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The House – Is it an Asset or a Liability?

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The House: Is it an Asset or a Liability?

Abstract

Most households enter retirement as homeowners and only sell after a spouse enters a nursing home or dies, with recent retirees having greater housing wealth but also greater mortgage debt. We show that the share of homeowners entering retirement with mortgages increased from 37.9% for early birth cohorts in the Health and Retirement Study to 50.8% for recently retiring cohorts, and their median mortgage balance approximately doubled, to $108,523 in 2022 dollars. Analyzing socioeconomic characteristics of mortgage holders, we find that Hispanic and especially Black households with mortgages have extremely low median financial assets, while financial assets for white households, though higher, remain insufficient to cover their mortgage debt. We additionally show that, conditional on demographic characteristics and house value, households with larger mortgages hold less financial assets, retire later, experience greater declines in consumption during retirement, and sell their houses earlier as they age. For some households, therefore, mortgage-financed housing wealth may be a liability in old age. Lastly, we develop an intertemporal optimization model of consumption and dissaving choices during retirement. The model includes long-term care risk, Medicaid, and a luxury bequest motive. We find that mortgage-financed illiquid housing provides little bequest value but acts as informal insurance against long-term care cost risk. The value, though small for households with low financial assets, reaches as high as 52% of the mortgage balance for households with substantial financial assets to protect. For such households, therefore, mortgage-financed housing wealth in retirement may be a valuable asset.

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1. Introduction

Most households enter retirement as homeowners and only sell or downsize after a precipitating shock (Venti and Wise 2004), often entry into a nursing home or death of a spouse. This has been viewed as a puzzle by many researchers, as homeownership in old age constrains liquidity and hence makes it more difficult to smooth consumption: The lack of a robust market for reverse mortgages and restrictions on home equity loans and lines of credit make it difficult to eat one's house (Hansel and Gretel notwithstanding).[1] This leaves researchers searching for explanations to resolve this puzzle. For example, housing wealth may substitute for both long-term care insurance and annuity purchases (Davidoff 2009, 2010), and it is partially protected by Medicaid when one spouse needs care and the other does not. However, it is an inferior stock of precautionary wealth relative to financial assets for those who are Medicaid-averse or for unmarried individuals who may return to the community after receiving care (Friedberg et al. 2014).[2] Luxury bequest motives have similarly been offered as an explanation for the lack of interest in annuities and long-term care insurance (Lockwood 2012, 2018), but the possible role of such bequest motives in explaining the value of illiquid housing has not been explored.

[1] Many homeowners do not qualify to borrow on their home equity, and home equity lines of credit have repayment periods, allowing 10 years to draw down equity and then requiring 10 years of repayment.

[2] The house is afforded some protection from Medicaid on behalf of a married spouse who is well when the other spouse who otherwise cannot afford it needs care. The house is not protected for the survivor (or other unmarried individuals) who may need care later.

It is worth considering these explanations in more depth, as recent birth cohorts are entering retirement with greater housing wealth but also greater mortgage debt (Collins et al. 2018, Chen et al. 2023).[3] Shifts in interest rates, inflation, tax preferences, and local housing costs during this period make for a complicated set of changes, some anticipated and others likely not, in both the cost to purchase a house and the capital gains that some owners have received. We will not dissect reasons for the increased prominence of housing in household balance sheets at retirement.[4] Instead, we will analyze the possible consequences during retirement.

For some, mortgage debt may reflect a preference for housing consumption that became more affordable, for example due to the long era of low nominal interest rates that recently ended.[5] Those households choosing higher housing consumption may optimally delay retirement (Butrica and Karamcheva 2020), hold substantial financial wealth, and exhibit the capacity to maintain post-retirement consumption.

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[3] After all, Davidoff's (2010) important analysis of the role of housing illiquidity in crowding out long-term care insurance begins with a statement, true for the cohorts he considered, that the elderly "typically owe little mortgage debt."

[4] Understanding the role of changes in housing and mortgage markets is complicated by the difficulty of modeling the joint decisions of where to live, work, and raise a family; and of observing expectations about future prices, taxes, and interest rates, especially when housing decisions for many in our data were made before the data set began.

[5] Nominal mortgage interest rates declined steadily throughout the period called by some macroeconomists the Great Moderation and continued after the Great Recession, until the COVID-19 pandemic shock. On the other hand, declines in marginal tax rates for many over this period, along with the limits on deductibility imposed by the Tax Cut and Jobs Act of 2017, have tended to reduce the tax benefits of mortgage borrowing and home ownership during this period.

The policy concern is that some households may be poorly positioned to carry mortgage debt (Brown et al. 2020). Further, women, racial and ethnic minorities, and low socioeconomic-status households may be disproportionately at risk of holding levels of debt that impede their ability to maintain consumption as they age (Lester et al. 2020), especially when minorities, in particular, hold mortgages with worse mortgage terms (Butta and Hizmo 2021). These factors may make home ownership a burden to some households. For example, Black women suffered economic harm as a result of disparities in lending practices followed by the Great Recession (Phillips 2012) and, perhaps also, from buying while prices are high and selling low.[6]

We document key patterns in the data on housing and financial assets of aging households, and then we develop a quantitative intertemporal optimization model of consumption and dissaving choices during retirement in the presence of mortgage-financed illiquid housing, long-term care risk, means-tested Medicaid, and bequests. Our empirical analysis consists of three parts. First, we update previous research on cross-cohort trends in home ownership, housing wealth, and housing debt among households entering retirement. Second, we compare socioeconomic characteristics of households with different-sized mortgages, as a way to gauge which households may choose to hold more housing wealth and bigger mortgages because they can, and which households may experience financial stress in meeting their mortgage obligations in old age. Third, we analyze whether households with larger mortgages hold more financial wealth, retire later, consume less, or sell their house earlier — all of which are

[6] https://apps.urban.org/features/mortgages-by-race/#8/41.923/-86.149

possible responses of households with a greater share of housing in their balance sheets at retirement.

We begin our analysis by documenting cross-cohort trends in housing assets and liabilities using data from the Health and Retirement Study (HRS), supplemented by the Survey of Consumer Finances (SCF). Among individuals ages 64 to 66 (which is at or just after retirement for most of the sample) in successive HRS cohorts, house values, mortgage holding, and mortgage balances have risen. For example, median house values among homeowners rose from $167,852 for birth cohorts who turned 65 in 1989 to 1995 to $216,336 for birth cohorts turning 65 in 2013 to 2018. The share of homeowners with mortgages increased from 37.9% to 50.8%, and the median mortgage balance among mortgage holders approximately doubled, from $46,677 to $108,523, all in 2022 dollars.

We then compare socioeconomic characteristics of households with different-sized mortgages. We find that Black households with mortgages have extremely low median financial assets. While Hispanic mortgage holders do as well, they are less likely to hold mortgages than Black households are. White households with mortgages hold comparatively ample financial assets relative to Black and Hispanic mortgage holders yet they hold less in financial assets than do white households without mortgages, and their assets remain insufficient to cover their mortgage debt. These results suggest underrepresented-minority households, and perhaps many others, appear likely to experience financial stress in meeting their mortgage obligations in old age.

Our final set of empirical results focuses on possible responses of households that hold a greater share of housing in their balance sheets. Conditional on both demographic characteristics and house value, larger mortgages are associated with holding lower values of financial assets, suggesting that, on average, more leveraged households are not able to accumulate additional assets to cover their greater obligations. In addition, such households retire later, experience greater declines in consumption during retirement, and sell their homes earlier, compared to households with smaller mortgages or none at all.

To understand the welfare consequences of illiquid housing, we develop an intertemporal optimization model of consumption and dissaving choices during retirement. The model includes long-term care risk, means-tested Medicaid, and a luxury bequest motive. We consider single individuals, assume that the house is only sold upon entry into a nursing home or death, and use the monthly transition matrix among care states (healthy, receiving home health care, in assisted living, in a nursing home, or deceased) estimated in Friedberg et al. (2014). We parameterize the model using quartiles of the financial asset distribution of mortgage holders at retirement in the HRS, which allows us to observe their home values, mortgage balances, and annuitized income.

The model demonstrates that mortgage-financed illiquid housing is valuable for households that face long-term care cost risk. The value is small for households in the lowest financial asset quartiles, at 5% or less of the mortgage, but it reaches 18% of the mortgage balance for households in the second-highest quartile of financial assets and 52% for households in the highest quartile. Illiquid housing provides little additional

bequest value, however, in line with the findings in Lockwood (2018) that, with a luxury bequest motive, only the wealthiest households get much utility from planned bequests.

In sum, we find that mortgage-financed housing wealth may be an asset for some households, especially those with relatively high financial assets at retirement, who gain from its use as a hedge against long-term care cost risk. It may be a liability for others, though, especially minority households with meager financial assets, as we observe households with higher mortgages retiring later, experiencing larger declines in consumption during retirement, and selling their house sooner in old age.

2. Data

We use rich data from the Health and Retirement Study (HRS) to understand the trends in housing assets and liabilities, along with their relationship to the overall financial situation of the household. We supplement this with data from the Survey of Consumer Finances (SCF), which is the premier data set focused on household wealth, but with the disadvantage that it is not longitudinal, so it cannot be used to track household financial status during retirement.

2.1 Health and Retirement Study

The HRS began in 1992 and has surveyed individuals 51 and older every two years since then. The original HRS comprised individuals ages 51 to 61 in 1992 and their spouses of any age, and other cohorts have been added to fill out the age range of participants, including new cohorts of 51 to 56 year olds every six years. To understand changes in housing balance sheets over time, we divide HRS participants into four cohorts: those born 1924 to 1930 (the Children of the Depression — CODA — cohort),

1931 to 1941 (the original HRS cohort), 1942 to 1947 (the War Babies cohort), and 1948 to 1953 (the Early Baby Boomers cohort). The four cohorts turned 65 in 1989 to 1995, 1996 to 2006, 2007 to 2012, and 2013 to 2018. We observe participants in all four waves at age 65, but only observe post-65 consumption trajectories for the first three cohorts. We begin our analysis at approximately the age of retirement, since we want to focus on post-retirement decisions. Therefore, we choose households with a member ages 64 to 66.[7] For much of our analysis, we use variables taken from the RAND HRS, which organizes a uniform set of variables from across all HRS waves.[8]

In measuring mortgage debt, we include second mortgages and home equity loans on the primary residence, but no information about secondary residences or investment properties is included in measures of housing assets or liabilities. We report all financial values in 2022 dollars.

We use additional components of the HRS for parts of our analysis. A subsample of each HRS cohort has participated in its Consumption and Activities Mail Survey (CAMS), which offers bi-annual panel consumption data.[9] Nonmortgage annual expenditure may change because mortgage payments cease or because financial assets are exhausted, which we are interested in, but also because a spouse enters a nursing home or dies. We therefore report median annual expenditure in adjacent age

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[7] We do not want to use the actual retirement date of a household, since the decision of when to retire is endogenous and may reflect housing wealth. Instead, we pick an age range that is at or just after the age of retirement for the majority of the sample, and that also gives us a reasonable sample size.

[8] We choose not to use HRS sample weights, as these weights are only effective in cross-section.

[9] For example, the original 2001 wave of the CAMS included 3,866 households, for a simple response rate of 77%.

pairs (for example, at the adjacent age pair of 75 and 77), in each case excluding households with a change in composition. Then, if the household remains in the survey in the following two years with no change in composition, they rejoin the sample (for the adjacent age pair of 77 and 79).

2.2 Survey of Consumer Finances

The SCF is a triennial cross-sectional survey of U.S. families. The survey focuses on assembling detailed information on household balance sheets and income.[10] Data from the SCF are widely used to study household finances. The SCF oversamples the wealthy and undertakes extensive efforts to obtain data about wealth. We focus on housing statistics for the lower portion of the financial asset distribution in order to determine whether the housing balance sheet trends that we see in the HRS are present in the SCF too.[11]

We define a sample of SCF households with the financial respondent ages 60 to 79 in the 1992, 2004, and 2016 waves of the SCF. We need to use a wider age range than in the HRS because the SCF has fewer households in the age and financial asset

[10] https://www.federalreserve.gov/econres/aboutscf.htm .

[11] Several features of the SCF survey design make it different from other available data sets. For example, while both the SCF and HRS use hot-deck imputation to fill in many missing values for financial data, the SCF is unique in doing this five times over, offering five "implicates" (or replicas) of the data set to reflect the additional error induced by the imputation process. As a result, sample size is not straightforward to define in the SCF — some implicates have observations just above or below our financial asset category cutoffs — and we report sample sizes that are rounded to the nearest integer.

ranges in which we are interested.[12] We report home ownership, house values, and mortgage balances for individuals with financial assets between $10,000 and $100,000, $100,000 and $200,000, and $200,000 and $500,000. We focus on medians, as in the HRS, to avoid means that are dominated by the skewness of the distribution.

3. Analysis of housing balance sheets

In this section, we discuss our analysis of housing trends and housing balance sheets of households. We first present cross-cohort trends in home ownership, housing wealth, and housing debt among households entering retirement. Second, we compare socioeconomic characteristics of households with different-sized mortgages. Third, we investigate whether households with greater mortgage debt hold more financial wealth, retire later, consume less as they age, or sell their house earlier — all of which are possible responses of households that are holding a greater share of housing in their balance sheets at retirement.

3.1 Trends in financial and housing balance sheets

We start by presenting descriptive statistics on the housing balance sheet around retirement age for our full sample from the HRS, and then we highlight confirming evidence of key trends for a supplementary sample in the SCF. Table 1 reports 1) the share with an outstanding mortgage, 2) the mortgage balance, 3) home value, and 4) the housing debt-equity ratio, defined as the mortgage balance divided by home value,

[12] If we expand the age range in the HRS, we observe similar trends in home ownership and mortgage balances across households, even though the levels are different as households pay down mortgage balances as they move from their 60s into their 70s.

for HRS households with a member ages 64 to 66 in the four successive cohorts that we study. We report medians as more representative, since means of many wealth variables are considerably higher than medians because of the skewness of the distribution of wealth holding. We condition housing values on owning a house and mortgage values on having a mortgage.

Median house values increased from $167,852 for the first cohort (which turned 65 in 1989 to 1995) to $195,211 for the second cohort (which turned 65 in 1996 to 2006), and $223,066 for the third cohort (which turned 65 in 2007 to 2012), and then declined to $216,336 for the fourth cohort (which turned 65 in 2013 to 2018), reflecting the increase in real house prices and then the bursting of the housing bubble during the Great Recession. Outside evidence shows not only that home values increased, but that the average American home increased in size over this period, even while the average American household shrank in size so that at least part of the increase likely reflects additional consumption rather than higher costs.[13]

The share with mortgages increased from 37.9% to 49.3% when comparing the first three cohorts, but only increased slightly among the Early Boomers to 50.8%, perhaps reflecting the after-effects of the housing bubble burst. Most notably, the median and 75th percentile of mortgage debt, conditional on having a mortgage,

[13] Just since 1999, the percentage of single-family houses sold that are under 1,400 square feet has declined from 13% to 2% in 2022, with commensurate increases in every category from 2,400 square feet and larger. In a longer series, the percentage of such houses with two bedrooms or less declined from a high of 24% in 1984 to 5% in 2022, and the percentage with at least four bedrooms rose from 19% to 57% (https://www.census.gov/construction/chars/current.html). The HRS lacks data on the physical size of survey participants' houses.

approximately doubled across the four cohorts, to $108,523 and $207,291 for the early boomers. Debt-equity ratios increased across the four cohorts, from 50.9% to 75.0% at the 90th percentile. Few of the mortgages were underwater, however, even after the bursting of the financial bubble.

Finally, the table reports the financial assets of homeowners, which may indicate whether households are choosing to consume more housing (and saving more to help amortize their mortgage later) or may be constrained by higher housing costs to consume more housing than they can easily afford. Financial assets declined at the median from $57,921 among the earliest birth cohort we consider to $45,739 among the latest birth cohort while rising at the 75th percentile, from $198,989 to $282,423. Thus, households in the middle of the distribution appear more constrained, while households at the upper end hold more of both housing and financial assets. In our regression analysis below, we consider this relationship more carefully.

We also present housing cross-cohort housing trends from the SCF. With the SCF survey differing by construction in important ways from the HRS, we focus on SCF households with the financial respondent ages 60 to 79 in the 1992, 2004, and 2016 waves. Statistics appear in Table 2 for those individuals with financial assets between $10,000 and $100,000, $100,000 and $200,000, and $200,000 and $500,000. They confirm the trends that are apparent in the HRS. Overall home ownership rose a little by 2016 for the lower and higher financial asset groups. Among homeowners, the percent holding a mortgage rose substantially, for example from 26.3% in 1992 to 45.2% in 2016 among those with $100,000 to $200,000 in financial assets. And among

mortgage holders, the mortgage balance approximately doubled over this time period, with similar values as observed in the HRS and a similar magnitude of increase as well.

3.2 Housing balance sheets and socioeconomic status

One way to gauge whether households may be able to afford higher mortgages or notis to investigate the socioeconomic characteristics of homeowners with different-sized mortgages. Table 3 compares the socioeconomic characteristics of homeowners with different-sized mortgages, to get a sense of whether they may be able to afford or, alternately struggle, with the size of their mortgages. The table divides households into those without mortgages at retirement age, those with mortgages below the median size, and those with mortgages above the median size, for both the first cohort (the CODA cohort born 1924 to 1930) and last cohort (the Early Baby Boomer cohort born 1948 to 1953) that we analyze.

In both birth cohorts, households without mortgage debt had similar levels of educational attainment to those in the bottom half of the distribution of mortgage debt. In contrast, households in the top half of the distribution of mortgage debt had substantially higher levels of educational attainment, suggesting that they may be choosing to have higher mortgages and larger houses than they can afford.

While educational attainment is strongly indicative of lifetime earnings, our tabulation of the HRS data confirm that race and ethnicity are also correlated with lifetime earnings, even conditional on educational attainment. In the 1948 to 1953 birth cohort, the share of Black households in each group was about the same, whereas, in contrast, Hispanic households were more likely to have no mortgage debt and less likely to have large mortgages, as might be expected given their average

socioeconomic status. The former finding is potentially concerning because Black households have fewer lifetime resources on average, so for Black households, whom we observe to be relatively likely to have a mortgage, carrying this financial obligation into retirement may be an indication of financial stress.

Lastly, we consider a direct measure of lifetime resources by analyzing median financial assets of Black, Hispanic, and white (or other race) households within each mortgage-size category. Also, for the later cohort, we calculate expected Social Security wealth at the Full Retirement Age.[14] Within each mortgage category, Black and Hispanic households hold extremely low median financial assets: Even those in the upper half of the mortgage distribution within the later cohort have only $18,290 (for Black households) and $10,364 (for Hispanic households).

In comparison, white households with mortgages hold far greater financial assets across all mortgage-size categories. For example, those in the high-mortgage group have $133,916 in median financial assets. Although this is considerably higher than the value for Black and Hispanic households, it is nevertheless the case that that white households with a mortgage hold less in financial assets than do white households without mortgages, and their financial wealth remains insufficient to cover their mortgage debt.

These results suggest that households in underrepresented minorities appear likely to experience financial stress in meeting their mortgage obligations in old age. Little apparent respite is available from Social Security wealth as, here too, Black and

[14] This measure is constructed by RAND using Social Security earnings records. These are available for only a few of the 1924 to 1930 birth cohort and we therefore report results only for the 1948 to 1953 birth cohort.

Hispanic households face disadvantages with respect to white households. Moreover, absent adjustments on other margins, some white households with mortgages may also be at risk. We explore these differences in greater depth in our multivariate analyses.

3.3 Household adjustments to housing balance sheets

Now that it is clear that successive cohorts are entering retirement with more housing wealth and bigger mortgages, we analyze other economic variables that may reflect household adjustments to the changes in the housing balance sheet. Households with a more expensive house can adjust a few margins as they reach retirement. They can 1) consume less and save more to reach retirement with more financial assets, 2) increase work effort, for example by retiring later, 2) lower post-retirement nonhousing consumption, or 3) sell their house post-retirement. Working more will protect post-retirement consumption, while carrying lower financial assets or a mortgage into retirement will necessitate lower post-retirement consumption or earlier liquidation of the house later on. We run multivariate regressions where the sample size allows or otherwise analyze comparative statics for variables capturing margins of adjustment. None of this analysis should be interpreted causally. Rather, understanding the correlation among key variables can help inform the theoretical analysis that we conduct later.

We begin by analyzing financial assets at retirement, which is the earliest margin of adjustment (by age) for households with expensive houses and large mortgages. The right-hand variables include socioeconomic controls (educational attainment, race, and marital status); these reflect lifetime earnings, and those who are better off can

afford to save more. We also control for the value of the house and the value of the mortgage balance at ages 64 to 66: A more expensive house may capture higher socioeconomic status and higher wealth, while a larger mortgage conditional on the value of the house reflects a higher commitment of resources during retirement. In order to avoid the influence of outliers, we classify individuals based on financial asset quartile and estimate an ordered probit regression.

Our regression estimates, which are not reported in this draft, demonstrate the expected associations with socioeconomic controls. Men with higher educational attainment enter retirement with significantly higher financial assets, as do married men. Conditioning on educational attainment, men who are Black or Hispanic enter retirement with significantly lower financial assets. When we add the house value and mortgage balance to the ordered probit regressions, the estimated coefficients on demographic characteristics get smaller in magnitude, while the house value exhibits a strong positive and significant association with financial assets. The effect of mortgage size conditional on house valuation is of particular interest: Financial assets decrease monotonically with mortgage size, so those with no mortgage have the highest levels of financial assets and those in the upper half of the mortgage distribution have the lowest. Since this specification conditions on the house value, the estimates suggest that more leveraged households are not able to accumulate as many assets as less leveraged individuals do.

Our next set of regressions focus on the age of retirement, with the same sets of right-hand side variables. In this case, we focus on men as the primary earners in the household for the cohorts we consider. On the one hand, socioeconomic controls that

reflect lifetime earnings indicate which individuals can afford to retire earlier; on the other hand, there is a well-known socioeconomic gradient in retirement, as those with higher educational attainment and higher lifetime earnings are observed to retire later.[15]

Table 4 reports the regression results for retirement age. The first panel shows the baseline coefficient estimates when only including socioeconomic controls, and as mentioned earlier, those with higher educational attainment retire later, as do married men. Early-cohort Hispanic and, especially, Black men retire earlier.

When we add the house value and mortgage balance to the regression, in the lower panel, some of the demographic coefficients get smaller in magnitude and a few even lose statistical significance; similar patterns occurred in the financial asset regressions as well. Similar to those regressions, higher house values are associated with later retirement here too. Those in the second quartile of the house value distribution retire about a half year later, while those in the third and fourth quartiles retire almost one year later; these effects vary in significance and magnitude, though not monotonically, across cohorts.

The effect of the mortgage size, conditional on house valuation, is more stable across cohorts and, though it is only occasionally significant for each one, it is estimated quite precisely for all cohorts together. Among homeowners, those without a mortgage retire half a year earlier than those in the lower half of the mortgage size distribution, and they retire almost a year earlier than those in the upper half. As with financial assets, these results suggest that high housing leverage may induce later retirement as

[15] One of the reasons that this regression may not be causal is that local housing prices may be correlated with local labor market conditions and opportunities for work at older ages.

another adaptation, though for most households the additional lifetime resources earned from an additional year of work falls far short of the amount needed to cover their mortgage debt.

We next consider consumption levels. These have been reported through the CAMS by an HRS subsample since 2001, but since the CAMS sample is small, we do not run regressions. Instead, we simply compare median annual consumption by age for homeowners with no mortgage, with a mortgage below the median (which is $111,258 in value at ages 64 to 66) among those who have a mortgage, and with a mortgage above the median. Each pair of rows in Table 3 shows annual expenditure at two adjacent ages, excluding any household with a change in composition, though such households may return in the pair of rows, showing the next two adjacent ages. The final rows compute the percentage change in consumption across various ages, adjusted for changes in composition.

Changes in consumption as the sample ages are negative, as has been found by others in the HRS.[16] Notably, households with above median mortgages exhibit greater declines in consumption, when considering various age ranges, than do households with below median mortgages. For example, between ages 65 and 81, annual consumption declines by 39.4% for the above-median mortgage group, compared to 28.4% for the below-median mortgage group.

Lastly, we analyze home sales as an outcome. We run regressions that take the same form as we did for retirement age, but with the sale of a home between the ages

[16] Rohwedder et al. (2022) show that annual consumption declines with age in the HRS, perhaps because the marginal utility of many types of consumption declines with physical and cognitive capacity.

of 65 and 75 as an outcome. Since this is not a common occurrence in the data, it may be reasonable to assume that home sales that occur before the death or institutionalization of a spouse are undertaken out of economic necessity. In these probit regression estimates, which are not reported in the current draft, we find quite similar patterns as above: Those with lower socioeconomic status are more likely to sell their house. Adding controls for housing wealth and mortgage size somewhat reduces the magnitude of the coefficients on socioeconomic variables; higher housing values are associated with a lower likelihood of selling one's home; and, conditional on home value, having a larger mortgage is associated with a greater likelihood of selling one's house early in retirement. The estimated effects of mortgage size fall slightly short of conventional levels of statistical significance, as we can reject null findings with 90% confidence but not with 95% confidence.

4. Model of home ownership and mortgages during retirement

4.1 Motivation

Home ownership provides the owner with a flow of housing services, the possibility of leaving the house as a bequest, and an asset that can be sold and used to pay for long-term care. A household with more housing wealth is unambiguously better off than one with less housing wealth. But, the question arises — all else equal, is a household better or worse off, upon entering retirement, with a more valuable house, financed by a mortgage, than with a less valuable house and no mortgage? The more valuable house provides more of the valuable benefits referred to above, but with the

obligation to amortize the mortgage, and, if the house is not liquidated, with an inability to finance nonhousing consumption in the event of outliving one's financial assets.

We answer this question theoretically by constructing an intertemporal optimization model in which typical single homeowners in each HRS financial asset quartile choose a consumption and asset decumulation path that maximizes expected utility. In each month, households face age-varying probabilities of transitioning between five health states — healthy, requiring home health care, residence in an assisted living facility, residence in a nursing home, and deceased. We then introduce a luxury bequest motive, parameterized following Lockwood (2018) and introduce long-term care cost risk, carefully modeling Medicaid rules as they apply to unmarried individuals for both home and nursing-home based care. We assume a real interest rate of 3%.

We start with the counterfactual case in which households do not have a mortgage. We do this by reducing the house value in each financial asset quartile by the mean mortgage debt for that quartile. We solve our model and calculate expected lifetime utility. We then reinstate mortgage debt and the original house value and re-run the model. We calculate the amount households must be compensated for holding mortgage debt. In our stylized model, there is little to make households better off from having a more valuable house plus mortgage debt.[17] But, we can learn about sources

[17] We assume away any direct utility that households may get from housing services. Depending on the form in which housing services would enter the utility function (which is much debated in the literature), this might make households prefer to take on a higher mortgage to hold more illiquid housing wealth. However, this possibility does not seem to explain the rise in mortgage debt and house values that we observe, and if other trends in

of potential value from holding more illiquid housing wealth by seeing how much compensation a household requires to take this on. Given our assumptions, households prefer that consumption declines with age, reflecting the lower probabilities of surviving to older ages.

We make a few important simplifications in our analysis. This analysis leaves aside the possibly endogenous decision of where to live and purchase a house. Several issues are at play here that would make such analysis complicated. First, the strength of labor markets and housing markets is correlated, so higher lifetime earnings are likely to be correlated with higher house prices, and possibly wage-adjusted house prices are similar across locations. Second, migration within the U.S. has decreased for successive cohorts, so recent households are more likely to live and work where they grew up.

Another simplification in our model is our assumption that the house is only sold on entry into nursing homes or death, which largely matches the observed data; given this assumption, mortgage-financed home ownership can distort the consumption path, forcing the household to consume less at younger ages when they have to pay down their mortgage and more at older ages than an unconstrained household would choose. It does, however, necessitate another simplifying assumption. As Friedberg et al. (2014) showed, a significant share of nursing home spells are followed by exit to the community, which is difficult to consider in this model given the assumption that the house is sold. One option would be to separately model transitions to short versus long

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housing markets explain it, then our model has a role to play in exploring the impact of those constraints on outcomes during old age.

nursing home stays, with only the latter resulting in the liquidation of the house, but we lack adequate data to do this. Instead, we assume that an individual who transitions from needing nursing home care to a healthier state enters assisted living.

A final assumption in the model is that individuals do not hold long-term care insurance. In the HRS, less than 10% of households hold long-term care insurance, and a significant fraction of those who purchase let policies lapse (Friedberg et al. 2023), sometimes in spite of holding the policies for many years. Instead, we rely on the findings delivered by a similar model in Brown and Finkelstein (2008) that long-term care insurance holdings are crowded out by means-tested Medicaid.

4.2 Model setup

Our model considers the problem of retired unmarried individuals who have to decide how rapidly to decumulate wealth during retirement in the presence of bequest motives, long-term care risk, and Medicaid, but in the absence of long-term care insurance or annuity markets. In some ways, it builds on the model by that Brown and Finkelstein (2008) used to investigate crowd-out of long-term care insurance by Medicaid, while updating the transition matrix among care states and incorporating a bequest motive and housing as an illiquid asset that may be leveraged.

In each month, the representative individual can be in one of five health states, at home receiving no care (health state 1), at home receiving home health care (health state 2), living in an assisted living facility (health state 3), living in a nursing home (health state 4), or dead (health state 5). The individual faces the following age- and gender-dependent care transition matrix:

$$\Omega_t^g = \begin{bmatrix} p_{11t}^g & p_{12t}^g & p_{13t}^g & p_{14t}^g & p_{15t}^g \\ p_{21t}^g & p_{22t}^g & p_{23t}^g & p_{24t}^g & p_{25t}^g \\ p_{31t}^g & p_{32t}^g & p_{33t}^g & p_{34t}^g & p_{35t}^g \\ p_{41t}^g & p_{42t}^g & p_{43t}^g & p_{44t}^g & p_{45t}^g \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \quad (1)$$

where $g \in \{m, f\}$ indicates the gender of the individual, and t indicates the age of the individual, measured as the number of months after age 65. The 25 elements in the matrix represent the transition probabilities from health states 1 to 5 at age t to the corresponding health states at age $t+1$, respectively. $\sum_{j=1}^{5} p_{ijt}^g = 1$.

Individuals enter the model at age 65, retired. The terminal period is T. In each month, individuals derive utility from time-separable general goods consumption, $C_{s,t}$ and, if they are in a nursing home or assisted living facility, from food and shelter provided by the institutions, $F_{s,t}$.[18] They do not receive utility from spending on long-term care. The individual gets expected discounted lifetime utility from the following expression:

$$U(C, F) = \sum_{t=0}^{T} \sum_{s=1}^{5} \frac{Q_{s,t}}{(1+\rho)^t} \frac{(C_{s,t}+F_{s,t})^{1-\gamma}}{1-\gamma} \quad (2)$$

where $Q_{s,t}$ is the probability of being in health state s at age t, calculated from the above care transition matrix. ρ is the time preference rate. γ measures the degree of risk aversion.

Individuals face the following budget constraint when they are not eligible for Medicaid:

$$W_{t+1} = (W_t + A_t - X_{s,t} - C_{s,t} - M_t)(1 + r) \quad (3)$$

[18] The latter term is necessary to avoid having the individual save in order to prevent consumption from reaching extremely low levels if institutionalized.

where W_t is households' financial wealth at age t. A_t is annuitized income at age t. $X_{s,t}$ is the cost of long-term care in health state s and age t. M_t represents mortgage payments, which may be zero for some. There is the usual no-borrowing constraint, so that $W_t \geq 0$ for all t.

If an individual enters a nursing home, the budget constraint becomes:

$$W_{t+1} = \left(\min\left(W_t + H_{s,t}, \underline{W}\right) + \min\left(A_t, \underline{C_s}\right) - C_{s,t}\right)(1 + r) \tag{4}$$

where Medicaid requires that the individual contribute financial assets above the asset eligibility limit $\underline{W}$, annuity income above the income eligibility limit $\underline{C_s}$ (which varies with long-term care status), and the amount $H_{s,t}$ obtained if the house is liquidated in time *t*, which Medicaid requires if the individual enters a nursing home. Wealth and income above the limits are required to be spent on the costs of long-term care first.

Medicaid pays an amount equal to:

$$X_{s,t} - \max\left(A_t - \underline{C_s}, 0\right) - \max\left(W_t - \underline{W}, 0\right) \tag{5}$$

the remaining long-term care costs after individuals pass both Medicaid income and assets tests.

The resulting Bellman equation for the multi-period optimization model is:

$$V_{s,t}(\theta_{s,t}) = \max_{C_{s,t}} \left\{ U(C_{s,t}, F_{s,t}) + \sum_{s'=1}^{4} \frac{q_{t+1}^{s,s'}}{1+\rho} V_{s',t+1}(\theta_{s',t+1}) + \frac{q_{t+1}^{s,5}}{1+\rho} v(W_{t+1}) \right\} \tag{6}$$

$$v(BW_{t+1}) = \left(\frac{\varphi}{1-\varphi}\right)^{\sigma} \frac{\left(\frac{\varphi}{1-\varphi} c_b + W_{t+1}\right)^{1-\sigma}}{1-\sigma}$$

where $V_{s,t}$ is the value function at health state s and age t and $v(BW_{t+1})$ is the utility of bequeathing terminal wealth, with $\varphi \epsilon (0,1)$, which we parameterize as in Lockwood (2018). $\theta_{s,t}$ is the state space of the model, including financial wealth, housing wealth, mortgage balance, monthly mortgage payment, and annuity income . The control space

of the model only has one variable, general consumption, $C_{s,t}$. $q_{t+1}^{s,s'}$ is the care transition probability from current health state s to health state s' next period. Individuals are subject to equations (3), (4), (5), and (6).

The model is solved by backward induction. We discretize the continuous variables in the state and control spaces and interpolate the values between the grid points. At the last period T, since individuals know they will be dead at the end of the period, they will maximize utility by splitting their remaining wealth between their final-period consumption and bequest. One period before, at period $T-1$, individuals choose their optimal consumption amount based on their preferences, the state variable set $\theta_{s,T-1}$ and the information on the value function calculated at period T, to maximize the summation of their current-period utility and expected discounted utility at the terminal period T. We undertake the same procedure back to the first period, yielding a set of decision rules and we apply the decision rules to compute simulated moments.

To reiterate, we capture the illiquidity of the house as follows: Housing wealth is only liquidated when an individual enters a nursing home (in which case it displaces Medicaid until financial assets drop to the Medicaid asset limit) or an individual dies (in which case the house becomes part of the individual's bequest). The amount by which the household has to be compensated to take on a mortgage, along with more illiquid housing is the willingness-to-pay to avoid a mortgage-financed increase in the value of the house. Individuals will have a positive willingness-to-pay to avoid the extra illiquidity, but if the willingness-to-pay is lower than the mortgage balance, that demonstrates that the illiquidity of the house has some value. We explore the model specification further

to determine how much of the value comes from using the house as a hedge for long-term care needs and how much comes from luxury bequest motives.

4.3 Parameter values

The model starts at age 65 and the terminal age T is set at 105. The coefficient of risk aversion is assumed to be 3 and the rate of time preference is assumed to be 3% as is conventional in the relevant literature.[19] The age- and gender-dependent monthly care transition probabilities are from Friedberg et al. (2014), estimated using the latest National Long-Term Care Survey (NLTCS) and the Health and Retirement Study (HRS) data. These care transition estimates fix a key design flaw in the Robinson (2002) model used in Brown and Finkelstein (2008), Davidoff (2009, 2010), and other related papers; provide a correct distribution of care use; and are able to closely match the latest care use statistics reported by Hurd et al. (2014).[20] Long-term care costs, and Medicaid eligibility limits are all measured in 2021 dollars. As reported by Genworth (2022), the average costs of a semiprivate room in a nursing home, a room in an assisted living facility, and home health care were $94,900 and $54,000 a year, and $27 an hour, respectively, in 2021.[21] Individuals who make use of nursing home care and home health care are subject to different Medicaid eligibility limits. We assume, when

[19] This coefficient of risk aversion is in the range reported in the literature, which tends to cluster between 2 and 10 depending in part on whether the estimates are derived from portfolio theory, purchases of insurance, economic experiments, or preferences over lotteries (Chetty, 2006).

[20] Nonannuitized wealth includes IRAs, 401(k)s, and nonpension financial assets. Annuitized wealth includes the expected present value of Social Security benefits and employer pensions.

[21] It does not report the cost of skilled nursing care in 2021. We assume that it is increased at the same rate as the cost of home health care.

individuals are residents in a nursing home, they are allowed to retain income and assets of $30 a month and $2,000, respectively. When receiving care at home, the Medicaid asset limit is also $2,000, but the income limit is increased to 100% of the Supplementary Security Income (SSI), the numbers in the most restrictive state.[22]

Table 6 reports data from the HRS on single homeowners at ages 64 to 66 by financial asset quartile. The mean of financial assets in the lowest quartile is $276 (measured in 2022 dollars), and individuals in that quartile have mean housing equity of $99,848 and a mean mortgage balance of $26,567, yielding a debt-equity ratio of 26.6%. The next higher financial asset quartile has the highest housing debt-equity ratio, of 41.2%, based on housing equity of $135,140 and a mortgage balance of $55,715. The housing debt-equity ratio of the next two quartiles of financial assets is 29.4% and 13.4%, respectively.

4.4 Model results for representative households

As noted earlier, we solve the model for representative households from the HRS by determining financial asset quartiles at ages 64 to 66 for homeowners, and within each quartile, using the mean value of financial assets, housing wealth, mortgage balance, and annuitized income that the individual is eligible for from Social Security

[22] Almost all states set Medicaid assets eligibility limit to $2,000 for single individuals, but the income individuals could retain varies by long-term care status and U.S. state. Single individuals receiving nursing home care are required to contribute essentially all their income except a monthly personal needs allowance which is $30 to $200, depending on the state of residence. The amounts individuals receiving home health care are allowed to retain are in range of 100% to 300% of the SSI. We choose the most stringent rules in our benchmark calculations as individuals place the highest value on long-term care insurance under the assumption. The partnership programs in more generous states will induce fewer individuals to purchase long-term care insurance and will have a smaller impact on Medicaid budgets.

and defined benefit pensions. After solving the model with the values above, we then consider a counterfactual in which we eliminate mortgage debt while reducing the house value by the same amount, in order to maintain the same value of total wealth. We compare the two by calculating the amount by which households must be compensated for holding a mortgage-finance increase in the value of their illiquid housing — this can also be viewed as the willingness-to-pay to avoid a mortgage. Moreover, we undertake this exercise for four versions of the model: with and without a bequest motive and with and without long-term care cost risk jointly with means-tested Medicaid. Lastly, we solve each of these versions parameterized for men and for women separately, since women can expect to live healthier and longer lives than men.

As noted earlier, we do not currently include imputed rent or utility from housing services, as doing so would involve making assumptions about how housing services and other consumption enter into the utility function. While the house does little to *add* value in the current model as a result of this assumption, we can still get important insights comparing how much the welfare cost changes under different scenarios.

The amounts by which households must be compensated to take on illiquid, mortgage-financed housing wealth appear in Table 7. In the no-LTC and no bequest case, the required payment is close to the mortgage balance. The amount of compensation drops considerably, when incorporating LTC risk. It is not very sensitive, though, declining only a little, when adding a bequest motive, with or without LTC risk.

In the base case of no-LTC/no-bequest motive, an individual in the second quartile (with the highest housing debt-to-equity ratio) must be compensated by $52,645 if male and a little more if female, to take on a mortgage-financed increase in housing

wealth of $55,715. Since the model assumes that the rate of return on the single risk-free financial asset equals the mortgage interest rate and abstracts from taxes, then providing the household with $55,715 would enable the household to amortize the mortgage and enjoy the same level of consumption it enjoyed without the mortgage. But, since the house is sold on entry to a nursing home or assisted living, by which time the mortgage will typically have been repaid, the more valuable house permits greater consumption in that state. To equalize expected discounted lifetime utility, the required compensation is therefore slightly less than the amount required to amortize the mortgage.

When adding a bequest motive, the compensation required to take on a mortgage is almost unchanged. This is the case even though the extra housing wealth substantially increases the bequest.[23] As Lockwood (2018) emphasized, a bequest function that fits multiple facets of late-life saving and insurance behavior well involves a bequest motive that is a luxury good. It is largely satisfied from incidental bequests (that is, made when one dies earlier than expected, before consuming that much of one's wealth). With such a bequest function, one has to be quite wealthy (in which case the marginal utility of one's own consumption is low) for the marginal utility of incremental planned bequests to exceed the marginal utility of own consumption.

When incorporating LTC cost risk jointly with means-tested Medicaid, illiquid housing gains considerably in value for wealthier households. An individual in the second financial asset quartile who is male now needs to be compensated by $49,754

[23] We obtained extremely similar results when we used the bequest motive found in De Nardi et al. (2016). Lockwood (2018) outlines the similarities across numerous specifications of bequest motives from the literature.

without a bequest motive, decreasing from $52,645, or 5.2%, in the case without LTC cost risk. Compensation is slightly lower in the presence of both long-term care cost risk and a bequest motive, since the house can only be used for one purpose — either paying for care or going to a bequest — and not both. For the next financial asset quartile, incorporating long-term care cost risk and Medicaid reduces the compensation from $56,461 to $46,101 (or 18.1% of the mortgage debt of $57,276) and from $41,923 to $18,946 (52.1% of the mortgage debt of $44,030) for the top financial asset quartile — in other words, by over half. The explanation is that at lower wealth levels, most of the benefit of the additional resources deriving from the sale of the house accrues to the government in the form of lower Medicaid payments rather than to the individual. The logic of this important finding is that the extra housing wealth gained as the mortgage is paid down now has additional value for individuals who are unlikely to qualify for Medicaid.

5. Conclusions

Assuming plausible preference parameters, we might expect succeeding birth cohorts to prefer acquiring more expensive houses due to two factors. In response to rising real incomes, households may want to increase their consumption of housing services along with other goods. Also, in many, though not all MSAs, house prices have increased faster than wages over the past 30 years, leading to an increase in spending on housing assuming that the demand for housing is relatively inelastic. Financial liberalization, a long era of low nominal interest rates, and evolving social norms may have enhanced those trends. Those considerations, by themselves,

however, do not tell us whether having more of one's wealth in housing upon entering retirement is an asset or a liability.

During retirement, additional factors come into play. The fact that few households downsize after retirement may reflect market failures induced by planning regulations — it may not be possible to purchase a smaller house in the same neighborhood — and perhaps it reflects a preference for more house even for empty nesters. Our analysis suggests an additional consideration: The larger house provides informal insurance against long-term care costs, since it can be lived in while receiving Medicaid-financed home health care or alternately sold to pay for non-Medicaid residential care. Our intertemporal optimization model suggests that the value of this insurance can be substantial, reaching over 50% of the mortgage for those with considerable financial assets.

This is not the situation, however, for those who are less well off. In what situations does the burden of mortgage debt and illiquidity of the house make it a liability? Households with greater mortgage debt who are not able to accumulate additional financial assets must either retire later or accept lower nonhousing consumption in retirement.

Many retiring mortgage holders in the HRS who are white have substantial financial assets, and so do not face these potential hardships. They may even be able to take advantage of low interest rates and tax preferences for arbitrage opportunities, and, as we have shown, they can benefit from using the house as informal long-term care insurance. The situation of Black and Hispanic mortgage-holding households is far worse, though, with lower Social Security wealth and negligible financial assets at the

median to cover the mortgage debt. This suggests that unsustainable mortgage borrowing strongly correlates with race and ethnicity, perhaps reflecting both predatory lending and the lack of fully effective redistribution through the retirement savings system.

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Tables

Table 1: Housing balance sheets of homeowners at ages 64 to 66, HRS

HRS cohort:	CODA	HRS	War babies	Early boomers
Birth year:	**1924-1930**	**1931-1941**	**1942-1947**	**1948-1953**
Share of homeowners with mortgage	37.9%	45.2%	49.3%	50.8%
Mortgage balance, conditional on having a mortgage				
50th percentile	46,677	76,477	101,945	108,523
75th percentile	98,736	146,708	182,276	207,291
90th percentile	199,197	248,895	299,039	310,936
Home value, conditional on home ownership				
50th percentile	167,852	195,211	223,066	216,336
75th percentile	279,784	325,353	373,799	370,862
90th percentile	394,946	569,367	618,104	609,680
Debt-equity ratio (mortgage/home equity)				
50th percentile	0.0%	0.0%	0.0%	2.0%
75th percentile	16.6%	32.0%	40.0%	47.1%
90th percentile	50.9%	61.2%	73.5%	75.0%
Financial assets (conditional on home ownership)				
50th percentile	57,921	65,324	70,000	45,739
75th percentile	198,989	275,519	344,932	282,423
90th percentile	472,698	721,697	807,191	814,582

Source: Authors' calculations, Health and Retirement Study. Sample consists of all households with one spouse ages 64 to 66. Mortgages are the sum of first mortgages, second mortgages, and home equity loans on the primary residence. All dollar amounts in 2022 dollars.

Table 2: Housing balance sheets of homeowners at ages 60 to 79, SCF

$10,000 - $100,000 in Financial Assets		1992	2004	2016
	Homeowner (%)	79.8	83.1	84.5
Conditional on owning a home, medians	Mortgage (%)	29.9	51.3	55.0
	Home value	$ 227,158	$ 266,399	$ 198,147
	Financial assets	$ 39,185	$ 40,066	$ 38,044
Conditional on having a mortgage, medians	Home value	$ 246,088	$ 319,678	$ 237,776
	Financial assets	$ 33,317	$ 49,017	$ 33,024
	Mortgage balance	$ 30,284	$ 75,458	$ 93,152
	Mortgage payments	$ 6,607	$ 8,489	$ 11,923
	Mortgage payments / Income	0.087	0.118	0.146
$100,000 - $200,000 in Financial Assets				
	Homeowner (%)	86.2	86.9	85.7
Conditional on owning a home, medians	Mortgage (%)	26.3	40.1	45.2
	Home value	$ 283,948	$ 319,678	$ 224,566
	Financial assets	$ 138,945	$ 151,314	$ 146,629
Conditional on having a mortgage, medians	Home value	$ 359,667	$ 319,678	$ 237,776
	Financial assets	$ 136,522	$ 149,610	$ 145,308
	Mortgage balance	$ 48,709	$ 78,602	$ 117,992
	Mortgage payments	$ 9,403	$ 8,300	$ 12,669
	Mortgage payments / Income	0.064	0.075	0.113
$200,000 - $500,000 in Financial Assets				
	Homeowner (%)	88.0	89.6	91.5
Conditional on owning a home, medians	Mortgage (%)	24.2	46.8	48.6
	Home value	$ 340,737	$ 383,614	$ 257,591
	Financial assets	$ 299,092	$ 296,235	$ 304,248
	Home value	$ 378,597	$ 426,238	$ 303,825
	Financial assets	$ 292,428	$ 297,940	$ 309,030

Conditional on having a mortgage, medians	**Mortgage balance**	$ 59,298	$ 103,755	$ 120,476
	Mortgage payments	$ 12,707	$ 12,073	$ 13,414
	Mortgage payments / Income	0.061	0.087	0.098

Source: Authors' calculations, Survey of Consumer Finances. Sample consists of households with the financial respondent ages 60 to 79. Mortgages are the sum of first mortgages, second mortgages, and home equity loans on the primary residence. All dollar amounts in 2022 dollars.

Table 3: Socioeconomic and financial characteristics of homeowners with differing mortgage balances

	No mortgage	Mortgage ≤ median	Mortgage > median
1924-1930 birth cohort			
Education			
Has not completed high sch	38.4	35.5	23.8
High school graduate	47.0	46.2	48.1
College graduate	14.6	18.3	28.1
Race and ethnicity			
White or other	85.6	77.0	83.2
Black	9.2	15.3	12.4
Non-Black Hispanic	5.3	7.7	4.4
Median financial assets, age 65			
White or other	133,936	59,056	102,473
Black	3,494	4354	16,158
Non-Black Hispanic	2,322	1,359	7,181
1948-1953 birth cohort			
Education			
Has not completed high sch	20.5	15.2	7.4
High school graduate	52.8	56.5	46.4
College graduate	26.7	28.3	46.2
Race and ethnicity			
White or other	62.8	71.3	73.2
Black	18.5	16.1	16.5
Non-Black Hispanic	18.7	12.6	10.3
Median financial assets, age 65			
White or other	197,141	80,905	133,916
Black	2,438	3,658	18,290
Non-Black Hispanic	0	2,472	10,364
Social Security wealth at Full Retirement Age			
White or other	334,560	346,900	419,800
Black	260,431	278,300	304,942
Non-Black Hispanic	225,982	310,442	293,883

Source: Authors' calculations, Health and Retirement Study. Sample consists of all households with one spouse ages 64 to 66. Mortgages are the sum of first mortgages, second mortgages, and home equity loans on the primary residence. All dollar amounts in 2022 dollars.

Table 4: Regression analysis, economic outcomes in old age, HRS homeowners

Outcome:	All cohorts			CODA (24-30)			Original (31-41)			War Babies (42-47)			Early Boom (48-53)		
Retirement age	Coef	s.e.	p	Coef	s.e.	p	Coef	s.e.	p	Coef	s.e.	p	Coef	s.e.	p
Education (omitted, has not completed high school)															
High school grad	0.64	0.26	0.013	0.55	0.69	0.423	0.93	0.34	0.007	1.43	0.67	0.034	1.30	0.73	0.073
College grad	1.87	0.30	0.000	3.10	0.86	0.000	2.05	0.41	0.000	2.95	0.76	0.000	2.64	0.79	0.001
Race and ethnicity															
Black	-1.64	0.33	0.000	-2.54	1.05	0.016	-1.04	0.44	0.019	-1.75	0.76	0.022	-1.11	0.68	0.101
Non-Black Hisp	-0.24	0.40	0.545	-1.77	1.30	0.174	-0.04	0.56	0.942	0.59	0.93	0.524	2.08	0.78	0.008
Married	1.46	0.33	0.000	0.35	2.15	0.872	1.04	0.43	0.015	0.07	0.77	0.923	2.68	0.65	0.000
Constant	60.25	0.37	0.000	62.24	2.18	0.000	60.91	0.48	0.000	59.87	0.91	0.000	55.81	0.86	0.000
Education (omitted, has not completed high school)															
High school grad	0.27	0.26	0.309	0.25	0.70	0.722	0.64	0.35	0.064	0.60	0.70	0.388	0.98	0.75	0.190
College grad	1.17	0.33	0.000	2.27	0.92	0.014	1.50	0.44	0.001	1.61	0.84	0.055	2.17	0.85	0.011
Race and ethnicity															
Black	-1.57	0.33	0.000	-2.63	1.05	0.013	-1.03	0.45	0.022	-1.51	0.76	0.048	-1.12	0.68	0.100
Non-Black Hisp	-0.17	0.40	0.672	-1.64	1.30	0.208	-0.09	0.56	0.869	0.69	0.93	0.458	2.30	0.78	0.003
Married	1.20	0.33	0.000	0.46	2.14	0.829	0.87	0.43	0.044	-0.38	0.77	0.622	2.43	0.67	0.000
Housing wealth, quartiles (omitted 1st quartile)															
Second	0.59	0.30	0.052	-0.44	0.85	0.602	0.27	0.41	0.506	2.04	0.73	0.005	0.88	0.72	0.225
Third	1.09	0.31	0.000	0.67	0.90	0.461	0.63	0.42	0.132	2.02	0.72	0.005	1.60	0.75	0.033
Fourth	1.08	0.34	0.001	0.48	0.93	0.606	0.65	0.46	0.157	2.38	0.82	0.004	0.90	0.83	0.280
Mortgage debt, categories (omitted mortgage<median)															
No mortgage	-0.47	0.26	0.073	-0.52	0.76	0.495	-0.44	0.35	0.219	-0.66	0.59	0.268	-0.97	0.60	0.108
Mortgage > med	0.88	0.31	0.005	1.97	0.95	0.038	1.16	0.42	0.006	0.09	0.71	0.900	-0.88	0.75	0.243
Constant	60.15	0.44	0.000	62.18	2.28	0.000	60.87	0.58	0.000	59.77	1.03	0.000	56.15	0.99	0.000
N		5085			650			2942			848			645	

Note: Authors' calculations, Health and Retirement Study. Sample consists of men who are homeowners at ages 64-66. All dollar amounts are in 2022 dollars.

Table 5: Median annual expenditures, HRS

	Mortgage debt of household at ages 64-66		
Age	**Zero**	**Below median**	**Above median**
65	59,004	57,094	85,517
67	56,268	54,322	81,935
67	57,826	55,432	83,645
69	57,320	53,993	78,985
69	58,670	54,461	78,516
71	55,998	53,960	77,723
71	58,237	53,511	76,530
73	54,744	52,288	70,065
73	57,456	53,013	69,990
75	53,501	50,411	64,942
75	53,327	54,273	65,613
77	48,840	51,254	59,148
77	50,672	52,085	58,707
79	48,163	53,158	56,852
79	50,561	52,086	57,302
81	44,442	46,384	52,478
% change, across ages			
65-81	-44.9%	-28.4%	-39.4%
65-79	-34.5%	-18.4%	-33.8%
65-77	-30.3%	-20.2%	-31.6%

Source: Authors' calculations, Consumption and Activities Mail Survey of the Health and Retirement Study. Sample consists of homeowners in cohorts born between 1924 and 1947, unless household composition changed between two adjacent ages. Percentage changes in consumption adjust for changes in composition. All dollar amounts are in 2022 dollars.

Table 6: Model parameters, based on HRS' financial asset quartiles

Financial asset quartile:	Financial assets	Housing equity	Mortgage balance	House debt-equity ratio	Annuitized income
1	276	99848	26567	0.266	11076
2	10029	135140	55715	0.412	14409
3	77509	194990	57276	0.294	18590
4	566058	328477	44030	0.134	19087

Source: Authors' calculations, Health and Retirement Study. Sample consists of unmarried homeowners at ages 64 to 66 in cohorts born between 1924 and 1947. All dollar amounts are in 2022 dollars.

Table 7: Model results, compensation required to accept additional mortgage-financed housing wealth

Financial asset quartile:	Mortgage	No LTC cost risk				LTC cost risk, means-tested Medicaid			
		No bequest motive		Bequest motive		No bequest motive		Bequest motive	
		Male	Female	Male	Female	Male	Female	Male	Female
1	26567	23543	24286	23542	24286	23097	23782	23097	23782
2	55715	52645	53432	52643	53431	49754	50023	49752	50021
3	57276	56461	56045	56454	56038	46101	43355	46096	43351
4	44030	41923	40689	41900	40669	18946	17314	18942	17313

Source: Authors' calculations, Health and Retirement Study. See text for details. All dollar amounts are in 2022 dollars.