at the 10% level

The starting-point for our simulations is the actual distribution of the home equity of homeowners at age 59. Cumulative distributions of the home equity at age 59 for the 1990 and 2010 cohorts are shown in Figure 7-3. 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). In particular, the upper percentiles of the distribution were much larger for the R2010 than for the R1990 cohort. The top panel of Table 7-3 shows selected percentiles of the distribution of actual home equity at age 59. The 90th percentile of the R2010 cohort was almost 98 percent larger than the 90th percentile of the R1990 cohort. The 10th percentile was only 32 percent larger. (Table 7-3 summarizes several additional results that will be referred to as we proceed.)

Figure 7-3. Cumulative distribution of actual home equity for households age 59, 1990 and 2010 cohorts

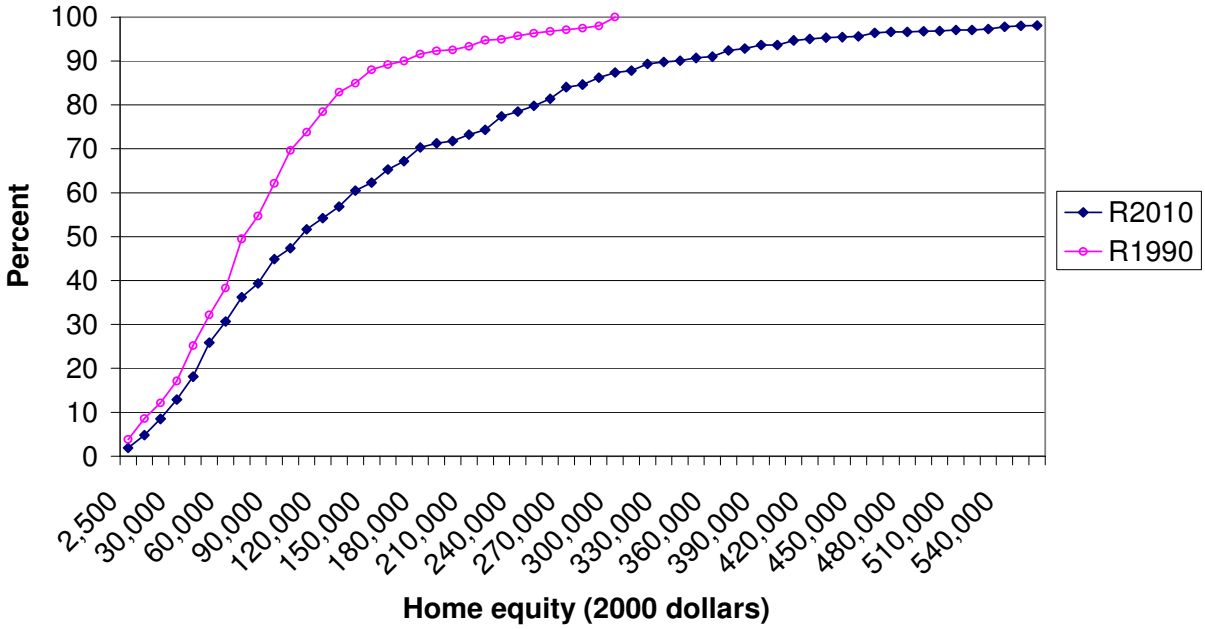


Figure 7-4. Cumulative distribution of projected home equity for households age 79, based on initial home equity at 59, 1990 and 2010 cohorts

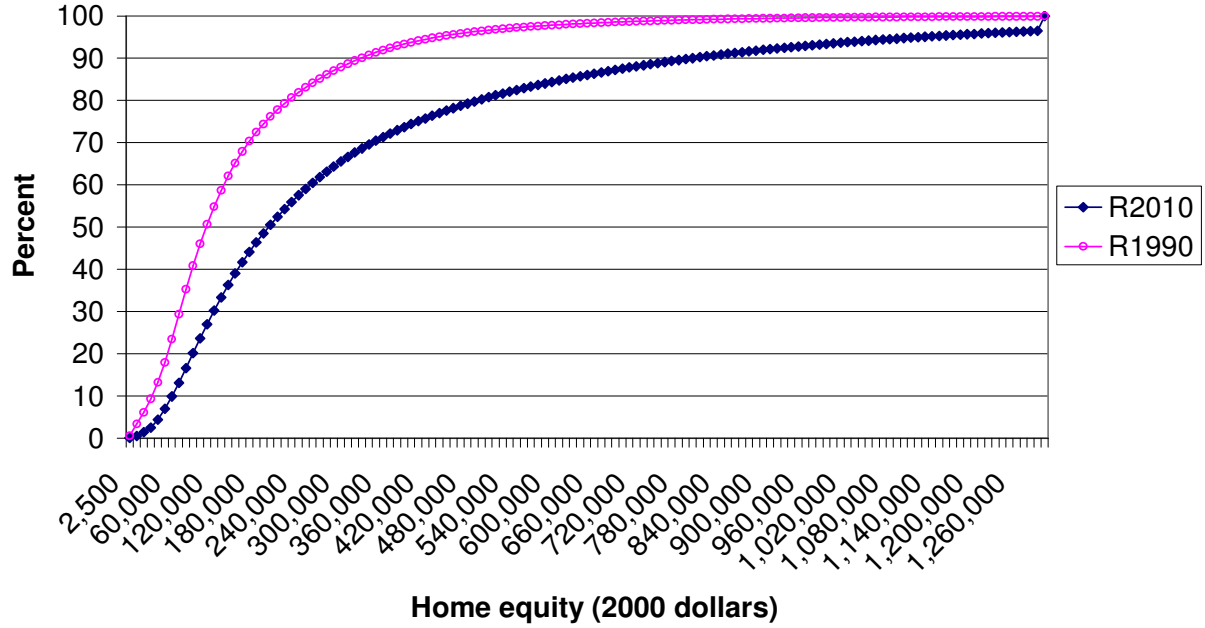
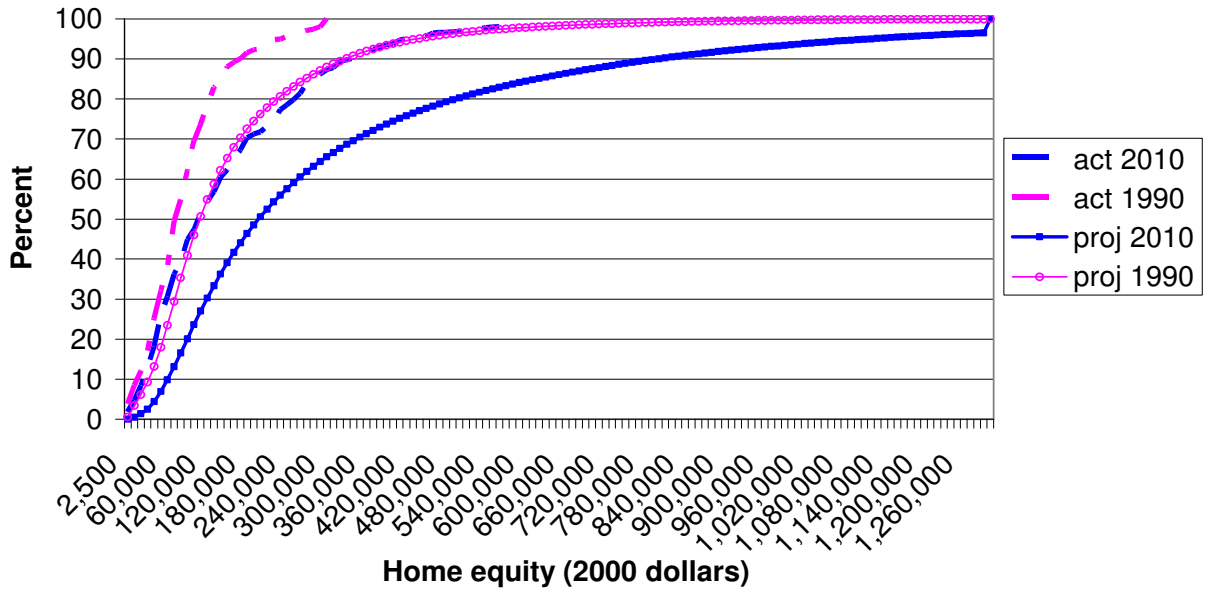


Figure 7-5. Cumulative distribution of actual home equity at age 59 and projected home equity at age 79, 1990 and 2010 cohorts



The distribution of home equity, calculated as the difference between home value and mortgage debt, is affected to some extent by the top-coding of both home value and mortgage debt. The effect of top-coding is essentially limited to the upper-tail of the distribution of home equity and leads to some underestimation of the number of households with very high levels of home equity. The number of home equity values that are affected by the top-coding of either home value or mortgage debt is described in Appendix figures A-1 and A-2.

Figure 7-4 shows the simulated cumulative distribution of home equity at age 79, twenty years after actual values of home equity were observed at age 59. The simulated distributions at age 79 together with the actual distributions at age 59 are shown in Figure 7-5. It is apparent that the average simulated home equity at 79 is much greater than actual home equity at 79 for both the R1990 and the R2010 cohorts. In addition, 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, as shown in the second panel of Table 7-3. The increase of the simulated average over the actual average at age 69 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

Table 7-3. Percentiles of actual home equity at age 59 and projected home equity at age 79, all households and households in the 1st and 5th home equity quintiles (year 2000 dollars)

Measure	Cohort retiring in 1990	Cohort retiring in 2010	% Change 1990 to 2010
All Households			
Actual home equity at age 59			
10th percentile	20,690	27,407	32.5%
50th percentile	75,372	111,454	47.9%
90th percentile	173,085	342,585	97.9%
Mean	89,867	154,074	71.4%
Projected home equity at age 79			
10th percentile	36,929	65,456	77.2%
50th percentile	113,646	202,408	78.1%
90th percentile	333,610	805,527	141.5%
Mean	159,538	341,848	114.3%
Households in the 1st home equity quintile			
Actual home equity at age 59			
10th percentile	0	6,395	NA
50th percentile	20,690	28,320	36.9%
90th percentile	36,947	45,678	23.6%
Mean	19,361	26,067	34.6%
Projected home equity at age 79			
10th percentile	10,639	31,742	198.4%
50th percentile	39,079	85,879	119.8%
90th percentile	105,019	218,587	108.1%
Mean	53,742	112,450	109.2%
Households in the 5th home equity quintile			
Actual home equity at age 59			
10th percentile	133,010	274,068	106.1%
50th percentile	173,085	338,930	95.8%
90th percentile	295,578	566,407	91.6%
Mean	191,620	372,496	94.4%
Projected home equity at age 79			
10th percentile	158,706	351,263	121.3%
50th percentile	292,742	702,397	139.9%
90th percentile	603,983	1,512,243	150.4%
Mean	346,824	840,871	142.4%

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 10th, 50th, and 90th 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).

Figure 7-6. Frequency distribution of projected home equity for households age 79, based on initial home equity at 59 for the 1990 and 2010 cohorts

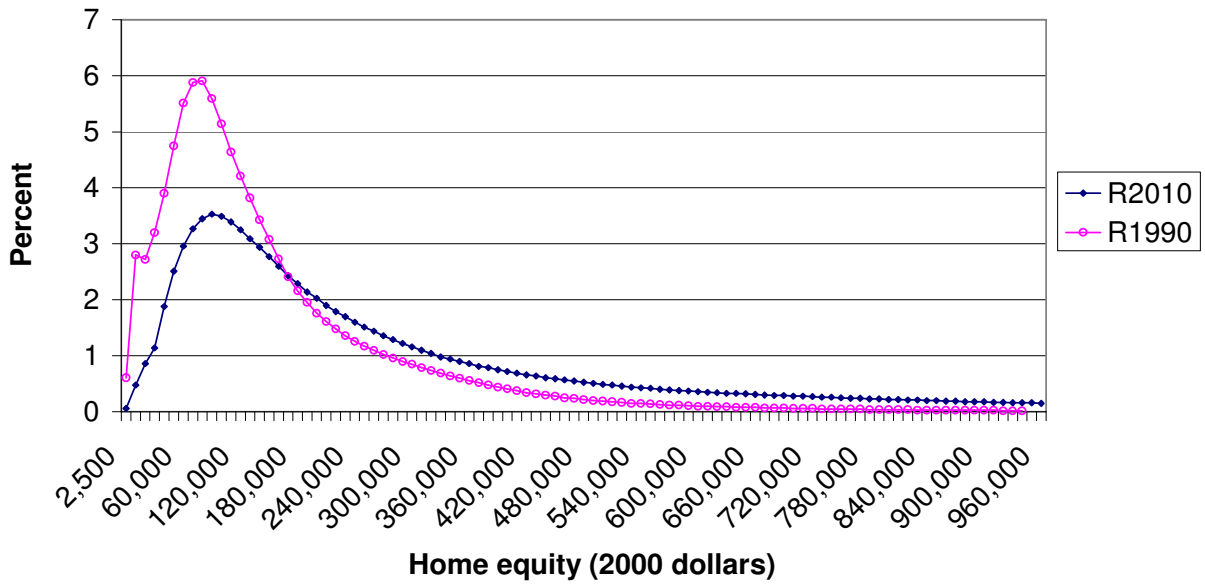


Figure 7-7. Frequency distribution of projected home equity for households age 79, based on actual home equity at age 59, 1990 and 2010 cohorts (1st quintile at age 59)

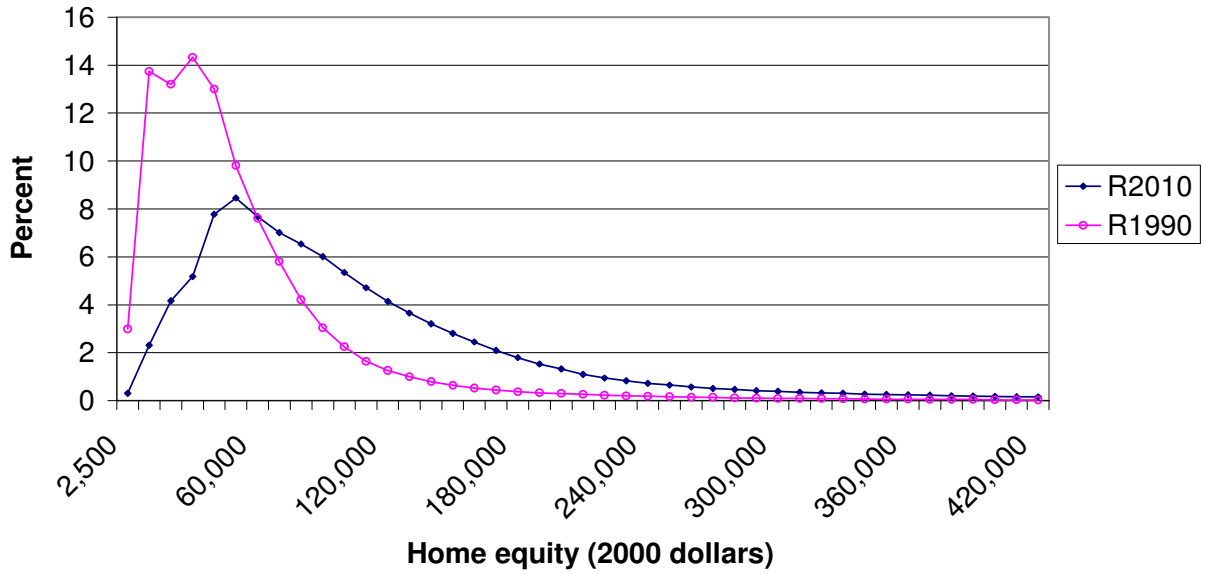
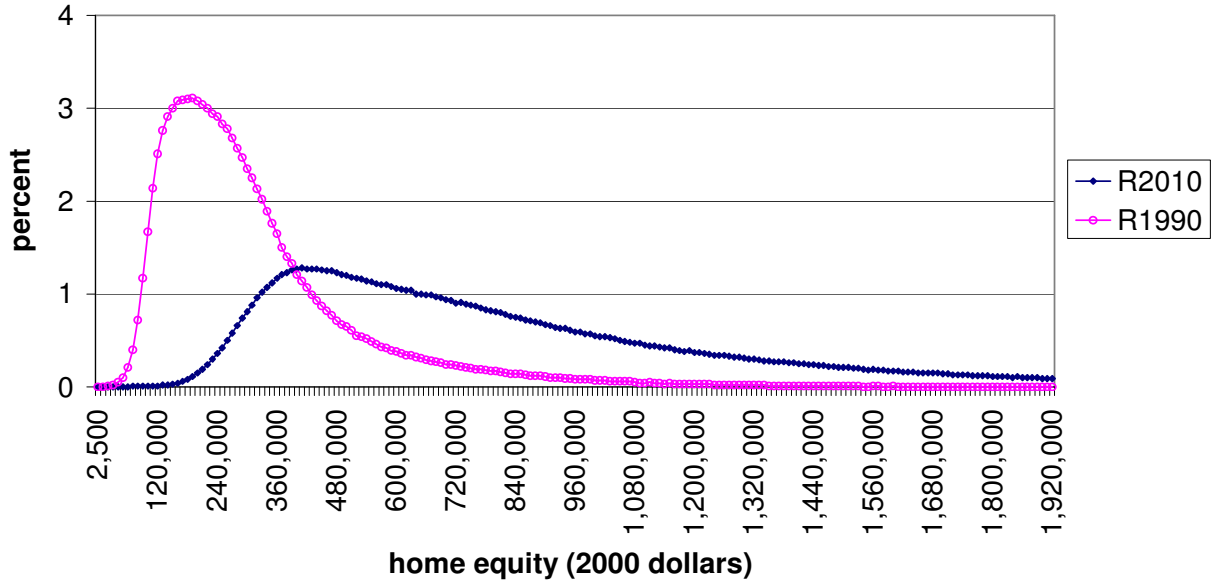


Figure 7-8. Frequency distribution of projected home equity for households age 79, based on actual home equity at age 59, 1990 and 2010 cohorts (5th quintile at age 59)



The distributions of actual and simulated equity shown above pertain to all homeowners. The difference between the actual distribution at age 59 and the simulated distribution at age 79, however, differs greatly by equity level. This is most easily seen by considering the pdf of simulated equity at age 79. The pfd for all homeowners is shown in Figure 7-6, for both the 1990 and the 2010 cohorts. While it is clear that the average equity at age 79 is greater for the 2010 than for the 1990 cohort, both distributions are concentrated around the mean for each cohort. The same is true for the pdf of equity values for homeowners in the 1st quintile of home equity values, as shown in Figure 7-7. The distributions for the 5th quintile of home values are very different. In particular, the proportion of high-equity values is much more pronounced for homeowners in the 2010 cohort than for those in the 1990 cohort. Thus the simulations suggest that when the 2010 cohort attains age 79, a much larger fraction of home owners will have very substantial home equity than was the case for 79 year old homeowners in the 1990 cohort.

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 10th, 50th, and 90th 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 90th percentile for the 2010 cohort over the 90th 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 10th percentile for the 2010 cohort is well below the 50th percentile of the 1990 cohort. And, the 90th percentile of the 1990 cohort is well above the 50th percentile for the 2010 cohort.

Figure 7-9. Projected 10th, 50th, and 90th percentiles of home equity based on actual equity at age 59, cohorts retiring in 1990 and 2010, all homeowners

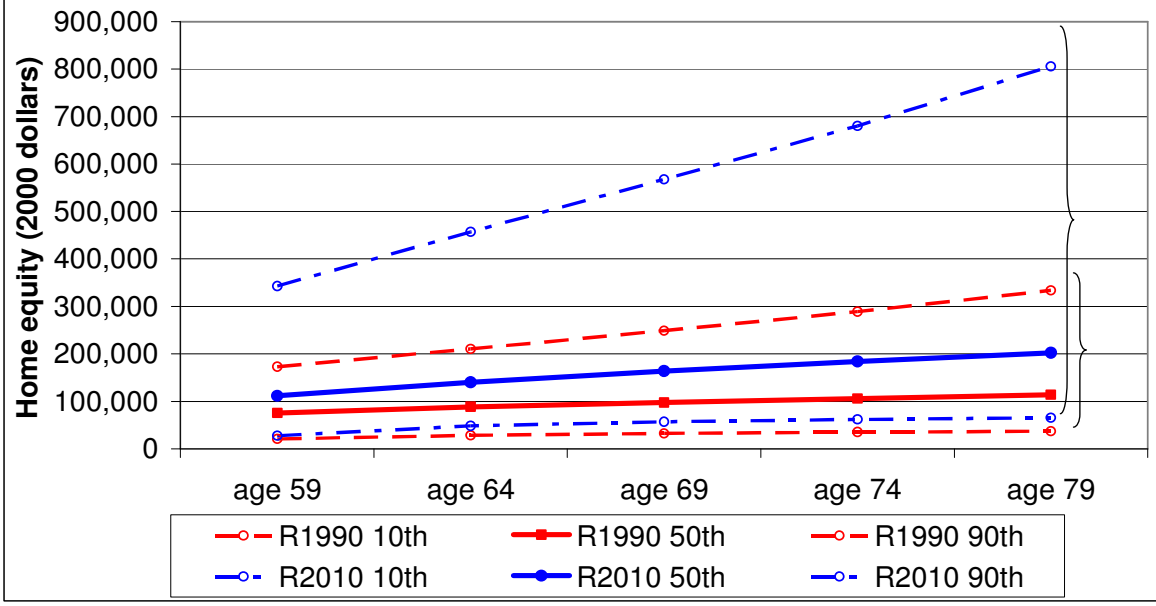


Figure 7-10. Projected 10th, 50th, and 90th percentiles of home equity based on actual equity at age 59, cohorts retiring in 1990 and 2010, 1st quintile

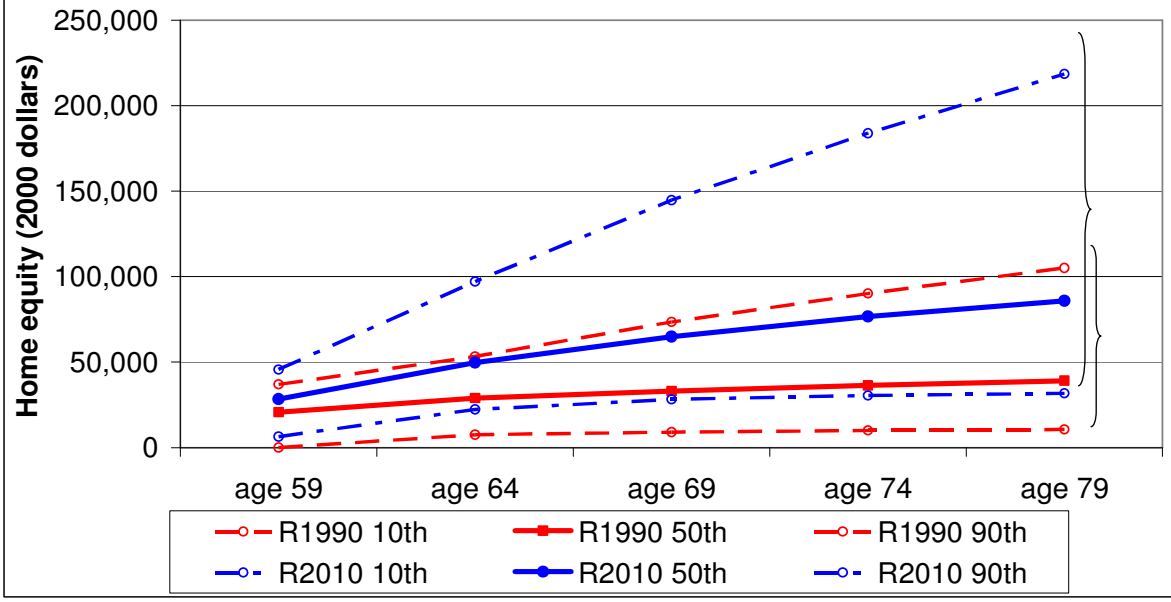
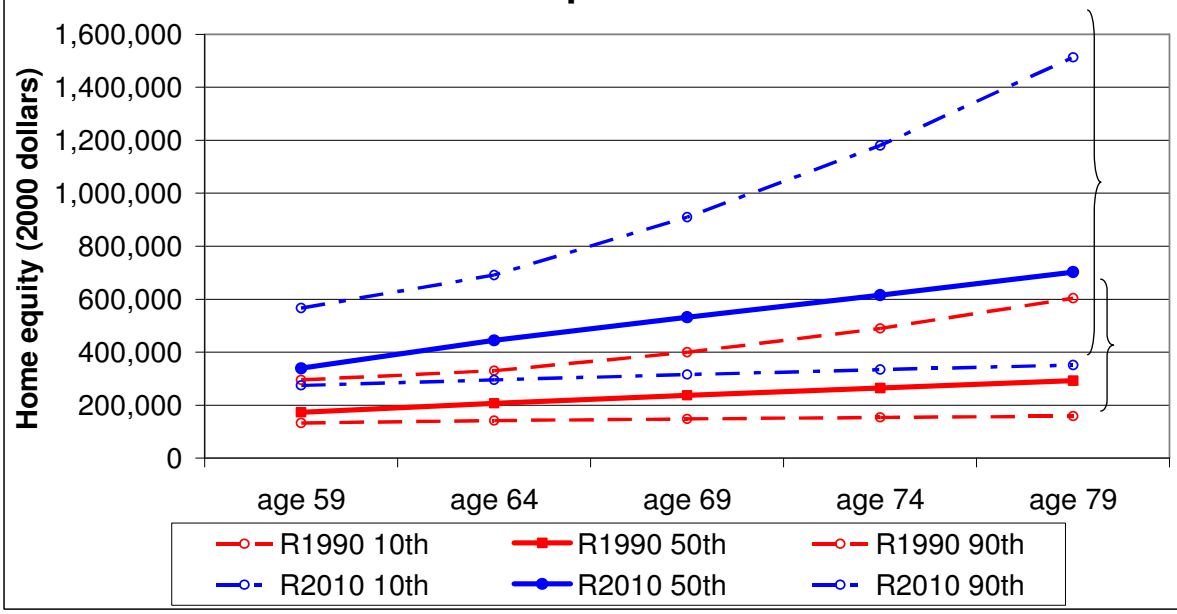


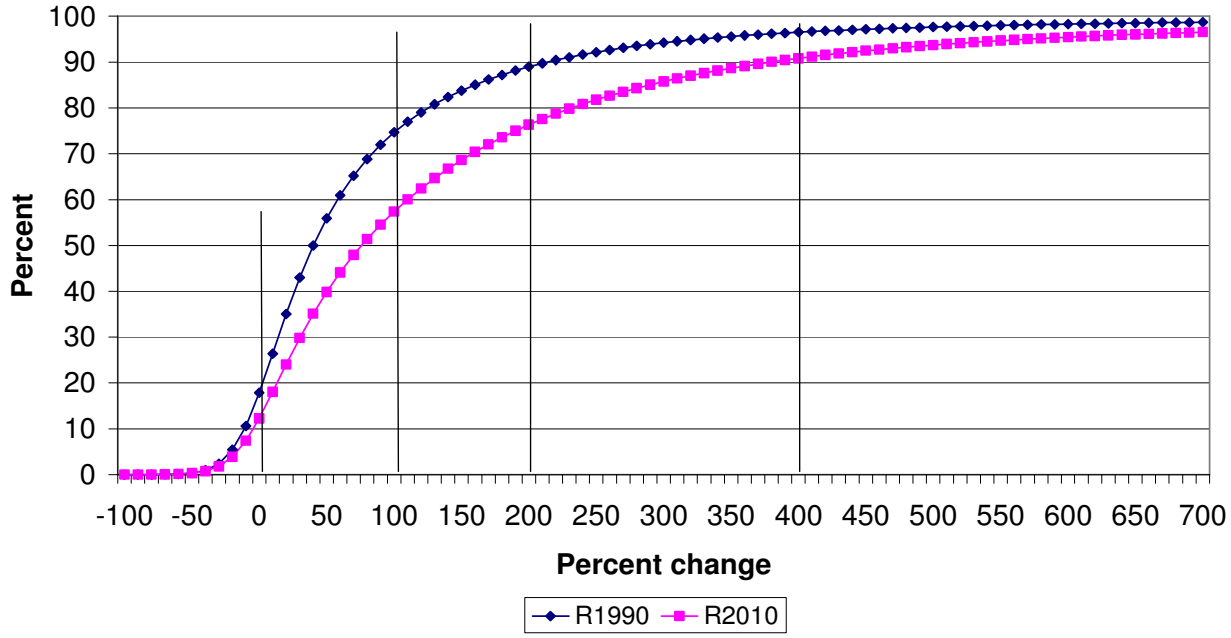
Figure 7-11. Projected 10th, 50th, and 90th percentiles of home equity based on actual equity at age 59, cohorts retiring in 1990 and 2010, 5th quintile



Analogous data for the 1st and the 5th quintiles are shown in Figures 7-10 and 7-11 respectively. The features of these figures are like the figure for all homeowners, except that the overlap between the distributions for the 1990 and the 2010 cohorts is much less for the 5th quintile then for the 1st quintile.

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

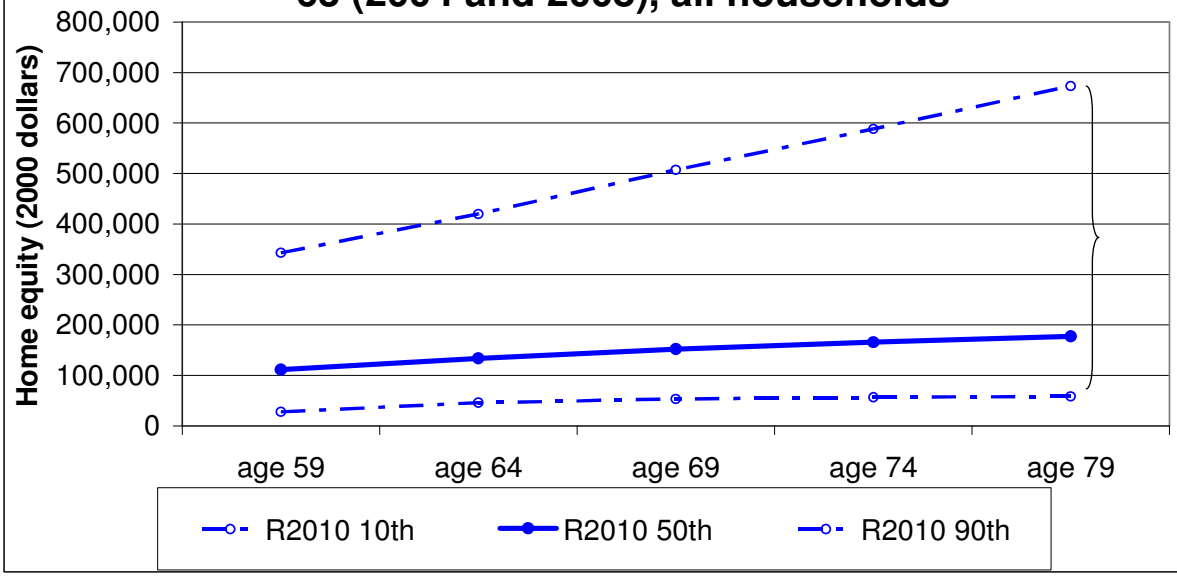
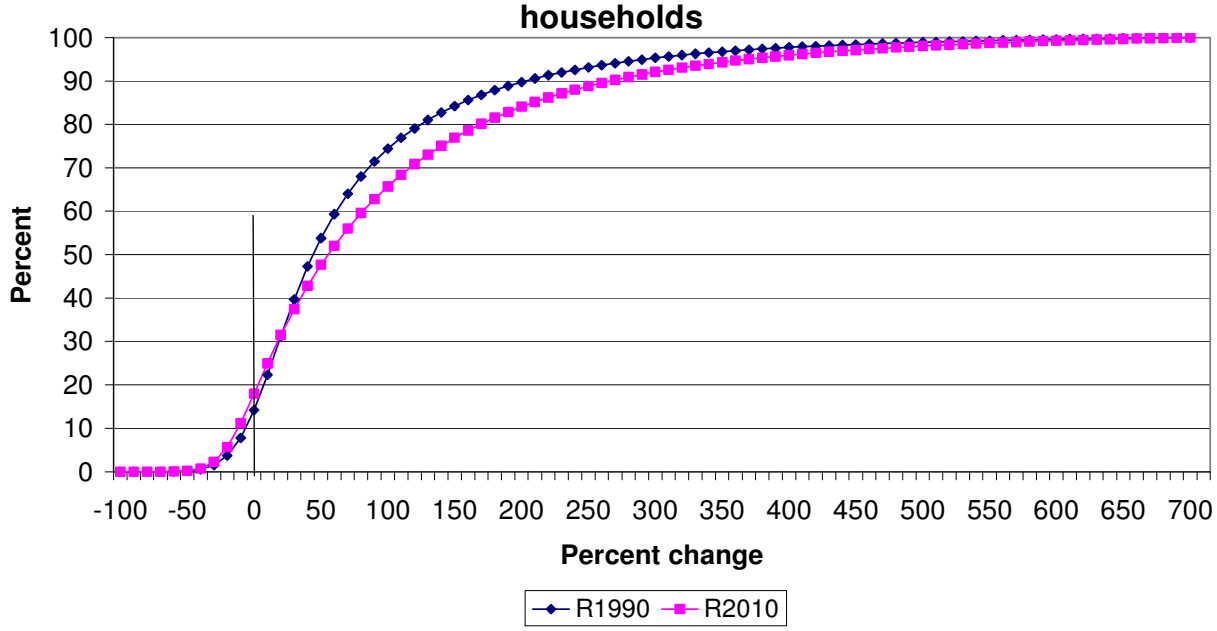


Figure 7-14. Cumulative distribution of percent change in home equity between 59 and 79 for the R1990 and R2010 cohorts, adjusted for changes in home prices between ages 59 and 63 (2004 and 2008) for the R2010 cohort, all households



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. The cohort data in Figure 6-7 suggests relatively small cohort effects in the ratio of home equity to total (non-pension) wealth over a broad span of cohorts, attaining age 65 between 1970 and 2040. 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.

Finally, Figure 8-4 shows the age profile of the ratio of home equity to wealth for selected years for which the SIPP data are available. The average over all years for which SIPP data are available is also shown. The key feature of the data is that, although there is random variation across ages in a given year, the age profiles of the

ratio of equity to wealth are very similar across the years between 1984 and 2004. Overall, the ratio is high at young ages, bottoms in the 50s, and then increases at older ages. The age profile of equity to wealth in Figure 8-4 is very similar to the cohort-based profile shown in Figure 6-7. The similarity of the two figures is consistent with limited cohort effects in the cohort data.

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

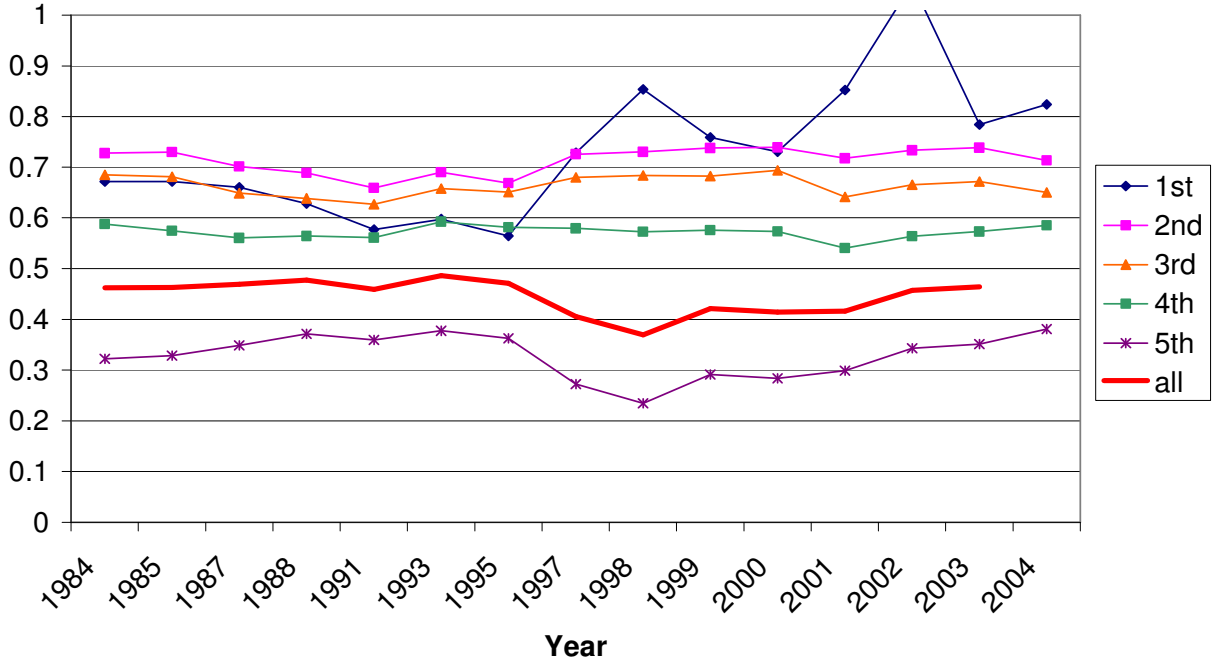


Figure 8-2. Percentiles of home equity by year--in 2000 dollars

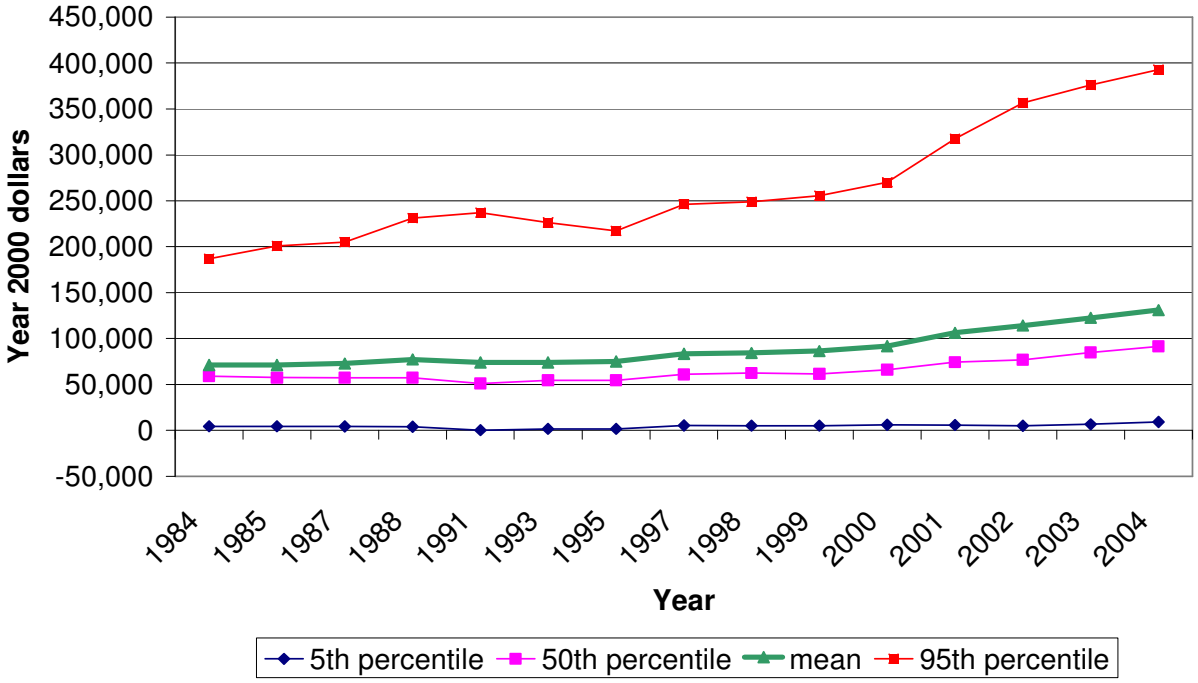


Figure 8-3. Percentiles of the ratio of home equity to wealth, by year (ratio of means)

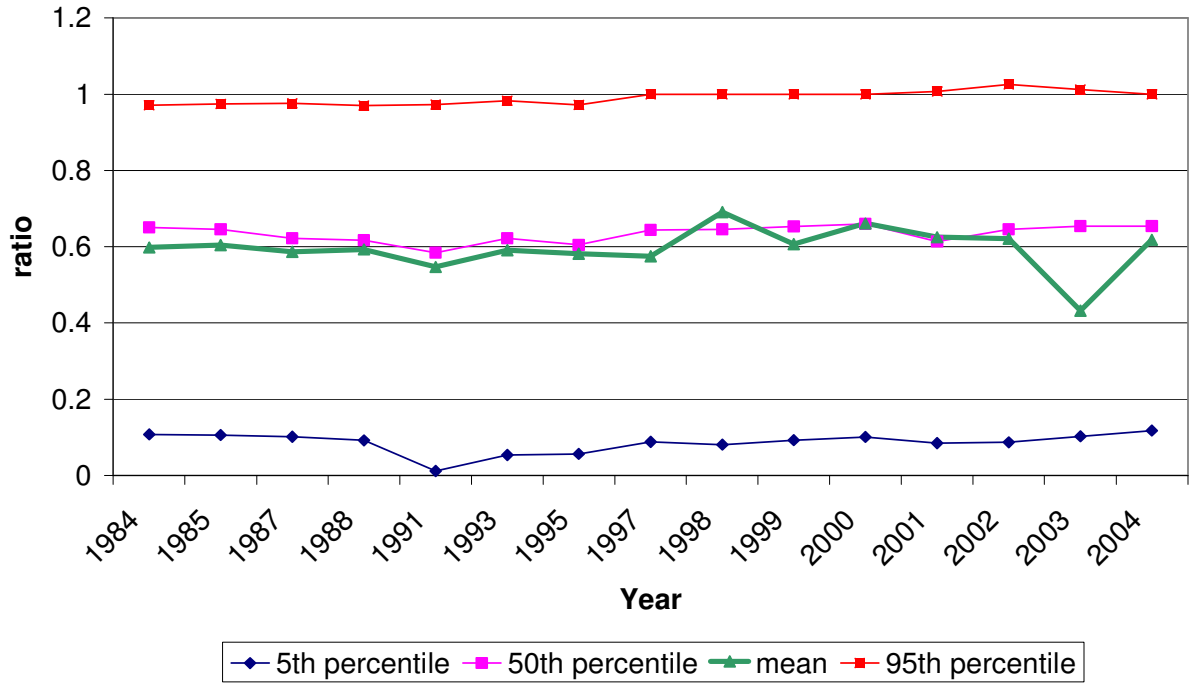
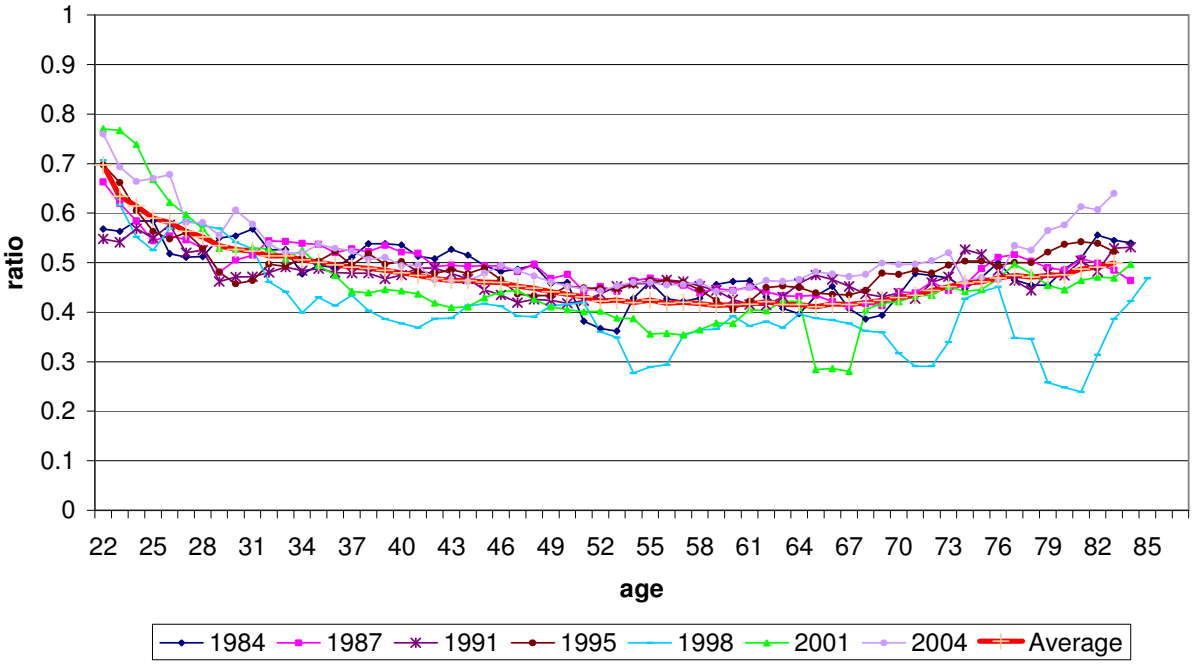


Figure 8-4. Ratio of home equity to wealth by age and by year (ratios of means)



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:

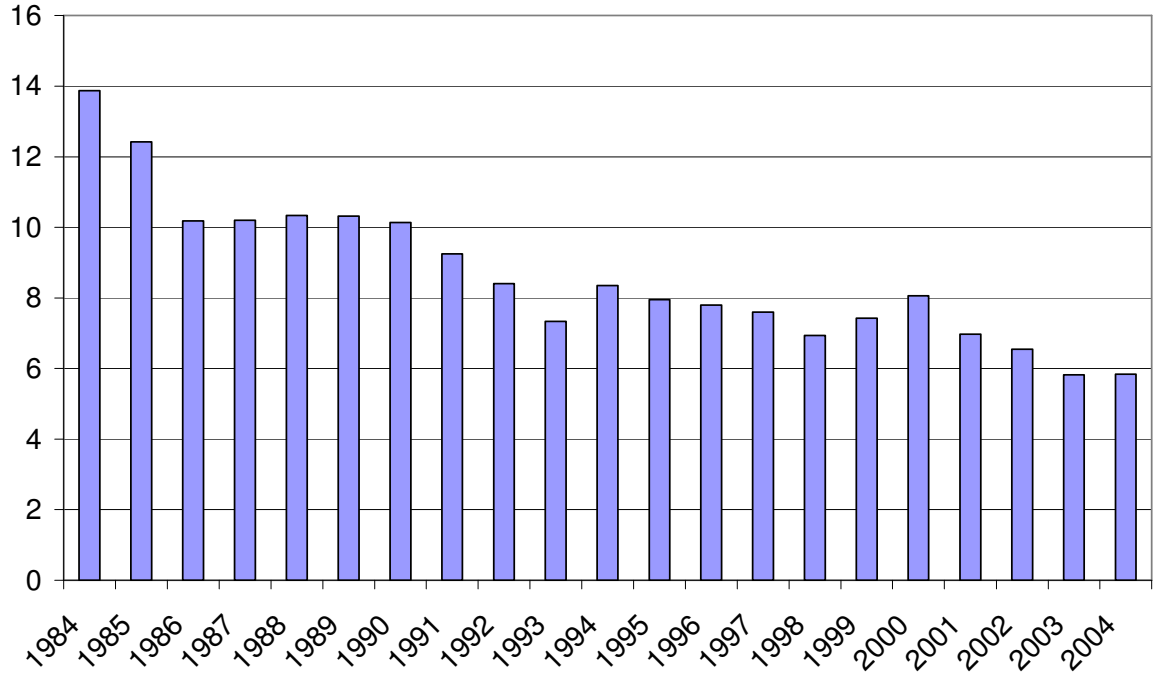
$$E_i = \left[c + age_{ai} + wealth_{wi} + income_{yi} + familytype_{fi} + \beta children \right] \cdot W_i + \varepsilon_i$$

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 Figure 8-5 shows the decline in mortgage rates between 1984 and 2004. The decline likely contributed substantially to the increase in home prices over this time period. We are interested, however, in the extent to which the 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 estimated results for 1984, 1995, and 2004 are shown in Appendix Tables A-1 to A-3. The comparative results for all years are shown in several figures.

Figure 8-5. 30-Year fixed mortgage rate, 1984 to 2004



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. 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 over 50 percent and real household non-housing-non-pension wealth increased by over 100 percent. Both trends would suggest an increase in the demand for housing and presumably an increase in home values. Indeed average home prices increased consistently from 1990 through 2004, as shown in Figure 7-1. Yet, judging by the confidence intervals, the proportions of wealth in 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 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.

Although the overall average ratio of equity to wealth is rather consistent over the entire period, there is some variation over time for households in some wealth and income categories, especially high wealth households. For example, Figure 8-7 shows the estimated ratios of equity to wealth for households in the 5th wealth and 5th income quintiles and for households in the 3rd wealth and the 3rd income quintiles. Perhaps

most noticeable is the pattern of equity to wealth ratios for households in the 5th quintiles. The bulk of stock market equity is held by households in these quintiles. With the run-up in the stock market in the late 1990s, the ratio of equity to wealth declined in this quintile and then increased as the stock market slumped. There is some variation over time for households in the 3rd quintiles as well, but the relative fluctuations from year to year are much less than for the wealthiest households. In addition, there seems to be little correspondence between the ratio of home equity to wealth for these households and trends in the stock market.

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

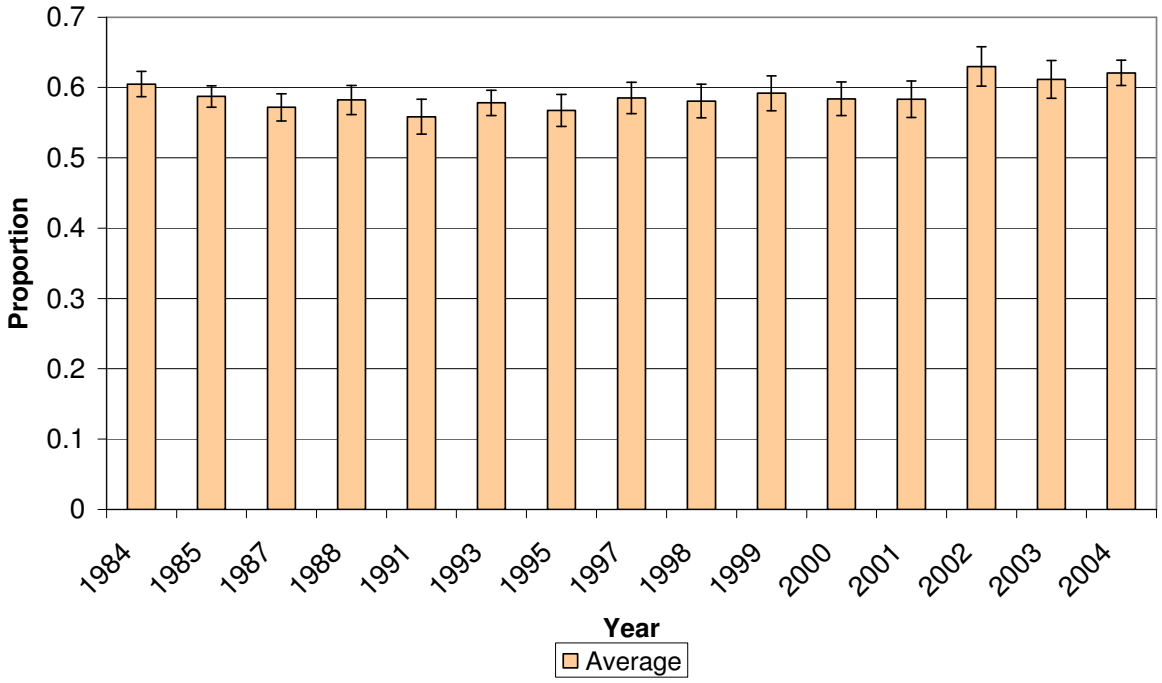


Figure 8-7. Estimated equity to wealth ratio for households in the 3rd wealth and income quintiles and in the 5th income and wealth quintiles, by year

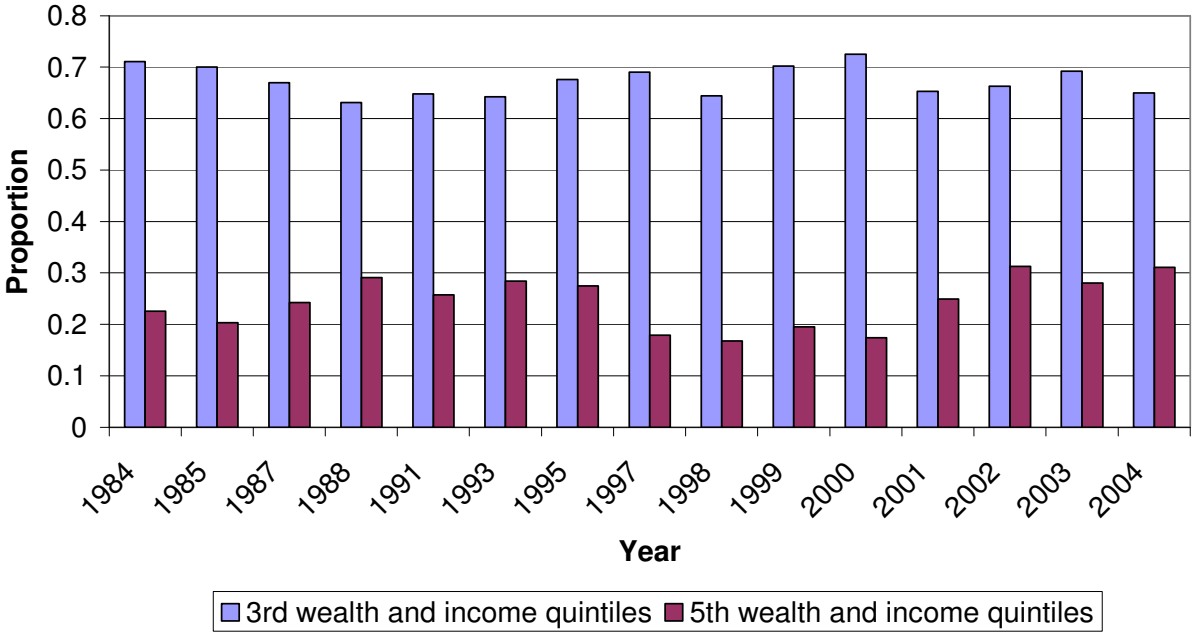


Figure 8-8. Estimated household type effects, by year

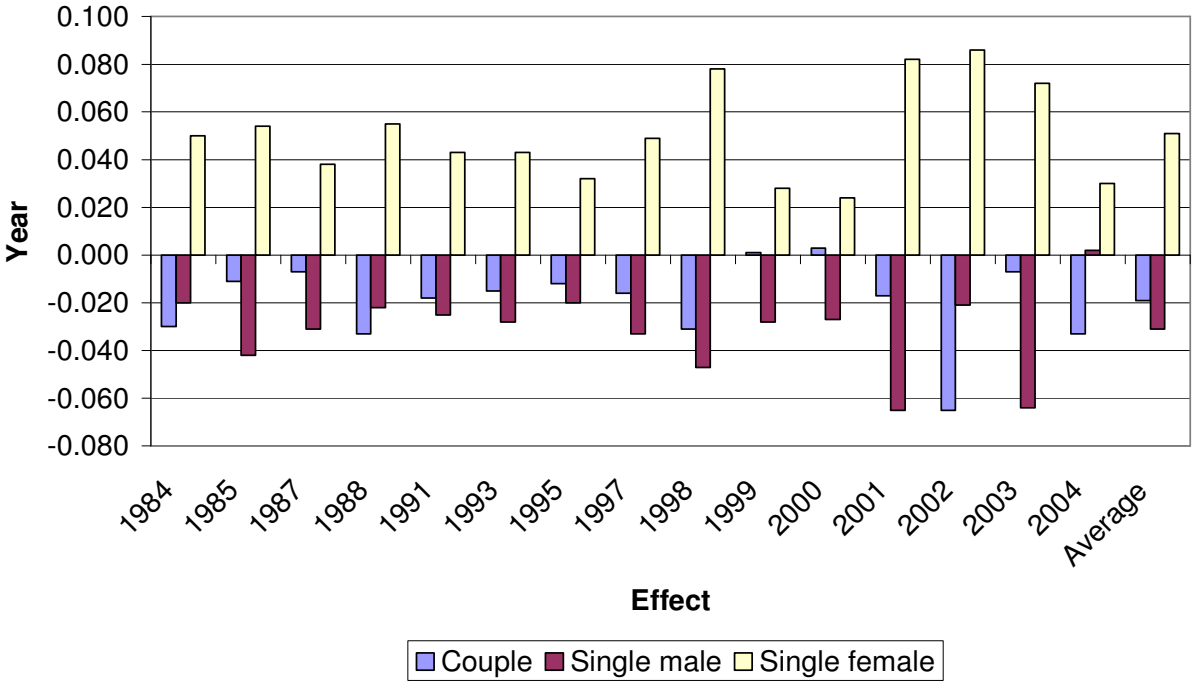


Figure 8-9. Estimated age effects for selected years and the average effect over all years

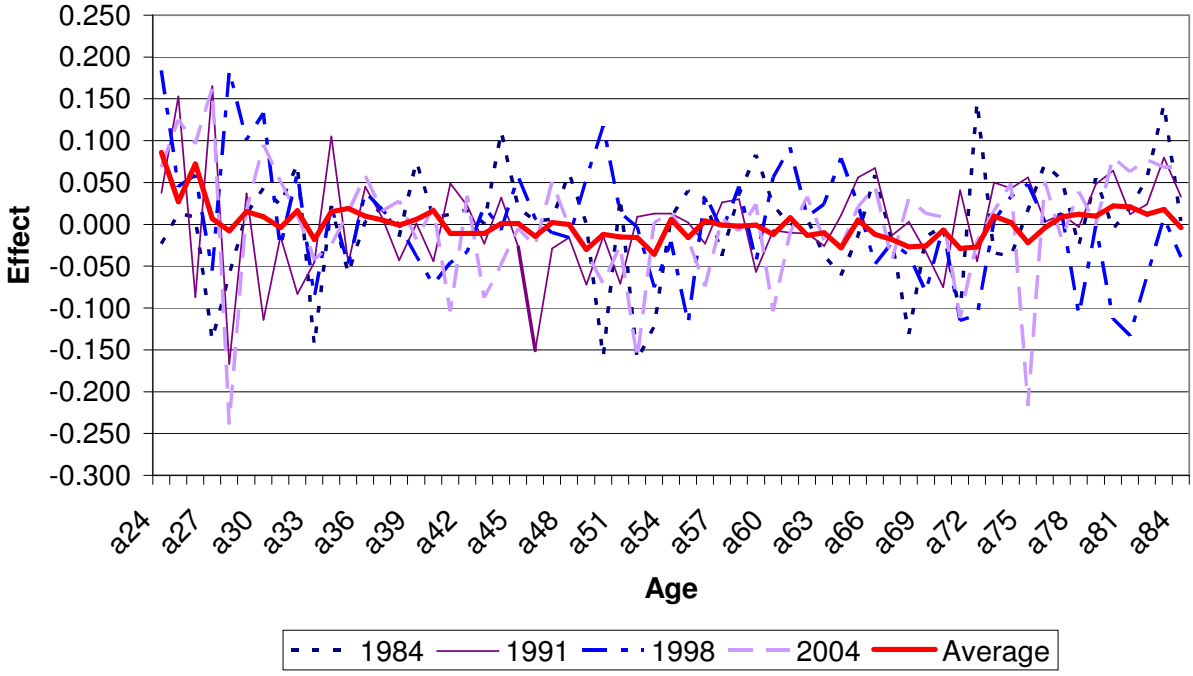
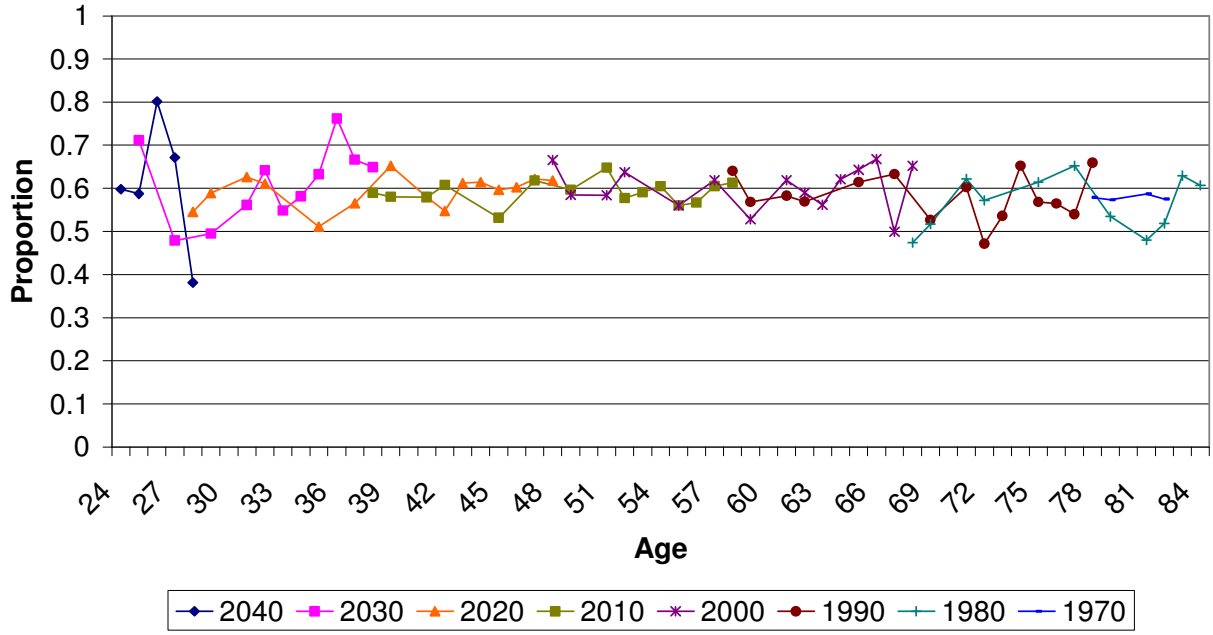


Figure 8-10. Ratio of Home equity to wealth for eight selected cohorts (identified by year cohort attains age 65), controlling for covariates



The estimated household type effects are shown in Figure 8-8. These effects vary somewhat from year-to-year but typically show that the proportion of wealth in home equity is highest for single women, presumably reflecting in part the home equity of widows. The proportion is lowest for single men.

There is considerable fluctuation in the estimated age effects—across ages in a given year and across years for a given age. But there is no systematic variation across years. The average of the estimated age effects (one for each age) is shown in Figure 8-9, together with the estimated effects for a few illustrative years. Except for the very young ages, the average profile is flat. This is in contrast to the U-shaped profiles shown in Figures 6-7 and 8-4. The estimated profile in Figure 8-9 controls for wealth and income quintile as well as for marital status and the number of children, whereas the values in Figure 8-4 are not adjusted for covariates. These estimates suggest that given the covariates, the ratio of home equity to non-pension wealth varies little with age.

Finally, the estimated age effects by year can be used to consider whether there are cohort effects in the age profile of the ratio of wealth to home equity. We have estimated age effects for each of the years. Age effects by cohort can be determined by following (diagonally) through the effects by year. For example suppose we start with the age effect of persons 25 in 1984. The cohort that is 25 in 1984 is 26 in 1985, 28 in 1987, and so forth. This cohort can be followed through age 45 in 1984. The cohort effect for a year can be added to the average proportion for that year to obtain the equity proportion of wealth for each age for each cohort. The age profiles of these equity proportions for selected cohorts are shown in Figure 8-10. Cohort effects are not evident. These are the same cohorts shown in Figure 6-7. There are two differences, however. The values in Figure 6-7 are the ratio of mean of equity to the mean of wealth, whereas the estimates in Figure 8-10 reflect average proportions. And, the proportions in Figure 8-10 are controlling for covariates—wealth quintile, income quintile, and family type. The proportions for each age, for each of the cohorts in Figure 8-10, cluster around 0.60, although because some of the age effects are based on a small number of data points, some of the estimates fluctuate rather broadly, especially for the youngest cohorts. These proportions, when compared to the proportions in Figure 6-7 suggest that the profile of proportions by age in Figure 6-7 are explained by the variation in wealth and income by age.

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. We compare the distributions of home equity of two cohorts—one attaining retirement age in 1990 and the other in 2010--whose members entered retirement with very different levels of home equity. 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 both the 1990 and the 2010 cohorts, 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-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. There was, however, some variation in this ratio across household wealth and income categories, especially the wealthiest household. This was also a period during which the number of homeowners was increasing but at a declining rate. 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.

References

Banks, James, Richard Blundell, Zoe Oldfield and James Smith (2007) "Housing Price Volatility and Downsizing in Later Life." Working paper.

Bordo, Michael. (2005) "U.S. Housing Boom-Busts in Historical Perspective." Prepared for the Conference on Housing Bubbles, Indiana State University. October

Green, Richard and Susan Wachter (2007) "The Housing Finance Revolution," paper presented at the Federal Reserve Bank of Kansas City symposium Housing, Housing Finance, and Monetary Policy, August 30, 2007.

Glaeser, Edward, Joseph Gyourko and Raven Saks (2005) " Why Is Manhattan So Expensive? Regulation and the Rise in Housing Prices", Journal of Law and Economics. Vol. 48 pp. 331-369.

Greenspan, Alan and James Kennedy (2007) "Sources and Uses of Equity Extracted from Homes," Federal Reserve Board Discussion paper No. 2007-20.

Himmelberg, Charles, Christopher Mayer, and Todd Sinai (2005) “Assessing High House Prices: Bubbles, Fundamentals, and Misperceptions.” Journal of Economic Perspectives 19:4, 67-92.

Hoynes, Hilary and Daniel McFadden (1997) "The Impact of Demographics on Housing and Nonhousing Wealth in the United States," The Economic Effects of Aging in the United States and Japan (ed.) M. Hurd and N. Yashiro. University of Chicago Press.

Mankiw, N. Gregory and David Weil (1989) "The Baby Boom, the Baby Bust, and the Housing Market," Regional Science and Urban Economics. Vol. 19, pp. 235-258.

McFadden, Daniel (1994) "Demographics, the Housing Market, and the Welfare of the Elderly," in Studies in the Economics of Aging, (ed.) D. Wise, University of Chicago Press.

Megbolugbe, Issac, Jarjisu Sa-Aadu, and James Shilling (1997) "Oh Yes, the Elderly Will Reduce Housing Equity Under the Right Circumstances." Journal of Housing Research. 8 (1): 53-74.

Poterba, James (1991) "House Price Dynamics: The Role of Tax Policy and Demography," Brookings Papers on Economic Activity. Vol. 1991 no. 2, pp. 143-203.

Poterba, James, Steven Venti, and David A. Wise (2007a) “Pension Assets of the Baby Boom Cohort: The Effects of Shifting from Defined Benefit Pension Plans to 401(k) Plans,” Proceedings of the National Academy of Sciences vol. 104. No. 3. August 14, 2007.

Poterba, James, Steven Venti, and David A. Wise (2007b) “New Estimates of the Future Path of 401(k) Assets,” NBER working paper #13083

Poterba, James, Steven F. Venti, and David A. Wise, (2007c) "The Decline of Defined Benefit Retirement Plans and Asset Flows." NBER Working Paper #12834.

Poterba, James, Steven F. Venti, and David A. Wise, (2007d) "The Rise of 401(k) Plans, Lifetime Earnings, and Wealth at Retirement," NBER Working Paper #13091.

Shiller, Robert (2007) "Understanding Recent Trends in House Prices and Home Ownership," paper presented at the Federal Reserve Bank of Kansas City symposium Housing, Housing Finance, and Monetary Policy, August 30, 2007.

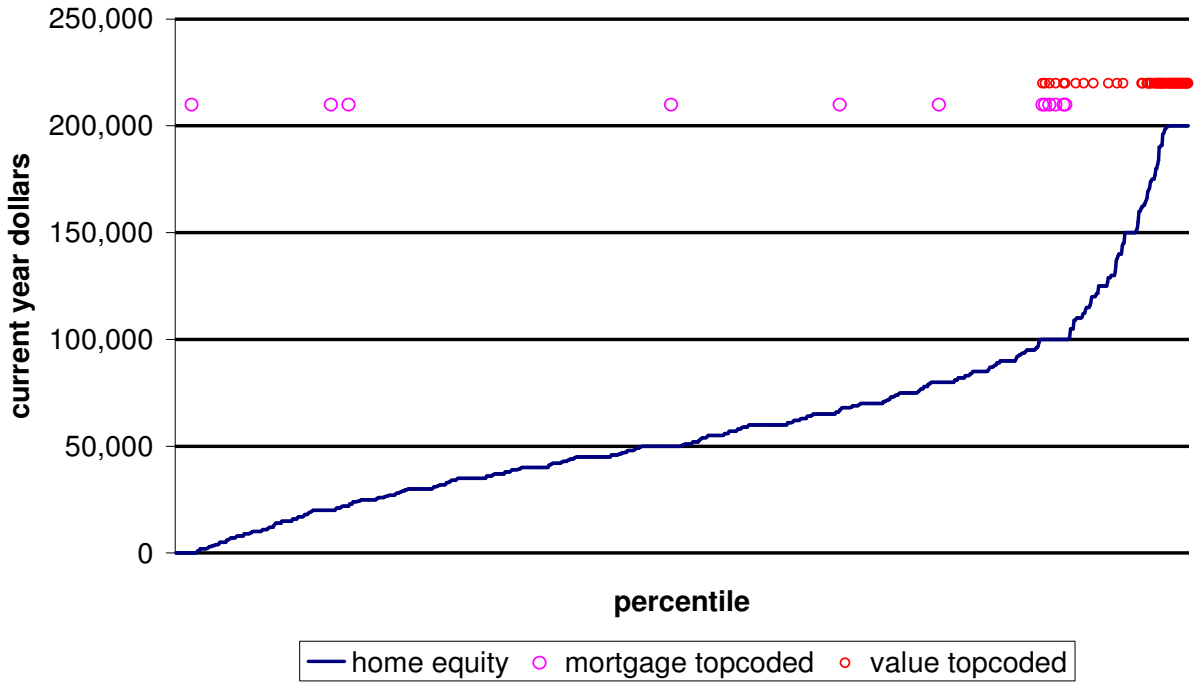
Sinai, Todd and Nicholas S. Souleles (2007) “Net Worth and Housing Equity in Retirement,” NBER Working Paper 13693.

Venti, Steven and David Wise (1990) "But They Don't Want to Reduce Housing Equity." in Issues in the Economics of Aging (ed.) D. Wise. University of Chicago Press.

Venti, Steven and David Wise (2001) "Aging and Housing Equity." in Innovations for Financing Retirement (ed.) O. Mitchell, Z. Bodie, P.B. Hammond, and S. Zeldes. University of Pennsylvania Press.

Venti, Steven and David Wise (2004) "Aging and Housing Equity: Another Look." in Perspectives in the Economics of Aging (ed.) D. Wise. University of Chicago Press.

Appendix Figure A-1. Topcoding, cumulative distribution of equity for R1990



Appendix Figure A-2. Topcoding, cumulative distribution of equity for R2010

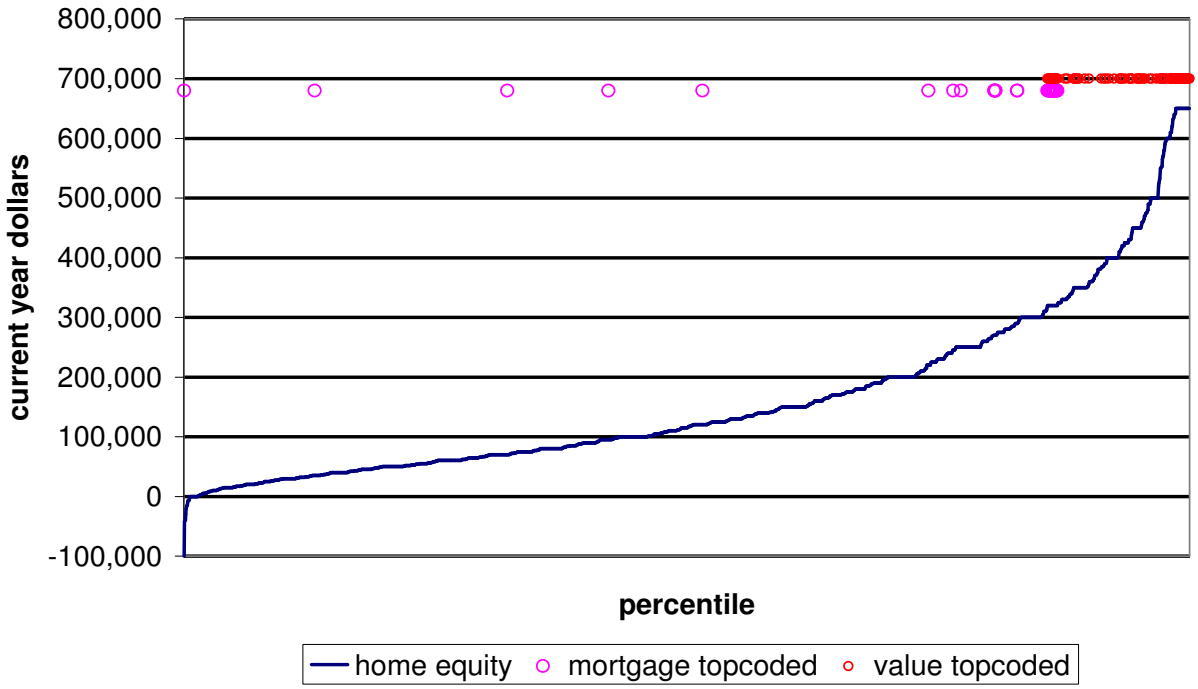


Table A1. Home equity regression for 1984

Number of obs	12148
F(72, 12076)	479.18
Prob > F	0
R-squared	0.7407
Adj R-squared	0.7392
Root MSE	47080

variable	coefficient	standard error	t-statistic
total wealth	0.605	0.009	66.1
a25	0.013	0.069	0.2
a26	0.009	0.043	0.2
a27	-0.138	0.031	-4.4
a28	-0.060	0.033	-1.8
a29	0.012	0.032	0.4
a30	0.043	0.030	1.5
a31	0.023	0.024	1.0
a32	0.072	0.029	2.5
a33	-0.144	0.014	-10.1
a34	0.022	0.022	1.0
a35	-0.059	0.013	-4.5
a36	0.003	0.016	0.2
a37	0.021	0.015	1.5
a38	-0.015	0.012	-1.2
a39	0.075	0.022	3.4
a40	0.008	0.015	0.5
a41	0.012	0.013	0.9
a42	0.017	0.014	1.2
a43	0.001	0.014	0.1
a44	0.111	0.016	6.8
a45	0.020	0.014	1.4
a46	0.004	0.012	0.3
a47	0.006	0.013	0.5
a48	0.061	0.017	3.6
a49	0.000	0.014	0.0
a50	-0.158	0.006	-26.1
a51	0.032	0.013	2.5
a52	-0.162	0.005	-34.8
a53	-0.122	0.006	-21.1
a54	0.009	0.012	0.8
a55	0.040	0.011	3.7
a56	0.031	0.011	2.7
a57	-0.037	0.008	-4.8
a58	0.036	0.011	3.4
a59	0.083	0.012	6.9
a60	0.023	0.012	2.0
a61	-0.001	0.009	-0.2
a62	0.006	0.011	0.5
a63	-0.037	0.007	-5.2
a64	-0.061	0.007	-8.2
a65	-0.014	0.010	-1.4
a66	0.059	0.014	4.1
a67	-0.021	0.014	-1.5
a68	-0.131	0.005	-24.3
a69	-0.015	0.013	-1.1
a70	-0.002	0.012	-0.2
a71	-0.108	0.008	-13.0
a72	0.146	0.019	7.8
a73	-0.034	0.018	-1.8
a74	-0.038	0.012	-3.1
a75	0.017	0.020	0.8
a76	0.072	0.021	3.4
a77	0.053	0.017	3.0
a78	-0.026	0.015	-1.8
a79	0.055	0.024	2.3
a80	-0.006	0.023	-0.3
a81	0.020	0.029	0.7
a82	0.055	0.031	1.7
a83	0.143	0.042	3.4
a84	0.004	0.016	0.2
q2	0.119	0.016	7.7
q3	0.085	0.012	7.3
q4	0.002	0.010	0.2
q5	-0.279	0.009	-30.0
i2	0.048	0.006	8.8
i3	0.020	0.005	4.1
i4	0.002	0.004	0.4
i5	-0.100	0.003	-30.0
n of children	0.025	0.002	15.8
single male	-0.020	0.005	-4.2
single female	0.050	0.005	10.7

Table A2. Home equity regression for 1995

Number of obs	11585
F(72, 11513)	452.28
Prob > F	0
R-squared	0.7388
Adj R-squared	0.7372
Root MSE	53321

variable	coefficient	standard error	t-statistic
total wealth	0.568	0.012	48.9
a25	-0.115	0.112	-1.0
a26	0.057	0.065	0.9
a27	-0.017	0.064	-0.3
a28	0.107	0.069	1.6
a29	-0.073	0.044	-1.6
a30	-0.151	0.044	-3.4
a31	-0.066	0.027	-2.4
a32	-0.068	0.031	-2.2
a33	0.028	0.030	0.9
a34	-0.084	0.022	-3.8
a35	-0.010	0.023	-0.5
a36	-0.024	0.023	-1.0
a37	-0.006	0.022	-0.3
a38	-0.035	0.020	-1.8
a39	0.085	0.019	4.5
a40	0.002	0.015	0.1
a41	-0.051	0.016	-3.3
a42	-0.015	0.016	-1.0
a43	-0.056	0.014	-4.0
a44	-0.004	0.016	-0.3
a45	-0.025	0.015	-1.7
a46	0.027	0.015	1.8
a47	-0.026	0.013	-2.0
a48	-0.085	0.010	-8.8
a49	0.029	0.016	1.8
a50	-0.030	0.013	-2.4
a51	0.023	0.014	1.6
a52	-0.038	0.013	-3.0
a53	0.013	0.015	0.9
a54	0.037	0.015	2.5
a55	0.028	0.012	2.2
a56	0.017	0.014	1.2
a57	-0.032	0.014	-2.3
a58	0.001	0.014	0.1
a59	-0.039	0.012	-3.3
a60	-0.072	0.010	-7.2
a61	-0.058	0.012	-4.9
a62	0.022	0.014	1.6
a63	0.029	0.013	2.2
a64	-0.077	0.010	-7.6
a65	0.038	0.014	2.6
a66	-0.009	0.010	-0.9
a67	-0.034	0.012	-2.9
a68	0.035	0.014	2.6
a69	-0.041	0.013	-3.2
a70	0.050	0.014	3.5
a71	-0.013	0.015	-0.8
a72	-0.011	0.015	-0.7
a73	0.050	0.018	2.8
a74	0.037	0.013	2.8
a75	0.101	0.016	6.3
a76	0.027	0.018	1.5
a77	0.024	0.014	1.7
a78	0.084	0.017	4.9
a79	-0.033	0.018	-1.9
a80	0.053	0.023	2.3
a81	0.161	0.027	6.0
a82	0.014	0.026	0.5
a83	-0.006	0.014	-0.5
a84	-0.033	0.021	-1.6
q2	0.110	0.019	5.7
q3	0.089	0.014	6.2
q4	0.026	0.012	2.1
q5	-0.233	0.012	-19.9
i2	0.020	0.005	3.8
i3	0.019	0.005	4.1
i4	-0.040	0.004	-9.2
i5	-0.060	0.004	-17.2
n of children	0.022	0.002	11.4
single male	-0.020	0.005	-4.3
single female	0.032	0.005	6.8

Table A3. Home equity regression for 2004

Number of obs	21663
F(72, 21591)	795.77
Prob > F	0
R-squared	0.7263
Adj R-squared	0.7254
Root MSE	95170

variable	coefficient	standard error	t-statistic
total wealth	0.621	0.009	68.0
a25	0.125	0.057	2.2
a26	0.096	0.078	1.2
a27	0.163	0.059	2.8
a28	-0.239	0.028	-8.5
a29	0.016	0.045	0.4
a30	0.095	0.031	3.0
a31	0.052	0.036	1.5
a32	0.011	0.023	0.5
a33	-0.042	0.023	-1.9
a34	-0.024	0.019	-1.3
a35	0.014	0.018	0.8
a36	0.058	0.019	3.0
a37	0.016	0.017	0.9
a38	0.028	0.017	1.7
a39	-0.018	0.014	-1.3
a40	0.020	0.016	1.3
a41	-0.104	0.012	-8.3
a42	0.034	0.013	2.6
a43	-0.088	0.011	-8.2
a44	-0.048	0.010	-4.8
a45	-0.005	0.011	-0.5
a46	-0.026	0.011	-2.5
a47	0.051	0.013	4.0
a48	-0.003	0.010	-0.3
a49	-0.033	0.010	-3.4
a50	-0.071	0.009	-7.8
a51	-0.025	0.010	-2.5
a52	-0.161	0.007	-22.9
a53	0.002	0.009	0.2
a54	0.014	0.010	1.4
a55	-0.018	0.009	-2.1
a56	-0.074	0.008	-8.9
a57	0.007	0.009	0.8
a58	-0.008	0.010	-0.8
a59	0.024	0.012	2.0
a60	-0.104	0.008	-13.7
a61	-0.010	0.010	-0.9
a62	0.033	0.010	3.2
a63	-0.019	0.009	-2.1
a64	-0.027	0.011	-2.5
a65	0.021	0.012	1.7
a66	0.045	0.011	4.1
a67	-0.043	0.011	-4.1
a68	0.031	0.010	3.0
a69	0.013	0.012	1.1
a70	0.009	0.012	0.8
a71	-0.112	0.010	-11.6
a72	-0.020	0.012	-1.7
a73	0.016	0.013	1.2
a74	0.049	0.015	3.3
a75	-0.217	0.005	-41.4
a76	0.051	0.012	4.1
a77	-0.018	0.011	-1.6
a78	0.039	0.014	2.8
a79	0.000	0.015	0.0
a80	0.080	0.020	3.9
a81	0.063	0.018	3.6
a82	0.077	0.020	3.9
a83	0.068	0.015	4.4
a84	0.068	0.010	6.5
q2	0.094	0.015	6.2
q3	0.044	0.011	3.9
q4	-0.004	0.010	-0.4
q5	-0.256	0.009	-28.0
i2	0.044	0.004	10.5
i3	-0.015	0.004	-4.0
i4	-0.024	0.003	-7.2
i5	-0.054	0.003	-19.2
n of children	0.011	0.002	7.0
single male	0.002	0.004	0.6
single female	0.030	0.004	8.6