Exploring the rise of mortgage borrowing among older Americans☆

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ABSTRACT

Between 1980 and 2015, older households in the US more than tripled the use of home mortgage debt. Rather than using owned homes as a source of imputed rent, older households are borrowing against home equity, with loan terms that exceed their expected life spans. Using several data sources, we explore the rising use of mortgages among elderly homeowners. Rising mortgage borrowing provides low-wealth older households with increased liquid assets, but it does not appear to be meaningfully associated with increases in loan defaults. This trend of elderly mortgage borrowing is not explained by increasing levels of income or cohort demographic shifts, but is linked to a rise on ownership of homes by older households in general. However, changes in subsidies associated with mortgage debt partially contribute to differential increases in mortgage use by older households.

1. Introduction

In the United States, the share of households headed by someone age 65 or older is increasing to the point where one in five household heads will soon be labeled as 'elderly' (Poterba, 2014). At the same time, older households are holding an increasing level of debt (Consumer Financial Protection Bureau, 2014; Vornovytskyy et al., 2011). According to US Census data, 3.6 million more households aged 65 and older had a mortgage in 2015 than in 2000, an increase of 39 percent. Meanwhile, households headed by someone under 40 had four million fewer mortgages over the same time period. Part of the increase is due to a rise in homeownership rates among older households. However, the rate of mortgage usage has nearly tripled, from 13 to 38 percent, among elderly homeowners since 1980.

A traditional life-cycle savings model predicts that individuals borrow at younger ages, then pay off debt and decumulate assets in retirement. Mortgage debt used to buy a home is an example—households borrow at younger ages to buy a home, pay off the loan and then use that asset to consume housing as they age, providing imputed rent.

However, the rate of older households holding a mortgage is rising relative to previous cohorts. For example, Census data in Panel A of Fig. 1 show that the rate of holding a mortgage nearly quadrupled from 10 percent of households near age 70 in 1980 to almost 40 percent by 2015. Home mortgage loans are typically the largest loans that households take on, and paying off these loans creates home equity and frees up cash flow for other consumption. However, the rate of seniors holding on to mortgages as they age is rising. This begs the question, why are older households increasingly holding mortgage loans?

Some media reports argue that rising levels of debt for older Americans presents a serious problem (Pham, 2011). A report by the Consumer Financial Protection Bureau (2014) claims that "rising mortgage debt is threatening the retirement security of millions of older Americans." Recent work by Mayer (2017) highlights increasing debt among retirees relative to financial assets, reporting that in 2012, 40 percent of homeowners aged 65 to 69 have more mortgage debt than they have financial assets, up from 28 percent in 1992. If older homeowners hold mortgages and are burdened with making mortgage pay-

Panel A: Mortgaged Rate   Panel B: Homeownership
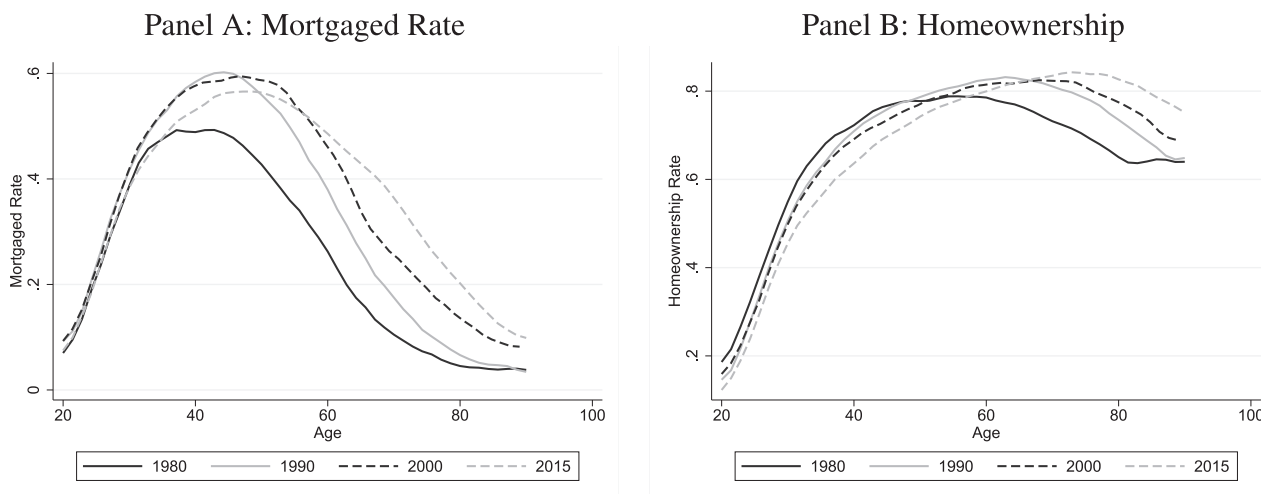

Fig. 1. Mortgage holding rates and homeownership by age profiles over time.
Source: Census PUMS Data 1980–2000, 2015 American Community Survey Data.

ments as they exit the workforce in retirement,[1] they have an added monthly expense, potentially crowding out consumption of other welfare enhancing goods, such as health care, food, and prescription drugs.

However, given longer life expectancy, improved health status, and extended labor force participation rates of older workers, households may be optimally choosing to maintain mortgage debt later in life. The housing boom of the 2000s may have encouraged borrowers to substitute away from higher cost debt, such as auto or credit card debt, to lower cost mortgage debt (Brown et al., 2015). It is also plausible that each new cohort of elderly households is being shaped by generational shifts. As the number of older people who own homes increases, and the composition of the elderly home owning population changes, the probability of older people holding a mortgage may also shift. The propensity for the elderly to hold mortgages may simply be a function of differences in each cohort's wealth and income trajectory, for example. Moreover, income tax, estate tax and other incentives may favor holding mortgage debt, combining with life-cycle factors and bequest motives, to make mortgage holding more favorable for more recent elderly cohorts than prior generations.

As household heads age, they reconsider the costs and benefits of owning versus renting a home. Older households are less location constrained, since they are less likely to be commuting to work and are unlikely to have school-age children. Given the lower opportunity costs of time for people out of the workforce, these households also have lower transaction costs of moving.[2] Combined with greater flexibility on housing location, these factors could encourage households to sell their homes and then rent or downsize to a lower cost property. Selling a home can free up home equity to be used for investment or consumption. On the other hand, the income of older households is less likely to rise when rents rise. By owning a home, households hedge against the increases in housing costs that renters face. For wealthier older households, owning housing provides an asset that may complement other assets in their portfolio. These financial factors might combine to encourage home owning in old age.

Even when older households decide to become or remain homeowners, they can decide to own the home outright with no loan, or have mortgage debt against their home. Mortgage usage among younger

households is often rationalized as a way to smooth consumption during earlier working years. Older populations have likely already aged out of peak earning years, making the use of a loan less compelling. At the same time, older households are less likely to experience unemployment spells and tend to have relatively stable income from Social Security and any annuities or defined pension income. This might result in older households perceiving the payment default risk of a mortgage as being lower than for younger households with more income volatility.

For some older households who own homes, having a mortgage may actually be driven by financial need. The boom-and-bust housing cycle of the 2000s had a dramatic impact on home values and access to mortgage debt overall. As shown by Bhutta and Keys (2016), unprecedented real housing gains in the boom period, combined with low interest rates, led to high rates of equity extraction among homeowners in general. As home values plateaued and then declined, homeowners in many parts of the country faced large losses and even home foreclosure. While older households were less likely than average to experience a foreclosure, the price decline still exposed their household balance sheets to the full brunt of the housing bust. Lower home values may have also delayed older households' plans to sell their homes to pay off their mortgage. Older households may have also been indirectly impacted by the recession if their adult-aged children needed in-kind or cash inter vivos transfers, which could have substituted wealth otherwise that would have been used to pay off a mortgage. Reverse mortgages, which are specifically designed to facilitate older households to tap into home equity to fund consumption, have not been in high demand (Shan, 2011). Instead older households may simply be extending existing mortgage debt.

This paper provides a deeper understanding of the prevalence of mortgages among older households over time. In addition to showing relative changes in the use of mortgages by subgroups within the elderly population, we explore tax policy and other factors that may have pushed higher relative rates of mortgage borrowing among older households.

This study complements several recent studies. Mayer (2017) documents evolving trends in homeownership and mortgage finance among older adults over the past several decades. He reports that while homeownership rates among older adults have been increasing over time, mortgage usage has also been increasing without a corresponding increase in financial assets. The author suggests that this is potentially a signal that elderly households experience less financial stability as they take on more debt. Lusardi et al. (2017) use data from the Health and Retirement Study from 1992, 2004, and 2010 to show that recent cohorts entering into retirement have taken on more debt than in the

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[1] We acknowledge that retirement from work and elderly status are both defined continuously, with households engaging in variable levels of work even at the older ages. Our assumption is that households 65 and older are more likely to be retired from work, and more likely to receive pension and Social Security income than market income.
[2] Dietz and Haurin (2003) describe home sale transaction costs.

past, largely to live in higher-priced homes with a lower equity percentage (also know as higher loan-to-value ratios). The authors did not follow cohorts past the initial years of exiting the labor force, however. Brown et al. (2016) explore the prevalence of mortgage holding by age over time using data from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (CCP). Using these administrative data, the authors also show rising debt levels among older households. These papers all raise the same basic questions we pose, and find that older homeowners are more likely to carry a mortgage and take on more mortgage debt in recent years than they did in prior decades.

We build upon these studies, exploring the heterogeneity in the use of mortgages by age cohorts over time, including bequest motives, education level, pensions and wealth. We then explore potential rational explanations for the increased debt load by these households, including state tax incentives, regional unemployment rates, and relative rents. Building on prior studies, we estimate the likelihood of holding a mortgage by comparing older households to slightly younger cohorts.

We find that relative to 50–64 year olds, households with heads aged 65 to 79 increased their mortgage usage by ten percentage points between 2000 and 2016. Even conditional on homeownership, mortgage borrowing has risen considerably among this group. These older households also have higher home values and home equity than prior cohorts, as well as higher rates of mortgage refinancing. The rise in the relative use of mortgages among older households is in part due to rising local unemployment rates, particularly the rise in unemployment during the Great Recession. Local area rents relative housing prices also are a factor in the choice to borrow.

We also consider the role that tax incentives, through the mortgage interest deduction, may have on increased mortgage borrowing among older households. We build on previous literature examining how tax incentives shift consumption behavior, such as DeFusco and Paciorek (2017), Dunsky and Follain (2000), Hilber and Turner (2014) and Ling and McGill (1998). We use variation in an individual's subsidy amount based on changes in state income tax rates, tax brackets, treatment of mortgage interest, and treatment of other tax deductions by state and year to estimate relative incentives for mortgage use by age cohort. We estimate about half of the increase in mortgage usage by older households is related to tax policy.

Mortgage borrowing could have economically significant implications for the financial wellbeing of retired households. Given historically low mortgage interest rates, households may simply be exploiting financial arbitrage between investment and borrowing rates. Households may be able to increase long-run consumption by "borrowing low" and "investing high." Indeed, Goodman and Mayer (2018) provide evidence that even over the boom-bust housing cycle, owning a home can be a financially advantageous strategy given house price patterns. However, holding a mortgage is risky. The house and property provide the collateral for the loan. If borrowers cannot maintain payments and ultimately default on their loans, they risk losing a significant financial asset as well as their source of housing. If households are borrowing primarily to tap home equity for consumption rather than investment, and they fail to keep up with debt payments, more households may be at risk of experiencing financial problems in older ages than they did in prior generations.

We do not find evidence of older households being at greater financial risk from defaults as they age and continue to hold mortgages, relative to other age cohorts or prior generations. Still the general pattern remains important to monitor, especially as market cycles, interest rates and home prices fluctuate. It may simply be a matter of older households' shifting preferences and risk tolerances, combined with credit markets willing to extend a supply of mortgage loans to elderly consumers.[3] A shock to retirement incomes, health care or other consumption costs, or a prolonged credit contraction could make these leveraged households more vulnerable to hardships.

This paper continues by providing a brief background on prior studies on homeownership and mortgage use among the elderly, mainly in the US context. We next provide information on the data sources and estimation strategies, followed by a series of visual and tabular representations of these estimates. We systematically show the relative use of mortgages for older households relative to slightly younger cohorts, by sub-population or group characteristics, in order to narrow in on heterogeneity in mortgage use. We then conclude with a brief discussion of the results and implications for the field.

2. Background

Younger households with higher expected future income and little current savings can use debt to smooth consumption over the life course. As households' ages and incomes peak, these households can pay down and eliminate debt while saving for retirement. The prediction from standard models is that older households will hold relatively less debt than younger households do.

As households age, they can select one of three housing options: (1) Own a home outright, without a mortgage; (2) own a home with a mortgage; and (3) rent a home, either for cash, or a no-cash rent, such as living with relatives. An increasing number of older households are choosing option (2), which motivates our analysis.

Mortgage debt is used to finance property, typically an owner-occupied residence that offers a stream of housing consumption to the owner.[4] The standard US mortgage loan has a 30-year amortized repayment term. This means that a mortgage originated when a household is 30 would naturally terminate by age 60, assuming no refinancing, prepayments, or selling of the home. Households who take out a mortgage at older ages could still pay off the loan ahead of schedule, use savings to pay off the balance, or sell the home to pay off the loan.

Older homeowners who lack assets to pay off their mortgage can sell their homes, and then use the proceeds to finance consumption while renting a home. Renting may also be attractive as homeownership exposes a large portion of household wealth to the occasionally volatile local housing markets. Housing-rich but income-poor older homeowners may also be burdened by property taxes (Shan, 2010) and could downsize their living space by selling their home and renting a smaller housing unit. Rental properties typically require less physical maintenance, which could be attractive to older households with physical limitations (Golant, 2008a,b).

Despite these potential benefits, the general trend is not for older households to transition from homeownership to renting. Painter and Lee (2009) study the housing tenure decisions of older households using the Panel Survey of Income Dynamics and conclude that age does not directly relate to households transitioning from ownership to renting. Shocks such as having a lower health status or becoming a single head of the household are more predictive of housing transitions than age alone. While there have been changes in the delivery of health care that may facilitate older households staying in their homes in spite of health shocks, there is also not strong evidence health care policies are contributing to more homeownership among the elderly (Engelhardt and Greenhalgh-Stanley, 2010).

Older households may prefer homeownership since it provides more predictable housing costs than rental markets, which are subject to annual contracts (Sabia, 2008; Sinai and Souleles, 2005). Aging households may also prefer owner occupied homes to be able to control the level of investment they make in home maintenance. Aging homeowners can smooth consumption by forgoing home maintenance, essentially reducing the equity value of the home over time and consuming what

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[3] Fair Lending regulations in the US also restrict lenders from denying credit solely on the basis of a loan applicant's age.

[4] Housing consumption value represents the flow utility of living in a home and is often approximated at the imputed rental value of the home.

would have otherwise been spent on home repairs (Gyourko and Tracy, 2006). Another factor that may contribute to homeownership of older households is the steady rise in Social Security benefits, which reduces income uncertainty in retirement (Engelhardt, 2008).

Of course, the composition of the elderly population who own homes is also changing over time, especially for the Baby Boomers cohort which has greater wealth and better health than prior age cohorts. This could also affect their probability of holding a mortgage when a homeowner. A number of studies (Brown et al., 2016; Copeland, 2015; Lusardi et al., 2018; Vornovytskyy et al., 2011) have shown absolute and relative increases in debt levels by age. The growth in mortgage debt exceeds what might be explained by rising homeownership rates in a population with longer life expectancy alone. The same trend is occurring in other countries, including among retirees in Canada (Bédard et al., 2018). Economic theory and descriptive studies suggests that older households will tend to remain in owner occupied homes as they age (Golant, 2008a,b). The question remains, however, why are older homeowners more likely to use a mortgage in recent years?

There are several reasons why home-owning households may strategically maintain mortgage debt as they age. First, financial planners counsel households on the tradeoffs of paying off a mortgage as part of retirement planning (Nason, 2017). Since mortgage interest rates are often a low cost form of borrowing, households can leverage their portfolios by arbitraging the difference between the costs of borrowing and real rates of return when investing in markets. Such strategies can be risky, since the home is collateral for the loan and the asset values of investments and housing can decline. It is unclear whether the average older household would have the ability to effectively borrow to invest, especially given low levels of measured financial literacy (Lusardi et al., 2017). Taking on debt may also expose a couple to the risk of one partner dying, leaving the surviving partner with mortgage debt but lower pension and Social Security income. While households could hedge this risk with insurance, only about one in three elderly households had cash value life insurance in 2016 (Bricker et al., 2017).

A second reason that older households may maintain mortgage debt as they age is because of tax incentives. At the federal level, and in most states, mortgage interest is deductible from income taxes. Several studies, including Hanson (2012) and Hilber and Turner (2014), examine the influence of the mortgage interest deduction on housing decisions. There is little evidence that the mortgage interest deduction has an impact on the extensive margin of the homeownership rate, although Hanson (2012) finds an intensive margin effect of the mortgage interest deduction on home size. While there are other tax incentives related to housing, such as the ability to deduct property taxes from income, the exclusion of capital gains from income taxes, and imputed rent from taxation, these all encourage homeownership, though not specifically borrowing or extending a mortgage.

Mortgage subsidies should prioritize mortgage debt over shorter-term consumer debt, such as automobile loans and credit cards, which typically charge higher rates. The subsidies lower the effective, after-tax interest rates of mortgages, making it less costly to finance current consumption through mortgage debt than to draw down financial investments. Amromin et al. (2007) show that the tax-exemption of certain retirement savings accounts means households might be better off if they continued to borrow using a mortgage loan while putting money into retirement accounts. The authors do not find evidence of this behavior, however. Part of the issue is that the mortgage interest tax deduction requires itemizing, which typically only applies to higher-income borrowers (Poterba and Sinai, 2008).

A third reason that households may hold mortgages as they age is the need to borrow to fund consumption. Poterba et al. (2011) show a pattern that is consistent across studies: many households have little savings even as they approach retirement. Home equity is one of the primary stores of non-pension wealth, especially for low-income and less wealthy families (Bricker et al., 2012). Home equity may be one of the few ways for households with little other savings to smooth spending or respond to financial shocks. Among all households age 65 to 70 in 2008, real estate represented 48 percent of non-Social Security or pensions wealth (Poterba et al., 2011). Several studies show that households often use home equity as a source of liquidity. For instance, Bhutta and Keys (2016) use a panel of consumer credit reports to document high rates of home equity extraction as a result of increasing house prices and low interest rates in the early 2000s. They further showed that households use this equity to pay down other consumer debts. Davidoff (2010) shows that home equity may substitute for long-term care insurance, and may therefore be a useful financial planning strategy. However, the value of home equity can be volatile, which presents a substantial risk for homeowners. Lusardi and Mitchell (2007) even suggested that some households in retirement have less home equity due to failure to plan ahead to pay off their mortgages.

Moulton et al. (2017) studied home equity conversion mortgages, or reverse mortgages, which is a type of loan designed for liquidity constrained borrowers age 62 or older where the balance is not due until the home is sold or the borrower is deceased. They compare otherwise similar reverse mortgage borrowers to borrowers of traditional (forward) home equity mortgages, finding that reverse mortgage borrowers are more likely to pay down existing debt. While reverse mortgages are subsidized by the US Department of Housing and Urban Development, only a small fraction of senior homeowners utilize the product (Moulton et al., 2017; Shan, 2011). In part this is due to the lowest income households not having sufficient home equity to produce significant financial benefits (Venti and Wise, 1991).

Overall, the literature suggests that homeownership among the elderly is likely to be persistent across successive cohorts of the same age, but offers few insights into why more recent cohorts of older homeowners are utilizing mortgages at higher rates than in the past. Our study examines mortgage holding by older homeowners over time compared to a slightly younger age cohort.

The observation of rising use of mortgages among the elderly is important if this rising use of debt may result in negative consequences for the well-being of elderly households. For example, Brown et al. (2019) examine factors for hardships (poverty, use of mean tested benefits, food insecurity, or a drop in wealth), including a simulation of the effects of rising debt. They find that debt is not a strong factor related to hardships, which the authors suggest is because people who take on more debt at earlier ages tend to be more economically secure than those who take on less debt.

Selection into mortgage debt could be positive, reducing the risks of hardships. Butrica and Karamcheva (2018) find that higher debt levels delay claiming of Social Security, a similar finding to a working paper by Moulton and colleagues (Moulton et al., 2019). This is also consistent with positive selection into mortgages and financial stability (at least measured by labor force participation or the ability to delay Social Security claiming due to having other assets).

Zhao and Burge (2017) find that housing wealth may encourage people to exit the labor force sooner as higher debt levels reduce net housing wealth and therefore delay retirement. At some level mortgage debt may not be sustainable. Bian (2015) showed that aging households are more likely to downsize or sell their home if their mortgage debt is larger relative to home value, at least at higher levels of the debt-to-asset ratio.

Brulé and Ravazzini (2019) studied subjective well-being (self-reported) of elderly people in Europe. They found that people report higher subjective well-being when they have more liquid assets than when they have wealth locked up in assets like housing. They also found mortgage debt levels have little relationship to subjective well-being. Other studies take a more pessimistic view of debt among older households (Jappelli et al., 2013), including links between debt levels and health (Argys et al., 2016). Still other studies link debt levels to particular forms of anxiety and self-reported debt-related stress (Drentea and Reynolds, 2015; Dunn and Mirzaie, 2016).
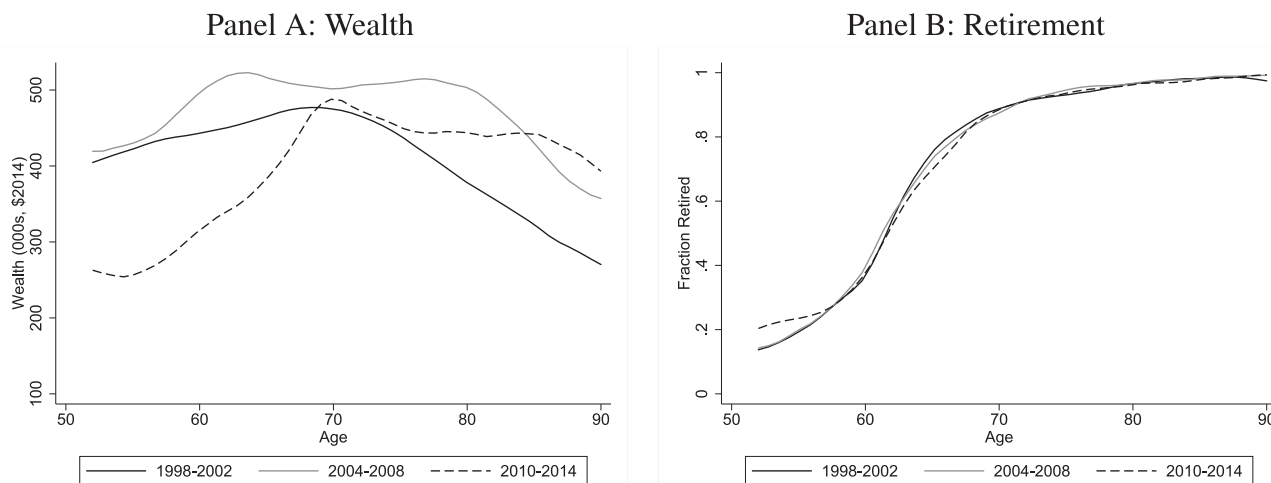
Fig. 2. Wealth & retirement age profiles.
Source: Health and Retirement Study.

It is notable across the literature that debt, especially mortgage debt, is treated as being a useful strategy to achieve higher financial well-being in some studies, or a risky threat to financial stability in other studies. The use of mortgage debt, relative to other borrowing options, clearly has advantages in terms of the cost and offering a long-term repayment structure. As described by Zinman (2015), researchers need to be cautious in how to consider consumer's use of debt. For some households, too little debt can limit valuable investments; for others too much debt can result in default. The optimal level of debt by age may be determined by a range of factors. To understand the use of debt, we need to better understand the heterogeneity of circumstances that elderly households face. With this in mind, we turn to several widely-used datasets to document the use of mortgage debt by older households based on observed characteristics.

3. Data

This paper aims to describe trends in mortgage holding across age cohorts using the Survey of Consumer Finances (SCF) and the Health and Retirement Study (HRS), as well as general population patterns in Census data.

The SCF data provide a comprehensive look at households' personal finances. The study is repeated cross-sectional data administered by the Federal Reserve Board in conjunction with the Department of the Treasury with triennial surveys since 1983. The greatest advantage of the SCF relative to the HRS and Census data is the detailed collection of household financial attributes including total assets and net worth, mortgage usage, home equity, pensions, savings, and delinquent debt payments. While the SCF contains questions not included in the HRS or the Census data, it does not provide geographic identifiers. Since the earliest SCF surveys do not contain our variables of interest, we begin our analysis with the 1989 survey for most estimates. We provide estimates for all households and then only for households who own homes.

The HRS is a biennial panel survey designed to track the demographic characteristics, health status, and financial assets of households 50 years and older in the United States. Beginning in 1992 with an initial cohort of 12,652 respondents, the HRS's primary respondents were born between 1931 and 1941. To cover the full age distribution above 50 years, the HRS has added additional cohorts over time. Of particular interest for this study, the HRS collects information on housing tenure status, mortgage status, and payment amount. We utilize restricted-access HRS data, which include geographic location information, allowing us to include housing market variables such as tax envi-

ronments, rent-to-house price ratios, and unemployment rates. In our analysis, we restrict our sample to primary respondents between the ages of 50 and 100, between 1994 and 2014. We provide estimates for most specifications for all households, and then only households who own homes.

We also use tabulations of the 1980, 1990, and 2000 PUMS decennial Census, and 2005, 2010, and 2015 American Community Survey to document the rate of older households owning homes and having a mortgage. We use a random sample of about a half-million households from each wave of these Census data, again excluding households with heads younger than age 50, and older than age 100. There is a total of six waves, covering a 35 year period. This dataset gives us the longest time horizon with which to study mortgaged rates. The Census data include housing tenure (rent, own with a mortgage, or own without a mortgage). We observe the age of household head, household income, household size, marital status, and state of residence. However, the Census data do not include information regarding household assets.

3.1. Trends in mortgages, homeownership, wealth, and retirement

Mortgage debt holding among the elderly has risen substantially over the past thirty years. Fig. 1 illustrates this trend in the rate of holding of a mortgage and homeownership rates for all households using data from the Census. Panel A shows that households decrease mortgage usage as they age past their 40s and 50s. However, households older than 65 are currently much more likely to have a mortgage than in previous decades. For instance, in 1980 only 4 percent of households aged 80 to 84 held a mortgage. By 2015, that rate had quadrupled to 17 percent.

Fig. 1, Panel B, suggests that increased mortgage borrowing is partly due to increasing homeownership. Between 1980 and 2015, homeownership rates actually decreased for those under 50 years old, likely due to family formation and career trends for this group.[5] While homeownership rates steadily increase as households age, they peak around 80 percent when households are in their 60s. The interesting pattern occurs after the intersection of homeownership rates in 2015 (and to a lesser extent, 2000) with rates of previous years near age 65. Younger households in 2015 are less likely to be homeowners than in previous years, and older households are more likely to be homeowners than in previous years. In fact, the largest absolute change in homeownership rates between 1980 and 2015 is for the 80 to 84 age group, which has

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[5] Gruber et al. (2017) point out a comparable trend in Denmark.

increased homeownership rates by 18 percentage points from 64 percent to 82 percent.

An immediate question arises: are these trends indicative of a movement towards a need to retire at older ages? Fig. 2 uses the HRS waves from 1998 to 2014 by age to illustrate trends in wealth (in constant 2014 dollars) and retirement rates again for all households—not just homeowners. The general pattern in Panel A is that wealth accumulates as household heads approach retirement ages, then plateaus or declines. Wealth is just over $100,000 lower on average in the 2010 to 2014 period than it was during the 2004 to 2008 period, reflecting the economic cycle. Only the 1998 to 2002 data show a decline in wealth with age. There are two other notable trends. First, wealth accumulation occurs much later in life for the 2010 to 2014 cohort than it did for the 1998 to 2002 and 2004 to 2008 cohorts. Second, for the earlier cohorts, wealth decreases more rapidly from age 70 to age 90 than it does for the most recent cohort. Fig. 3 shows the same patterns by wealth quintile. Wealth accumulation levels at the lowest quintile are low in general, and lower and happening much later in life for the 2010 to 2014 period. Wealth persists into later ages at similar rates across time periods at the median and highest quintiles. The pattern of the lowest wealth group could be consistent with a need to borrow more at later ages.

Fig. 2 Panel B displays the share of households who report being retired from work. Here the patterns are very similar across age cohorts where most households transition to retirement between ages 60 and 70. Changes in wealth or retirement do not seem to have changed in recent years by age cohort the way that wealth holding has. These general averages could still be masking other characteristics of today's seniors that could explain these trends. We next turn to a more formal analysis of differences by cohorts over time.

4. Empirical strategy

To determine the change in mortgage prevalence across cohorts and over time, we estimate Equation (1) using three different datasets. Each data sample allows for different measures, including the geographic location of the respondent. We focus on household heads in two groups, age 65 to 79 and, compared to those aged 50 to 64. We then plot the estimated difference by data year. The estimated difference between the 80–100 year olds and the 50–64 year olds are shown in Appendix A. Fig. 11 We estimate α_1 in Equation (1) for each sample year j, where j represents each year available in the three surveys, to begin to understand the decrease in the mortgaged rate gap between older and slightly less older households in recent decades.

$$Y_{im} = \alpha_0 + \alpha_1 A2_i + \alpha_2 A3_i + \beta_1 X_i + (\delta_m +) \epsilon_{im} \qquad (1)$$

In Equation (1), Y_{im} is a binary variable equal to one if individual household i currently has a mortgage and equal to zero otherwise. We choose a linear probability model for ease of interpretation, but our results are comparable if we compare marginal effects from a logit. X_i includes number of children, logged total income, a high school education or less dummy, race indicators (white or non-white), net worth quartiles, an employment indicator, a marital status indicator (married, single male, and single female), and net worth quartiles by age cohort by year. In the HRS sample, X_i additionally includes bequest motives are proxied by the self-reported likelihood of bequeathing at least $10,000 and dummies for the self-reported health status on a 1 to 5 scale.[6]

A2 and A3 are the second and third age cohorts comprising those ages 65 to 79 and 80 to 100, respectively. The excluded age group is households with heads age 50 to 64. When we use HRS and Census data, we include δ_s, MSA fixed effects.[7]

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[6] The SCF does not contain questions on bequest motives or health.
[7] Neither MSA nor state identifiers are available in the SCF.

20th Wealth Percentile

50th Wealth Percentile

80th Wealth Percentile

29
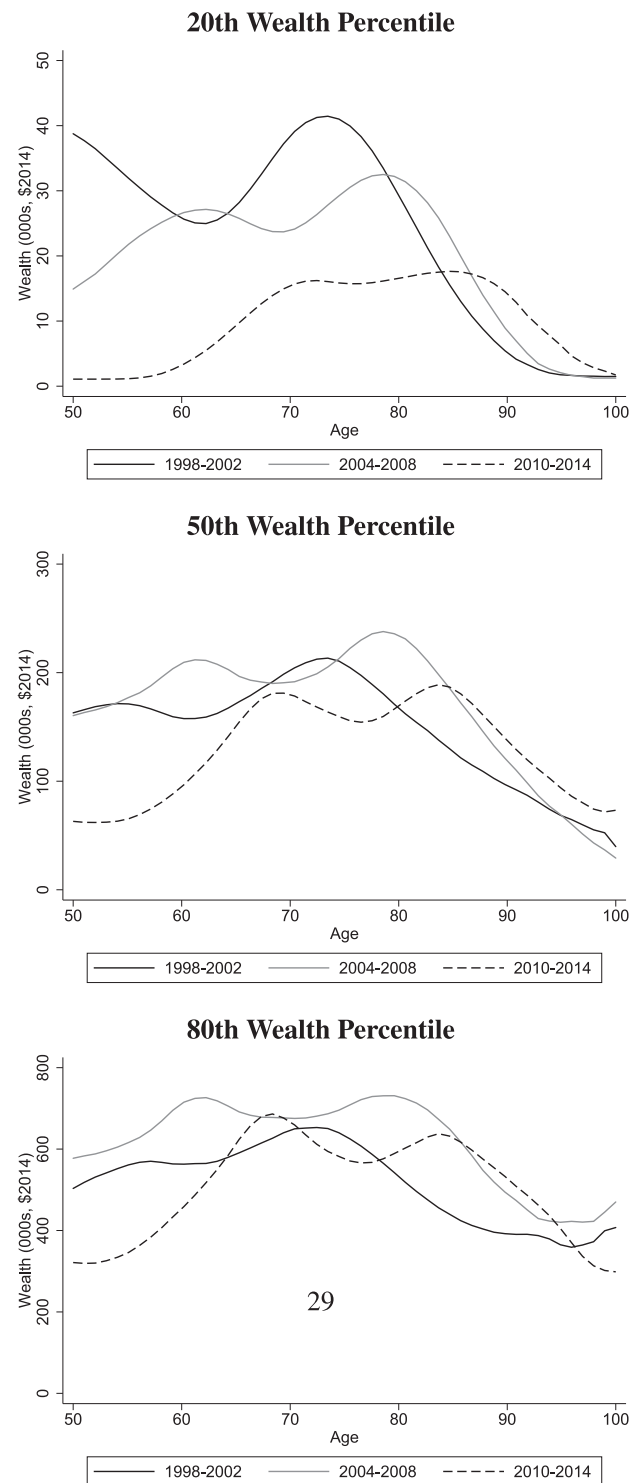
Fig. 3. Wealth by age by time period within quintile.
Source: Health and Retirement Study.

The coefficients represent the gap between the prevalence of mortgages for 65–79 year olds and 50–64 year olds. If the estimates by year are less negative, then older households are closing the gap and becoming more likely relative to younger households to have a mortgage.

5. Findings

We start by estimating a baseline rate of mortgage borrowing using the specification in Equation (1) with no controls. We then add con-

A. Survey of Consumer Finances
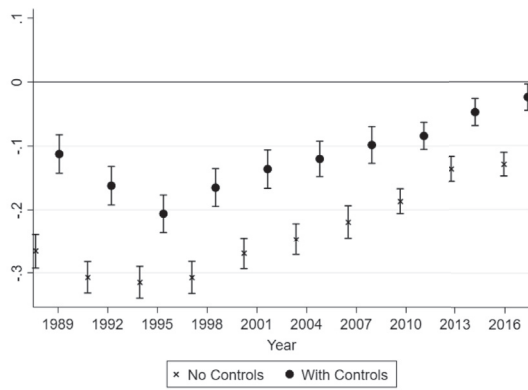
Difference: 65-79 and 50-64 year olds   Difference: 80-100 and 50-64 year olds
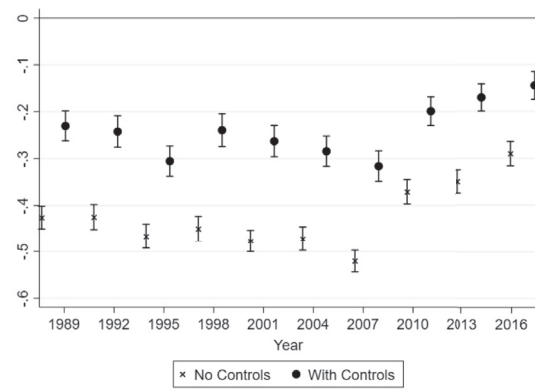
B. Health and Retirement Study
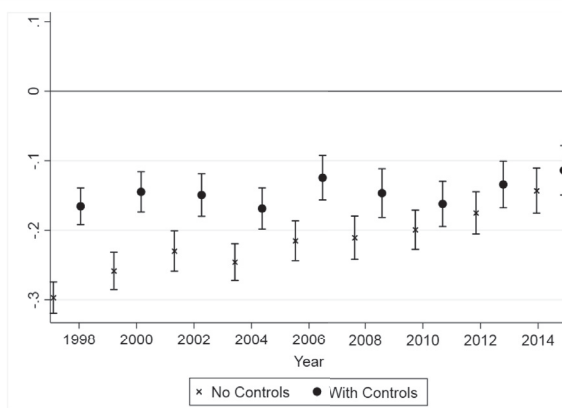
Difference: 65-79 and 50-64 year olds   Difference: 80-100 and 50-64 year olds
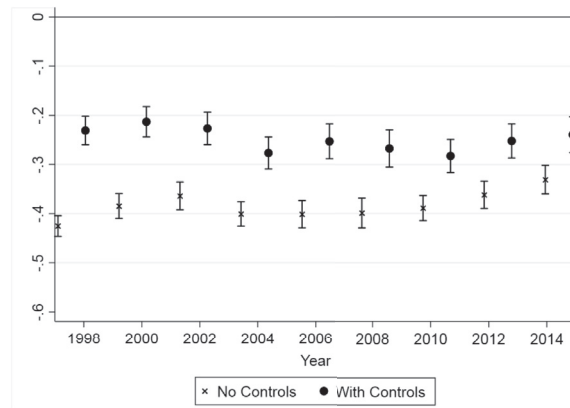
Fig. 4. The prevalence of mortgage by age cohort over time.
Estimates α_1 and α_2 coefficients from Equation (1) in each dataset with 95% confidence intervals reported for each coefficient. SCF estimates are in Appendix Table 3. HRS estimates are in Appendix Table 4. Controls include number of children, logged income, greater than high school education, employment status, net worth quartiles, race, and marital status. HRS controls additionally include self-reported health status and bequest motive variables.

trol variables X_i. Further, we explore additional outcomes that changed over this period (homeownership, mortgages conditional on homeownership, home values, refinance rates, home equity, and equity extraction). Next, we explore heterogeneity in the changing mortgaged rates of older households. Finally, we estimate the effect of three economic or policy variables on the likelihood of holding a mortgage over this period for each age group. As most of our analysis is descriptive and intended to portray national averages we use sampling weights when computing estimates. When estimating the causal effect of tax rates, rental markets, and labor markets on mortgage usage we do not use sample weights since we are not concerned with identifying partial effects or endogenous sample selection.[8] While we present nearly all of our results graphically, we provide estimated coefficients in Appendix A. We show estimates for most specifications for all households, and then only households who own homes.

Each figure displays the estimated gap between mortgage holding of households with heads age 50 to 64 versus those age 65 to 79 and corresponding 95% confidence intervals, for each survey year. These specifications include no controls beyond the age dummies; the HRS

specifications include MSA-level fixed effects. These figures tell a general story of how the gap between older and slightly younger generations' mortgaged rates has narrowed over time.

5.1. Adding controls for wealth, health, and bequest motives

The rise in holding mortgages among older households may be explained by changes in demographics, wealth, health, or preferences to bequest money to children. Fig. 4 explores this question, where we include controls for demographics, wealth (SCF and HRS), health (HRS), and bequest motives (HRS) in addition to the demographic controls. Panel A explores the SCF data, which controls for all variables in X_i in Equation (1). The trend is a closing gap such that 65–79 year olds are borrowing at similar rates to 50–64 year olds by 2016, including controls. Panel B, shows the HRS data and additionally adds controls for self-reported health, bequest motives, and wealth quantiles. While the trend still shows that 65–79 year olds are less different from 50 to 64 year olds in their mortgage rates than in years past, the trend is quite flat after adding in controls.[9]

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[8] See Solon et al. (2015) for a more thorough consideration of the appropriate usage of using sampling weights.

[9] Note that the HRS data span more frequent but a shorter span of years than the SCF (1998–2014 vs. 1989–2016). Thus, the HRS trends match the 1998–2014 trends in the SCF more closely than the overall trend.

A. Homeownership
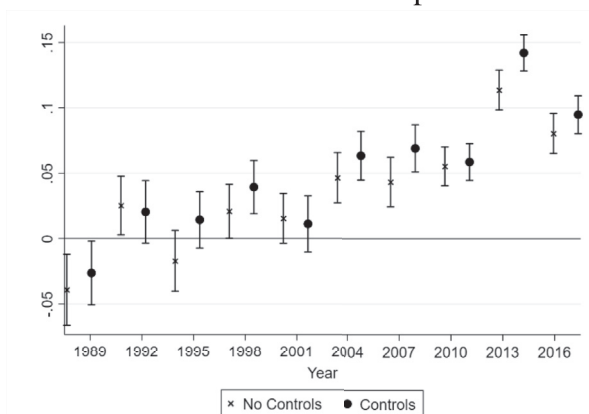
B. Mortgages Among Homeowners
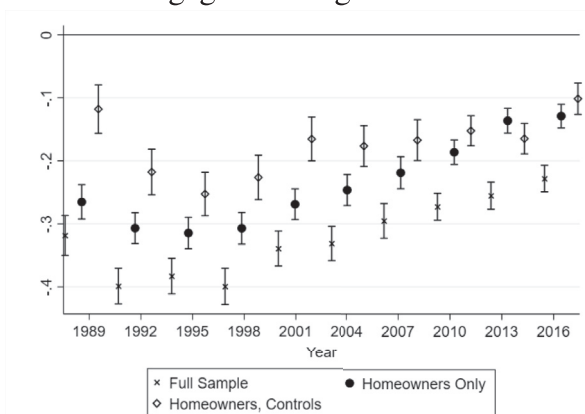
Fig. 5. Homeownership rates increasing for 65–79 relative to 50–64 Year olds.
Source: Survey of Consumer Finances. We report estimates of α_1 coefficients from Equation (1) with 95% confidence intervals. All estimates are in Appendix Tables 5 and 6. Controls include number of children, logged income, greater than high school education, employment status, net worth quartiles, race, and marital status.

One explanation for rising mortgaged rates could simply be that older households are more likely to own a home than they were before. Further exploration into the SCF data with the same controls suggests that the gap in homeownership between 65 to 79 and 50–64 year olds has been increasing steadily since 1989 (Fig. 5). This trend persists even with the inclusion of controls. Increased housing consumption may indicate a growing preference among older households towards owner-occupied housing. This contributes to greater mortgage borrowing as households may not have enough financial assets to own their optimal home size outright. However, Fig. 5 also shows that the mortgaged rate gap among owners narrowed by 2016, similar to the overall full sample (marked with an 'x'). This evidence supports the fact that the increase in mortgaged rates is in part due to an increase in homeownership by older households, though it does not fully explain why seniors with homes are holding onto mortgages longer in life. Even allowing for more people age 65 and older owning homes, relatively more are also using mortgages.

To further explore potential mechanisms for the puzzling trend, we change our outcome of interest to variables capturing the value of the home, the amount of home equity, the prevalence of equity extraction, and the likelihood of refinancing one's mortgage in Fig. 6. In Panel A, we show that from 1992 to 2004 home values across households with heads age 65 to 79 and age 50 to 64 were not different from one another. From 2007 to 2016, the value of homes for the older cohort became greater than the younger cohort. This is reflected in greater home equity in Panel B.

Though 65–79 year olds hold more equity in their home than 50–64 year olds in recent years, the two groups have been equally likely to extract equity from their home from 2007 to 2016 in Panel C. This was not always the case. The older cohort was less likely to extract equity in prior years. Finally, the gap in the likelihood to refinance steadily decreased and in 2016 the two age groups were equally likely to refinance in Panel D, with controls. Taken together, Fig. 6 suggests that older homeowners are accessing wealth in their homes by borrowing.[10]

5.2. Exploring heterogeneity by Age Profiles

Are the changing mortgage trends prevalent only for certain groups? We next seek to explore heterogeneity in the changing trends of mort-

gaged rates. Fig. 7 reports the estimated α_1 coefficients from Equation (1), along with the estimated standard errors bars around each coefficient for 65–79 year olds relative to 50–64 year olds.[11]

Panel A in Fig. 7 uses an HRS question item about bequest intentions—here we might expect that those households who plan to donate their wealth to their heirs would prefer to pass on a home free and clear of a mortgage. There does not appear to be any time trend, although households without a bequest motive borrow at older ages similar to those at younger ages, and the pattern of those with bequest motives shows lower relative mortgaged rates. Fig. 8 Panel A shows these estimates only among homeowners. Here the trend is flatter and shows few differences, however. In part this is because there are few homeowners without bequest intentions, resulting in wide confidence intervals.

Panel B of Fig. 7 uses the SCF to show those households where the head or spouse have a defined pension compared to those without pensions. Prior studies suggest that rising levels of annuitized income may encourage owning a home and perhaps therefore more borrowing (Engelhardt, 2008). There is selection in play, however, since people with pensions likely had careers and access to benefits that are different in multiple dimensions from those without pensions. The trend over time is generally for a shrinking mortgage use gap for both groups, however. Fig. 8 Panel B shows no differences by pension and generally narrowing borrowing rates by age.

Panel C of Fig. 7 uses the HRS to show that increases in educational attainment over time are not likely to explain higher borrowing rates. The gap in mortgaged rates across the two age cohorts for those with high school degrees or those who did not complete high school are similar. The trend for both groups shows a closing of the gap, with more mortgage holding for 65–79 year olds relative to 50–64 year olds. If we expect that education is a proxy for the type of employment, that is not a main reason for the decreasing gap in mortgaged rates for younger and older households. Fig. 8 also shows few differences and relatively more borrowing among older households.

Panel D of Fig. 7 uses the SCF to split the sample by those above and below median wealth.[12] Those below median wealth are largely

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[10] Although not shown, we rule out mortgages on second homes; the magnitude of the second home rate gap between age groups is close to zero in magnitude across our sample period.

[11] We continue to control for X_i in Equation (1) but exclude the variable of interest for each specification. When we split the sample by wealth, we continue to control for quantiles of those variables, but it reduces to one dummy variable instead of three.

[12] For example, in 2014 median wealth for the 50 to 64 age group was $60,000 and for the 65 to 79 age group was $146,800.
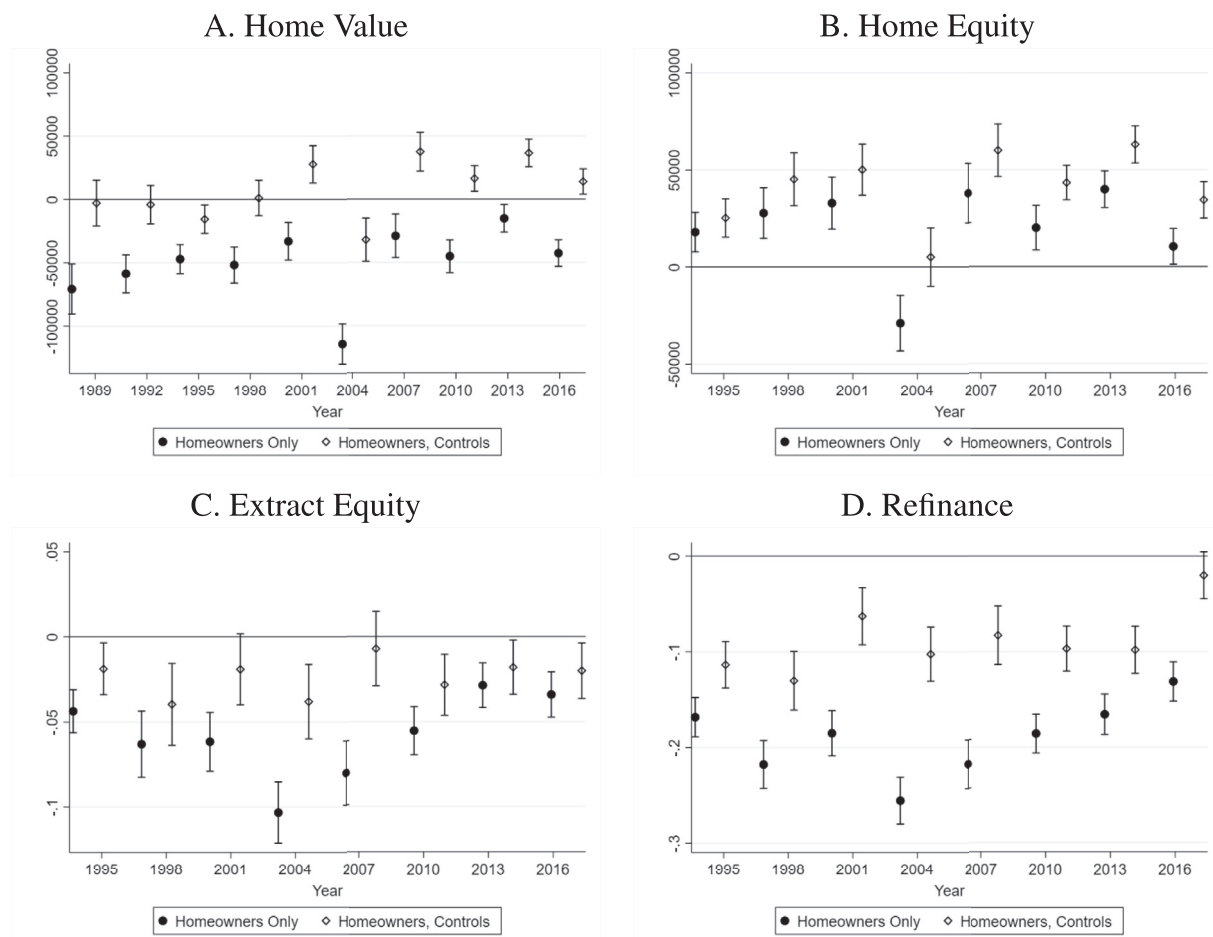
Fig. 6. Home values and equity extraction for 65–79 relative to 50–64 Year olds.
Source: Survey of Consumer Finances. We report estimates of α_1 coefficients from Equation (1) with 95% confidence intervals. Coefficient estimates are in Appendix Tables 7 and 8. Controls include number of children, logged income, greater than high school education, employment status, net worth quartiles, race, and marital status.

closing the gap between the two age cohorts. At the same time, those 65–79 year olds above median wealth remain less likely to hold a mortgage than 50–64 year olds with above median wealth. Fig. 8, Panel D, which only shows homeowners, shows a less clear pattern; conditional on homeownership, wealth does not explain relative borrowing rates.

5.3. Tax policies, rental markets, and labor markets

Next, we examine variation in the economic and policy environment over our period of interest to understand the magnitude to which they impact the gap between older and younger cohorts' mortgage borrowing rates. We explore subsidies from the mortgage interest deduction (MID), local unemployment rates, and rent to price ratios (RTP) in Equation (2).

We predict that both tax benefits and relatively higher rental prices provide incentives for older households to have a mortgage. Local unemployment rates have less predictable effects. Higher local unemployment trends could increase the rate that older households use mortgages if homeowners to hold on to mortgages to help smooth income or to help out family members struggling to find work. Unemployment rates could decrease mortgage rates if slack labor markets and liquidity needs drive older people to sell their homes. Since many older households are not actively in the labor market, the effect of changes in unemployment trends could be minimal.

Mortgage borrowers who itemize their deductions on tax returns may deduct mortgage interest from federal (and typically state) income taxes through the MID. Costing $83 billion in tax revenue in 2017,

the MID is the second largest tax expenditure for individuals in the federal budget (Burman et al., 2008). Lower-income owners benefit less from the MID than more affluent buyers do, both because lower-income households are less likely to have enough deductions to itemize their returns instead of taking the standard deduction and because of the progressivity of the US tax code. We investigate the degree to which subsidies from the largest tax incentive for owning a home, the MID, vary by age. Since we include the MID average marginal tax rate in our regressions, we expect the relationship with mortgaged rate to be negative, as a lower tax rate increases the subsidy rate for mortgages.

There is a body of literature studying the effects of the MID on homeownership, prices, and household finance decisions, as well as a broader literature on the effects of tax policy and homeownership (Gale et al., 2007).[13]

Hilber and Turner (2014) examine variation in the MID subsidy rate using a household fixed-effects model to identify the effect of the MID on homeownership and house prices, finding that the MID only increases homeownership among higher-income households in less regulated housing markets. Sommer and Sullivan (2018) build a general

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[13] Variations exist in other countries, showing weak or mixed effects depending on the local context. For example, Jappelli and Pistaferri (2007) in Italy finds no effects of MID on homeownership or mortgage debt holding in Italy. Gruber et al. (2017) find large changes in tax subsidies for owner-occupied housing were dominated by demographic and other factors. In the US, Ling and McGill (1998) and Dunsky and Follain (2000) find that when tax rates are cut, the relative tax price of mortgages increases, and mortgage debt falls.

A. Bequest Motive

B. Pension

C. Education Level

D. Wealth

Fig. 7. Heterogeneity in age profiles.
Source: Health and Retirement Study data in panels A and D; 1989–2016 Survey of Consumer Finances data in panels B and C. We report estimates of α_1 coefficients from Equation (1) with 95% confidence intervals. Coefficient estimates are in Appendix Tables 9–12. Controls include number of children, logged income, greater than high school education, race, employment status, net worth quartiles, and marital status.

equilibrium framework to examine the relationship between the MID, rents, house prices, and homeownership and find, counterintuitively, that eliminating the MID would actually increase homeownership.[14] While previous research investigates the effects of the MID on homeownership, home prices, and household debt, prior studies have not focused on the heterogeneity of the effects of MID by age.[15]

We test for the influence of the economic and policy environments over our sample period by estimating Equation (2).

$$Y_{imst} = \alpha_0 + \alpha_1 A2_{it} + \alpha_2 A3_{it} + \alpha_5 P_{ist} + \alpha_6 A2_{it} \times P_{ist} + \alpha_7 A3_{it} \times P_{ist} +$$

$$\beta_1 X_{it} + \beta_2 MTR_{st} + \eta_m + \gamma_t + [\delta_i+]\epsilon_{imst}$$

(2)

In Equation (2), we control for the same characteristics ($\beta_1 X_{it}$) from Equation (1), as well as MSA (η_m) fixed effects, year fixed effects (γ_t), and the top marginal income tax rate in the state in that year. In some specifications, we further include household fixed effects (δ_i) to compare households to themselves as they age and as policy environments change. The household fixed effects strategy is used by Hilber and Turner (2014) with the Panel Study of Income Dynamics. Household fixed effects is not our preferred specification, however, since households age into and out of each age category over time. It becomes challenging to identify the differential effects the policy by age for cohorts. Further, we estimate overall patterns across age groups and not within households throughout the prior analysis. Although we show estimates both with and without household fixed effects, we prefer the estimates without household fixed effects. The estimates without household fixed effects document the overall differences across age cohorts, as opposed to differences within individual households in response to changes in policies. As in the prior estimates, the excluded age group are households with heads aged 50–64 years of age.

When we test for the effect of the mortgage interest deduction (MID) on mortgage usage by age group, we follow Hilber and Turner (2014) by assigning P_{ist} as the state average marginal mortgage interest tax

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[14] A justification for the MID is the premise that positive externalities exist such that communities are better off with homeowners. However, there is little empirical evidence of this in practice. One exception is that Engelhardt et al. (2010) find that when randomizing homeownership via subsidized savings households show increases in home maintenance expenditures. There is little evidence supporting homeownership as a means to facilitate other social benefits, however.

[15] One paper by Poterba and Sinai (2008) estimates simulated benefits of the MID by age, concluding households over age 65, on average, derive less value from the MID since their taxable income is relatively low.

A. Bequest Motive

B. Pension

C. Education Level
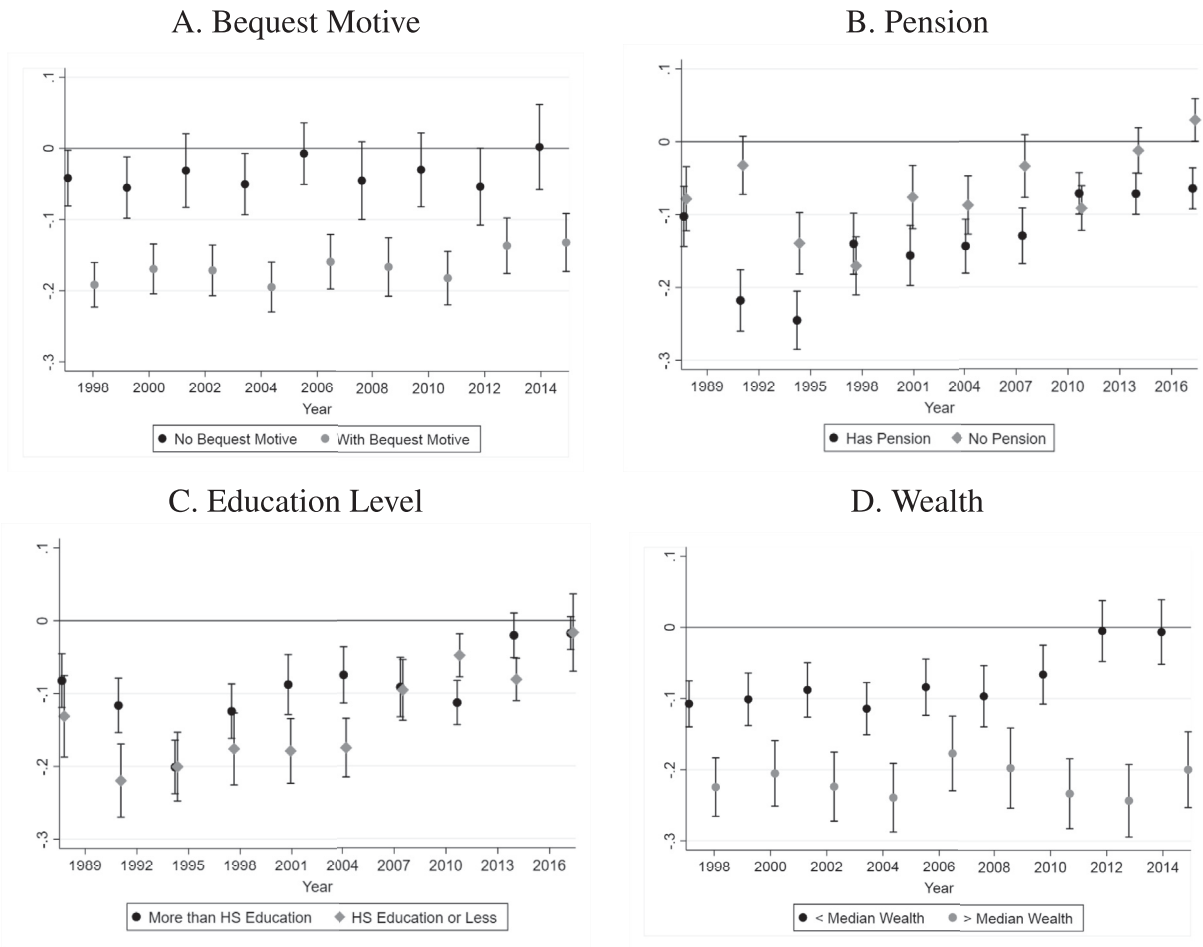
D. Wealth

Fig. 8. Heterogeneity in Age Profiles, homeowners only.
Source: Health and Retirement Study data in panels A and D; 1989–2016 Survey of Consumer Finances data in panels B and C. We report estimates of α_1 coefficients from Equation (1) with 95% confidence intervals. Coefficient estimates are in Appendix Tables 9–12. Controls include number of children, logged income, greater than high school education, race, employment status, net worth quartiles, and marital status.

rate as measured by the NBER.[16] The estimated effect of the MID on mortgage use stems from within-state variation in the tax rate, as well as from cross-state changes due to within-household mobility from state to state. The within-state variation is due to changes in state income tax rates, tax brackets, treatment of mortgage interest, and treatment of other tax deductions. To alleviate concerns of households moving in response to state tax policies, Table 16 shows these estimates based on the initial state in which households resided, ignoring any subsequent cross-state moves.

Table 1 reports results from estimating Equation (2). Column (1) shows that a 65–79 year olds are 14.8 percentage points less likely to hold a mortgage than those who are 50–64 years of age. Adding in the relative value of the MID from tax rates in Column (2) shows no overall effect of the value of the MID on mortgage rates. A one percentage point increase in the MID increases the rate of mortgage holding by 0.6 percentage points for 65–79 year olds without changing the mortgage

rate for 50–64 year olds.[17] Given that the average combined federal and state mortgage interest marginal subsidy rate has decreased by 8 percentage points between 1980 and 2015, this implies that changes in the MID may explain around 5 points of the relative change in mortgage usage between 50 to 64 year olds and 65–79 year olds over this time period. There are no statistically significant effects for the 80–100 year old group, suggesting the decrease in the gap between the mortgaged rates of those age 80 to 100 and those age 50 to 64 is not explained by these tax incentives. Columns (3)–(4) repeat the prior estimates, but conditional on homeownership. Column (3) reports a larger overall gap in mortgage rates between 65 to 79 year olds and 50–64 year olds in the subsample of homeowners (0.245). Column (4) suggests an even larger effect of the MID on mortgage rates among homeowners than in Column (2) for 65–79 year olds, about 0.8 percentage points.

Next, we investigate two economic factors that may contribute to older households holding onto mortgages longer: local unemployment rates and rent-to-price ratios as estimated by Campbell et al. (2009). Since Campbell et al. (2009) provides RTP estimates through 2007, we

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[16] The NBER calculates the marginal tax rates for the mortgage interest deduction based on a large, fixed, nationally representative sample of 1995 individual tax returns for each state and year.

[17] The MID subsidy value ranges from −9.04 to 1.16 with a mean of −2.68, implying a reduction in tax liability when deducting mortgage interest. Lower (more negative) values of the MID variable indicate a larger subsidy. Thus a greater subsidy indicates a greater likelihood of holding a mortgage for 65–79 year olds.

Table 1
Mortgage interest tax treatment and mortgage rate.

	(1) Base	(2) + MID	(3) Base	(4) + MID
Age 65–79	−0.148***	−0.146***	−0.254***	−0.243***
	(0.004)	(0.007)	(0.005)	(0.009)
Age 80–100	−0.250***	−0.241***	−0.340***	−0.307***
	(0.005)	(0.009)	(0.007)	(0.012)
65-79 X MID		−0.006***		−0.008***
		(0.002)		(0.003)
80-100 X MID		0.003		−0.000
		(0.003)		(0.004)
MID		0.000		−0.005
		(0.003)		(0.004)
Always Own			X	X
MSA FE	X	X	X	X
Year FE	X	X	X	X
Controls	X	X	X	X
Observations	71,327	71,327	41,063	41,063

* p < 0.10, ** p < 0.05, *** p < 0.01.
Notes: Health and Retirement Study. Each observation is a respondent-year. All models include MSA and year fixed effects and control for number of children, logged income, top state marginal income tax rate, urban area, greater than high school education, race, marital status, bequest motive, net worth quartiles, and subjective health measure. MID is the average marginal mortgage interest tax rate by state and year from NBER.

Table 2
Mortgage rate by state unemployment and MSA rent to price ratio (RTP).

	(1) Base	(2) +UE,RTP	(3) Base	(4) +UE, RTP
Age 65–79	−0.166***	−0.200***	−0.230***	−0.311***
	(0.005)	(0.028)	(0.007)	(0.040)
Age 80–100	−0.261***	−0.373***	−0.297***	−0.580***
	(0.007)	(0.037)	(0.010)	(0.056)
65-79 X Unemployment		0.010***		0.008**
		(0.002)		(0.003)
80-100 X Unemployment		0.015***		0.020***
		(0.003)		(0.005)
65-79 X RTP		−0.004		0.009
		(0.005)		(0.007)
80-100 X RTP		0.008		0.040***
		(0.007)		(0.010)
Unemployment		−0.005**		−0.008***
		(0.002)		(0.003)
RTP		0.005		0.001
		(0.012)		(0.017)
Always Own			X	X
MSA FE	X	X	X	X
Year FE	X	X	X	X
Controls	X	X	X	X
Observations	42,927	42,927	25,009	25,009

* p < 0.10, ** p < 0.05, *** p < 0.01.
Notes: Health and Retirement Study. Each observation is a respondent-year. All models include MSA and year fixed effects and control for number of children, logged income, urban area, greater than high school education, race, marital status, bequest motive, net worth quartiles, and subjective health measure. Unemployment rate is the state unemployment rate that year. RTP is rent to price ratio as estimated by Campbell et al. (2009).

can not include observations beyond 2007 for these specifications. We assign individuals to RTP data based on their metropolitan area of residence or their census region if RTP estimates for their metro are not available. If we instead include only the unemployment rate in areas with and without RTP data, our results remain consistent.

Table 2 Column (2) shows that a one percentage point increase in the unemployment rate decreases the relative likelihood of holding a mortgage by 0.5 percentage points and increases the likelihood of holding a mortgage for 65–79 year olds by 0.5 percentage points. Thus, a one unit increase in the unemployment rate decreased the relative mort-

gage rate gap, by roughly 1 percentage point between those households age 50 to 64 and 65–79 year olds, and 1.5 percentage points between 50 to 64 and 80–100 year olds. This is consistent with the trend in Fig. 4 Panels A and B where the gap in borrowing by age decreased most during the Great Recession. Given that average unemployment rates in the Great Recession (2007–2009) were roughly 10 percent (U.S. Bureau of Labor Statistics, 2012), or four units higher than in 1999, this increased unemployment decreased the gap by 4 points. The estimates conditional on ownership in Column (4) are similar in magnitude.

Table 2 also includes the interaction between age cohorts and the
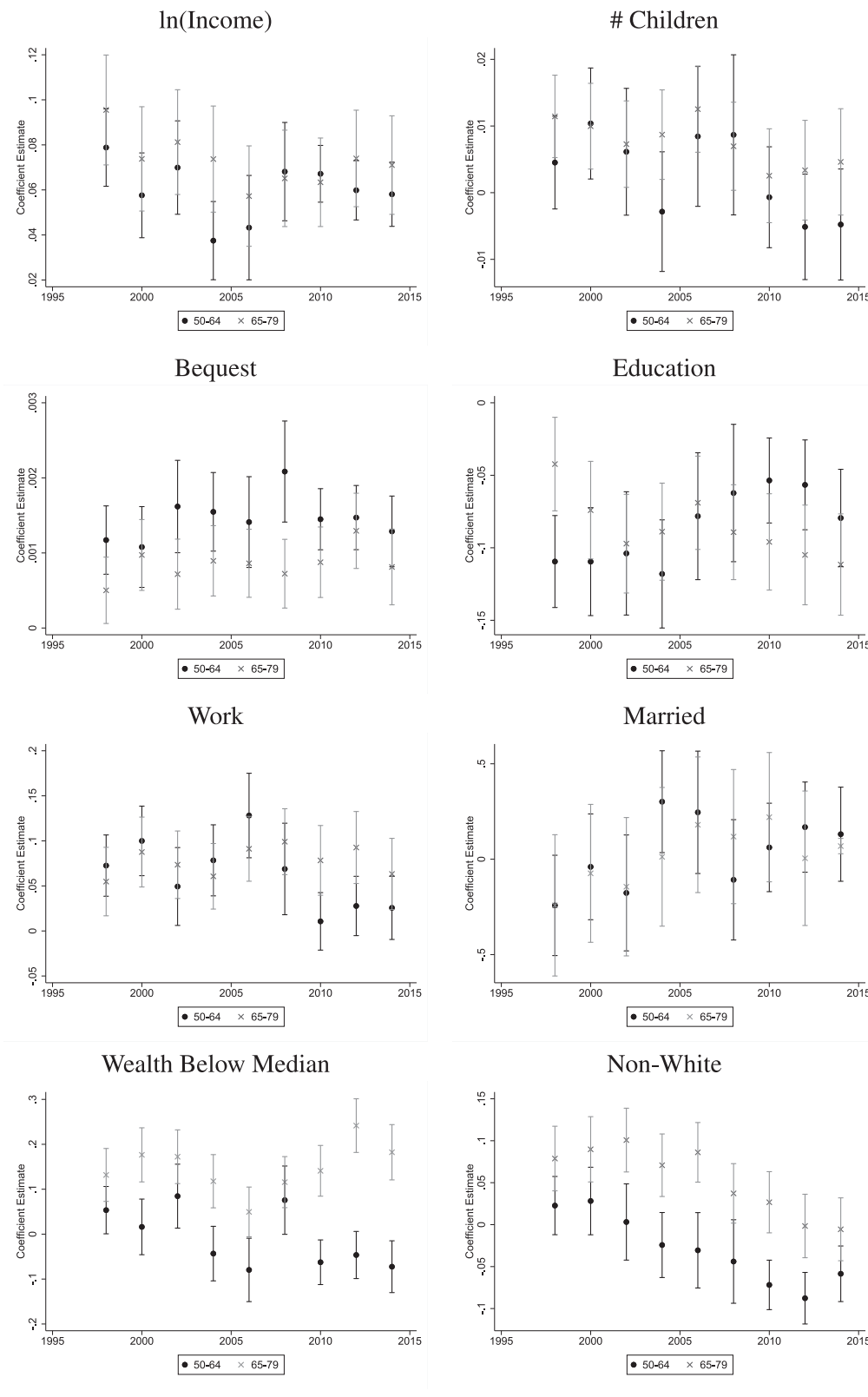
Fig. 9. Mortgage rates by age cohort by demographic factor.

Source: Health and Retirement Study. This model's dependent variable is a mortgage indicator and the independent variable is each control variable. We run a separate regression for each age category 50–64 and 65–79 for each year. We report the coefficient estimates for each age group and year, as well as the 95% confidence interval.

Rent to Price (RTP) ratio, or the ratio of semiannual rents to the purchase price of similar homes (see Campbell et al. (2009) for a comprehensive discussion of this measure). We choose the RTP measure over a traditional home price measure to capture the opportunity cost of owning versus renting. We use RTP data estimated by Campbell et al. (2009) between 1975 and 2007 for 24 metro areas and the four census regions. For interpretation, multiply the RTP ratio estimate by 100. Across the

US, between 1994 and 2014 the RTP ratio declines significantly from 5.0 to 3.7. The RTP ratio has little effect on mortgage borrowing, except among the 80–100 year old group. This suggests that older households in areas with higher rents relative to home values are more likely to have a mortgage—perhaps because the transition to renting would not lower their monthly housing costs by as much as it would in lower rent areas. The estimates in Column (4) conditional on ownership, are

similar.

Appendix Tables 13–14 replicate Tables 1–2 but includes household fixed effects in Equation (2). Column (1) shows a decrease in borrowing for those aged 65 to 79 as a baseline with household fixed effects. This means that those that age into a new category were 1.7 percentage points less likely to hold a mortgage at age 65 to 79 than age 50 to 64. While the MID effect remains the same in magnitude for 65–79 year olds, it is no longer statistically different from zero in either Columns (2) or (4). We take this as evidence that even with less power, the signs on the MID effects still remain consistent.

Nearly all coefficients are consistent across Tables 14 and 2, though the overall effect of RTP on mortgage rates is stronger. Since the identification is coming from within household changes, this could be coming from individuals' choices to relocate in response to prices—and differentially by age. Appendix Table 17 displays holds a households initial state of residency constant and produces similar findings.

5.4. Are more recent elderly borrowers different from prior cohorts?

Finally, we explore the degree to which mortgage borrowers look different across years in the HRS data. We run separate regressions for each age band (age 50 to 64 and 65 to 79), including all of the control variables from Equation (1). For simplicity in graphing the results, we bundle wealth into two instead of four categories at the median. The dependent variable in each regression is a mortgage indicator. Fig. 9 reports each coefficient estimate for each age group in each year. If lenders are originating additional mortgages among older people with certain characteristics, the increase in the mortgaged rate among seniorshttps://www.ssa.gov/policy/docs/rsnotes/rsn2013-01.html compared to 50–64 year olds may be driven by supply-side factors.

Fig. 9 shows that there are no noticeable differences in the influence of income, number of children, education, work status, or marital status across these age groups over time. The confidence intervals for each of these coefficients overlap, and are very close for bequest motives.[18] There are differences along some dimensions. Those age 65 to 79 are more likely to have mortgages with lower levels of wealth in recent years than 50–64 year olds are. Non-white 65–79 year olds are more likely to hold mortgages than whites, but this likelihood has decreased over time to zero. For 50–64 year olds, non-whites were equally likely to hold mortgages as whites in the same age range, and the likelihood has also decreased over time. Race explains less of the trend than wealth in the prior figure.

5.5. Default

Higher mortgage debt is a problem if households cannot service the debt payments. This is particularly true in retirement, as households have limited ability to counteract financial troubles with increased labor supply making loan defaults more painful for elderly borrowers. The pattern of loan defaults — defined as being 60 days late —relative to other age cohorts could signal that as older households take on more debt they also are more likely to default. Fig. 10 shows that older households are less likely to be at least 60 days late on any account than younger cohorts are in most periods, though there has been a decrease in the gap from 1998 to 2016.

However, overall delinquency rates of the SCF sample are less than 3 percent for nearly every period. Further, the magnitude of the difference across age groups is small: 0.045 percentage points in 1998, where the effect size is largest. We interpret this as evidence that older
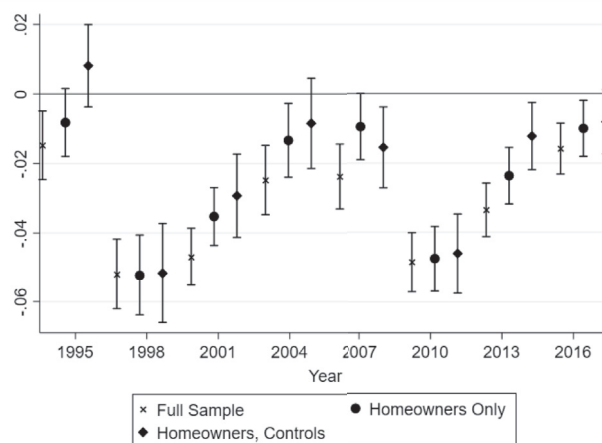
Fig. 10. Late payments for 65–79 relative to 50–64 Year olds.
Source: Survey of Consumer Finances. We report estimates of α_1 coefficients from Equation (1) with 95% confidence intervals. Coefficient estimates are in Appendix Table 15.

borrowers are unlikely to be risky borrowers—which is consistent with recent trends in defaults. This is consistent with findings in Brown et al. (2016), showing that older borrowers (age 50 to 80) have the highest credit scores and lowest delinquency rates.

Note however, that rates of mortgage borrowing overall have increased considerably among older households, and in the aggregate more elderly people will mechanically be in mortgage default. Even though default rates have not substantially increased, and relative to slightly younger age cohorts the rates are not rising, the sheer number of older households defaulting may raise some concerns given how severe the consequences of mortgage foreclosure can be for this group. Elderly cohorts have more exposure to default risk through mortgages, even if relative default rates are not elevated in an economically meaningful way in our estimates.

6. Discussion

Older households are using mortgages at higher rates than prior generations did. This trend is not explained by increasing levels of income or education, or cohort shifts in marriage rates, urban location, or race. Rising wealth does not substantially explain rising borrowing overall or within age groups over time. Rising rates of homeownership are an important component of this trend: more homeowners mechanically means more households who can borrow against home equity. Indeed, mortgage borrowing among older households accelerated with the housing boom in the mid-2000s. Changes to tax laws also appear to contribute to differential changes in mortgage usage by age.

We find each percentage point increase in the subsidy for mortgage interest increases the likelihood of a 65–79 year old household having a mortgage by roughly 0.6 percentage points. According to NBER estimates, the average combined state and federal marginal subsidy rate for mortgage interest increased by 8 percentage points between 1980 and 2014. We estimate approximately 5 percentage points of the growth in mortgage usage by this people age 65 to 79 compared to 50–64 year olds can be attributed to changing tax policy.

Relatively older homeowners without other assets, especially non-retirement assets, may simply be borrowing to fund consumption in the present—there are some patterns of borrowing in response to local unemployment rates that are consistent with this concept. This could be direct consumption, or to help family members.

Many of these households are actively originating new mortgages or increasing mortgage balances through cash-out refinances. In the HRS

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[18] While bequest motives optically increase the likelihood of having a mortgage for 50–64 year olds by more than they do for 65–79 year olds, the magnitude of the association is small–a 0.002 percentage point increase in the year with the greatest correlation.

data, we find that nine percent of homeowners over age 65 originate new mortgages or increase their mortgage balance by at least $5000. Among older renters who transition to homeownership, half use a mortgage to finance the purchase.

Low interest rates and rising home values may have enticed many homeowners in their 50s and 60s into refinancing in the 2000s. Given the decline in home equity in the late 2000s, paying off these loans may not have been feasible. Whether these patterns are sustained as housing prices appreciate remains to be seen.

Adults age 62 and older have access to the federally insured Home Equity Conversion Mortgage (HECM) reverse mortgage. These loans allow older adults to consume from the equity in their homes without any monthly repayment. Just over one million HECM loans have been originated in the last two decades, representing only about two percent of the eligible population with a mortgage (Moulton et al., 2017). The lack of use of this program may deserve more attention, given the need for liquidity that households have and the potential to tap equity without a monthly payment. For example, studies like those by Davidoff and colleagues (Davidoff et al., 2017), may point to a lack of understanding of HECMs and how they could be useful.

Policymakers managing social insurance obligations have an interest in facilitating households to unlock home equity to fund their consumption and reduce reliance in public insurance programs (French et al., 2018). The rise of mortgage use by older households is one way that people can tap their home equity, borrowing against their real property to pay for living expenses instead of drawing benefits. The standard forward mortgage is ubiquitous and efficient, serving as an alternative to a more complicated reverse mortgage. Of course, households have to be able to keep up with monthly payments for this strategy to be useful.

The increase in the use of mortgages by older households is an important issue for lenders and financial institutions to monitor going forward as more cohorts of older households retire, and existing retirees either take on more debt or pay off their loans. Likewise, estate sales of property and probate courts may find more homes encumbered with a mortgage. Surviving widows and widowers may struggle to pay mortgage payments after the death of a spouse and may face a reduction of pension or Social Security payments. This may be a form of default risk not currently priced into mortgage underwriting for older loan applicants. If more mortgage borrowing among the elderly results in more foreclosures, smaller inheritances, or even estates with negative values, this could have negative effects on extended families and communities.

While researchers have mixed views of debt overall, there may be insights to draw from ongoing work in fields such as sociology. For example, work by scholars like Dwyer (2018) focus on use of debt by race and class, and how the use of different kinds of debt in differing contexts may lead to growing economic inequality. Another potential area to study is how people have developed preferences for debt over time. The Baby Boom generation, who will soon make up the majority of the elderly population, are the first generation to have grown up with easy access to credit, and a 30-year mortgage market. They also experienced high interest rates in the 80s, and may view debt as relatively cheap today. This is a generation with high levels of wealth, education and income, as well as health and longevity (Guido et al., 2018). Understanding the influences and preference formation related to credit use for this unique age cohort may help further our understanding of this generation's housing and mortgage choices.

Appendix A

Census

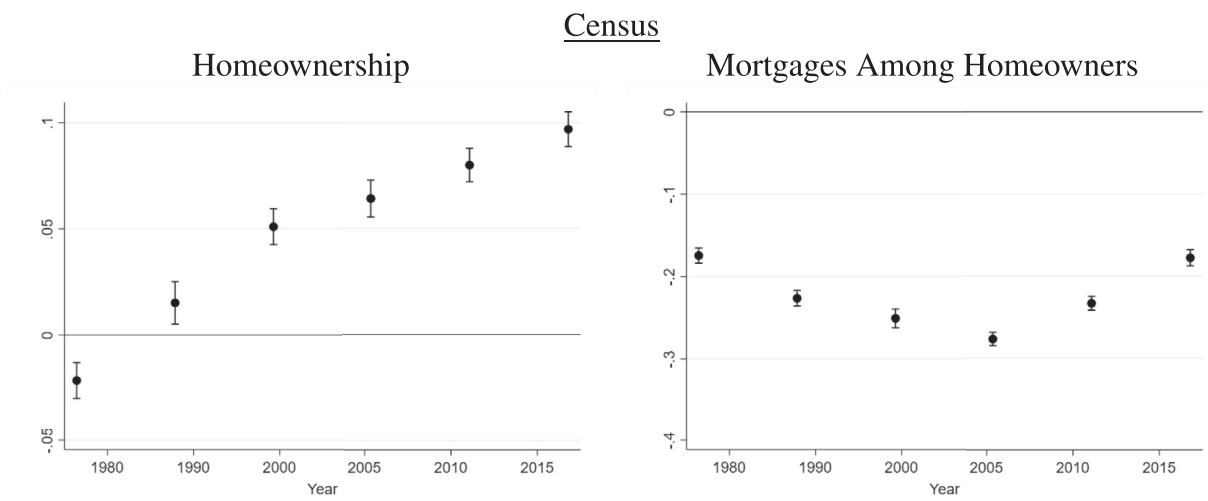### Homeownership   Mortgages Among Homeowners

Fig. 11 Homeownership Rates Increasing for Older Households Relative to 50–64 Year Olds.
Source: Census Data. We report estimates of α_1 coefficients from Equation (1) with 95% confidence intervals.

Table 3
Mortgage Rates by Age Cohort over Time, SCF.

	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A: SCF, No Controls										
65–79	−0.265***	−0.307***	−0.315***	−0.307***	−0.269***	−0.246***	−0.219***	−0.186***	−0.136***	−0.129***
	(0.0139)	(0.0125)	(0.0127)	(0.0128)	(0.0124)	(0.0126)	(0.0130)	(0.00987)	(0.00996)	(0.00951)
80–100	−0.426***	−0.425***	−0.466***	−0.450***	−0.477***	−0.472***	−0.521***	−0.371***	−0.350***	−0.290***
	(0.0124)	(0.0138)	(0.0134)	(0.0137)	(0.0119)	(0.0131)	(0.0119)	(0.0132)	(0.0127)	(0.0132)
N	8030	9270	10140	10329	10661	11736	12040	17050	16745	18210
Panel B: SCF, Controls										
65–79	−0.112***	−0.162***	−0.206***	−0.165***	−0.136***	−0.120***	−0.0983***	−0.0842***	−0.0474***	−0.0241**
	(0.0153)	(0.0153)	(0.0150)	(0.0150)	(0.0153)	(0.0141)	(0.0147)	(0.0108)	(0.0108)	(0.0105)
80–100	−0.230***	−0.242***	−0.305***	−0.239***	−0.263***	−0.284***	−0.316***	−0.199***	−0.170***	−0.144***
	(0.0162)	(0.0171)	(0.0165)	(0.0178)	(0.0178)	(0.0165)	(0.0166)	(0.0156)	(0.0148)	(0.0152)
N	7792	8881	9700	10058	10407	11320	11658	16389	16171	17569

Notes: Survey of Consumer Finances. Controls include race, marital status, and high school education indicators, as well as logged income, and number of children. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4
Mortgage Rates by Age Cohort over Time, HRS.

	1998	2000	2002	2004	2006	2008	2010	2012	2014
Panel A: HRS, No Controls									
65–79	−0.297***	−0.259***	−0.230***	−0.246***	−0.215***	−0.211***	−0.199***	−0.175***	−0.143***
	(0.012)	(0.014)	(0.015)	(0.013)	(0.015)	(0.016)	(0.014)	(0.015)	(0.017)
80–100	−0.425***	−0.385***	−0.364***	−0.401***	−0.401***	−0.399***	−0.389***	−0.362***	−0.331***
	(0.011)	(0.013)	(0.014)	(0.013)	(0.014)	(0.015)	(0.013)	(0.014)	(0.015)
N	9077	7409	6691	7267	6558	6013	8357	7593	6974
Panel B: HRS, Controls									
65–79	−0.166***	−0.145***	−0.149***	−0.169***	−0.125***	−0.147***	−0.162***	−0.134***	−0.114***
	(0.013)	(0.015)	(0.016)	(0.015)	(0.016)	(0.018)	(0.017)	(0.017)	(0.018)
80–100	−0.231***	−0.213***	−0.227***	−0.277***	−0.253***	−0.267***	−0.283***	−0.252***	−0.239***
	(0.015)	(0.016)	(0.017)	(0.017)	(0.018)	(0.019)	(0.017)	(0.018)	(0.019)
N	8186	7053	6443	7007	6375	5853	8026	7448	6847

Notes: Source: Health and Retirement Study. Controls include race, marital status, and high school education indicators, as well as logged income, and number of children. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5
Homeownership Rates by Age Cohort over Time, SCF.

	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A: Homeownership										
65–79	−0.0391***	0.0253**	−0.0170	0.0208**	0.0154	0.0466***	0.0433***	0.0553***	0.114***	0.0804***
	(0.0139)	(0.0115)	(0.0118)	(0.0105)	(0.00973)	(0.00981)	(0.00966)	(0.00758)	(0.00776)	(0.00779)
80–100	−0.143***	−0.0851***	−0.156***	−0.0223	−0.104***	0.0105	−0.0733***	0.0276**	0.0633***	0.0786***
	(0.0240)	(0.0209)	(0.0224)	(0.0164)	(0.0175)	(0.0160)	(0.0161)	(0.0124)	(0.0129)	(0.0121)
N	8030	9270	10140	10329	10661	11736	12040	17050	16745	18210
Panel B: Homeownership, Controls										
65–79	−0.0263**	0.0204*	0.0144	0.0394***	0.0112	0.0635***	0.0691***	0.0586***	0.142***	0.0948***
	(0.0124)	(0.0122)	(0.0110)	(0.0104)	(0.0109)	(0.00952)	(0.00917)	(0.00718)	(0.00707)	(0.00738)
80–100	−0.125***	−0.0849***	−0.0969***	0.00930	−0.113***	0.0442***	−0.0324**	0.0416***	0.116***	0.0980***
	(0.0201)	(0.0195)	(0.0207)	(0.0161)	(0.0165)	(0.0152)	(0.0136)	(0.0111)	(0.0113)	(0.0114)
N	7792	8881	9700	10,058	10,407	11,320	11,658	16,389	16,171	17,569

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 5. All models include controls for race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6
Mortgage Rates Conditional on Homeownership by Age Cohort over Time.

	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A: Mortgage Conditional on Homeownership										
65–79	−0.319***	−0.399***	−0.383***	−0.399***	−0.339***	−0.331***	−0.295***	−0.273***	−0.255***	−0.228***
	(0.0161)	(0.0144)	(0.0144)	(0.0147)	(0.0141)	(0.0138)	(0.0140)	(0.0109)	(0.0110)	(0.0107)
80–100	−0.524***	−0.535***	−0.562***	−0.571***	−0.581***	−0.594***	−0.635***	−0.487***	−0.496***	−0.427***
	(0.0152)	(0.0176)	(0.0176)	(0.0167)	(0.0150)	(0.0153)	(0.0145)	(0.0156)	(0.0152)	(0.0156)
N	6795	7865	8855	8591	8917	10084	10350	13835	13540	14685
Panel B: Mortgage Conditional on Homeownership, Controls										
65–79	−0.118***	−0.218***	−0.253***	−0.226***	−0.165***	−0.176***	−0.167***	−0.152***	−0.165***	−0.102***
	(0.0195)	(0.0185)	(0.0176)	(0.0180)	(0.0177)	(0.0165)	(0.0164)	(0.0121)	(0.0124)	(0.0126)
80–100	−0.273***	−0.299***	−0.366***	−0.319***	−0.290***	−0.378***	−0.395***	−0.282***	−0.297***	−0.255***
	(0.0206)	(0.0224)	(0.0211)	(0.0225)	(0.0216)	(0.0202)	(0.0206)	(0.0184)	(0.0183)	(0.0177)
N	6587	7521	8475	8405	8718	9780	10043	13339	13111	14157

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 5. All models include controls for race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7
Home Values and Equity Conditional on Homeownership by Age Cohort over Time.

	1989	1992	1995	1998	2001	2004	2007	2010	2013	2016
Panel A1: Home Value Conditional on Homeownership										
65–79	−70588***	−58623***	−47039***	−51696***	−33013***	−114067***	−28961***	−45136***	−15139***	−42669***
	(10076)	(7649)	(5853)	(7265)	(7559)	(8115)	(8816)	(6575)	(5587)	(5358)
80–100	−82258***	−91922***	−68106***	−105492***	−78866***	−86050***	−108383***	−93640***	−84474***	−38803***
	(17670)	(12379)	(9509)	(8658)	(10898)	(16854)	(10461)	(8805)	(6762)	(9042)
N	6795	7865	8855	8591	8917	10084	10350	13820	13530	14680
Panel A2: Home Value Conditional on Homeownership, Controls										
65–79	−2825	−4011	−15544***	1160	27774***	−32018***	37553***	16420***	36561***	14013***
	(9206)	(7727)	(5710)	(7138)	(7473)	(8715)	(7790)	(5194)	(5571.4)	(5069)
80–100	−20441	−28083**	−34716***	−34951***	−9343	12269	10117	−121.9	17968**	40648***
	(16776)	(13295)	(8060)	(9254)	(11395)	(15898)	(10875)	(7817)	(7565)	(8283)
N	6587	7521	8475	8405	8718	9780	10043	13324	13101	14152
Panel B1: Home Equity Conditional on Homeownership										
65–79			18027***	27804***	32954***	−28887***	37987***	20084***	39957***	10402**
			(5196)	(6661)	(6849)	(7288)	(7830)	(5848)	(4819)	(4698)
80–100			15285*	−6359	14888	26149	9561	3927	8286	42319***
			(9179)	(8162)	(10639)	(16529)	(9977)	(8088)	(6399)	(8641)
N			8855	8591	8917	10084	10350	13835	13540	14685
Panel B2: Home Equity Conditional on Homeownership, Controls										
65–79			25304***	45210***	50141***	5159	60026***	43383***	63047***	34452***
			(5029)	(6952)	(6691)	(7651)	(6915)	(4557)	(4882)	(4799)
80–100			15499**	15466*	17386*	58807***	45401***	38772***	52847***	79443***
			(7273)	(8909)	(10504)	(15249)	(10041)	(7173)	(6959)	(8191)
N			8475	8405	8718	9780	10043	13339	13111	14157

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 6. Controls include race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8
Home Equity Extraction and Refinance Conditional on Homeownership by Age Cohort over Time.

	1995	1998	2001	2004	2007	2010	2013	2016
Panel A1: Equity Extraction Conditional on Homeownership								
65–79	−0.0437***	−0.0630***	−0.0616***	−0.103***	−0.0801***	−0.0554***	−0.0286***	−0.0340***
	(0.00646)	(0.00989)	(0.00879)	(0.00919)	(0.00964)	(0.00723)	(0.00673)	(0.00682)
80–100	−0.0728***	−0.134***	−0.119***	−0.156***	−0.159***	−0.0867***	−0.0649***	−0.0745***
	(0.00525)	(0.00731)	(0.00822)	(0.00876)	(0.00825)	(0.00971)	(0.00873)	(0.00845)
N	8855	8591	8917	10084	10350	13835	13540	14685
Panel A2: Equity Extraction Conditional on Homeownership, Controls								
65–79	−0.0188**	−0.0396***	−0.0190*	−0.0381***	−0.00701	−0.0283***	−0.0180**	−0.0200**
	(0.00775)	(0.0123)	(0.0106)	(0.0112)	(0.0112)	(0.00919)	(0.00815)	(0.00834)
80–100	−0.0315***	−0.0917***	−0.0550***	−0.0691***	−0.0280**	−0.0536***	−0.0487***	−0.0627***
	(0.00670)	(0.0118)	(0.0117)	(0.0117)	(0.0117)	(0.0120)	(0.0108)	(0.0105)
N	8475	8405	8718	9780	10043	13339	13111	14157
Panel B1: Refinance Conditional on Homeownership								
65–79	−0.168***	−0.218***	−0.185***	−0.256***	−0.218***	−0.186***	−0.166***	−0.131***
	(0.0105)	(0.0127)	(0.0121)	(0.0125)	(0.0129)	(0.0103)	(0.0108)	(0.0105)
80–100	−0.232***	−0.320***	−0.311***	−0.375***	−0.382***	−0.306***	−0.326***	−0.332***
	(0.0106)	(0.0110)	(0.0108)	(0.0132)	(0.0125)	(0.0136)	(0.0140)	(0.0120)
N	8855	8591	8917	10084	10350	13835	13540	14685
Panel B2: Refinance Conditional on Homeownership, Controls								
65–79	−0.114***	−0.130***	−0.0628***	−0.102***	−0.0829***	−0.0969***	−0.0980***	−0.0201
	(0.0124)	(0.0156)	(0.0153)	(0.0144)	(0.0156)	(0.0120)	(0.0126)	(0.0126)
80–100	−0.148***	−0.186***	−0.132***	−0.155***	−0.153***	−0.166***	−0.189***	−0.193***
	(0.0132)	(0.0158)	(0.0165)	(0.0169)	(0.0179)	(0.0163)	(0.0171)	(0.0149)
N	8475	8405	8718	9780	10043	13339	13111	14157

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 6. Controls include race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. Household weights are used in all specifications. Excluded age group is 50–64. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 9
HRS: Bequest Heterogeneity in Mortgage Rate by Age Cohort over Time.

	(1) 1998	(2) 2000	(3) 2002	(4) 2004	(5) 2006	(6) 2008	(7) 2010	(8) 2012	(9) 2014
Panel A1: Mortgage Conditional on Bequest Motive									
65–79	−0.192***	−0.169***	−0.171***	−0.195***	−0.159***	−0.166***	−0.182***	−0.137***	−0.132***
	(0.016)	(0.018)	(0.018)	(0.018)	(0.020)	(0.021)	(0.019)	(0.020)	(0.021)
80–100	−0.257***	−0.246***	−0.253***	−0.320***	−0.307***	−0.311***	−0.320***	−0.277***	−0.282***
	(0.017)	(0.019)	(0.020)	(0.020)	(0.022)	(0.023)	(0.020)	(0.021)	(0.021)
N	7090	5726	5207	5592	5027	4650	6382	5883	5408
Panel B1: Mortgage Conditional on No Bequest Motive									
65–79	−0.042**	−0.055**	−0.031	−0.050**	−0.007	−0.045	−0.030	−0.054*	0.002
	(0.020)	(0.022)	(0.026)	(0.022)	(0.022)	(0.028)	(0.026)	(0.027)	(0.030)
80–100	−0.113***	−0.118***	−0.113***	−0.116***	−0.086***	−0.113***	−0.119***	−0.109***	−0.044
	(0.021)	(0.023)	(0.026)	(0.023)	(0.022)	(0.028)	(0.025)	(0.026)	(0.030)
N	1910	1619	1411	1552	1415	1247	1786	1608	1466
Panel A2: Mortgage Conditional on Has Bequest Motive, Homeowners									
65–79	−0.227***	−0.191***	−0.197***	−0.216***	−0.174***	−0.177***	−0.255***	−0.227***	−0.226***
	(0.018)	(0.020)	(0.020)	(0.020)	(0.022)	(0.023)	(0.021)	(0.022)	(0.023)
80–100	−0.283***	−0.243***	−0.255***	−0.329***	−0.318***	−0.318***	−0.401***	−0.379***	−0.373***
	(0.021)	(0.022)	(0.024)	(0.023)	(0.026)	(0.027)	(0.024)	(0.024)	(0.025)
N	5804	4676	4260	4558	4086	3819	4780	4399	4031
Panel B2: Mortgage Conditional on No Bequest Motive, Homeowners									
65–79	−0.148***	−0.130**	−0.089	−0.179***	−0.044	−0.163**	−0.284***	−0.375***	−0.204***
	(0.053)	(0.059)	(0.062)	(0.065)	(0.068)	(0.078)	(0.058)	(0.067)	(0.068)
80–100	−0.221***	−0.180***	−0.167**	−0.242***	−0.226***	−0.251***	−0.520***	−0.467***	−0.233***
	(0.061)	(0.064)	(0.067)	(0.070)	(0.074)	(0.089)	(0.066)	(0.069)	(0.080)
N	658	549	476	477	411	367	474	415	407

Notes: Health and Retirement Study. This table includes the estimates for Fig. 7. All models include state fixed effects, as well as controls include number of children, logged income, greater than high school education, race, and marital status. Excluded age group is 50–64. Household weights are used in all specifications. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 10
SCF: Pension Heterogeneity in Mortgage Rate by Age Cohort and Pension Holding over Time.

	(1) 1989	(2) 1992	(3) 1995	(4) 1998	(5) 2001	(6) 2004	(7) 2007	(8) 2010	(9) 2013	(10) 2016
Panel A1: Mortgage Conditional on Pension										
65–79	−0.103***	−0.218***	−0.245***	−0.140***	−0.156***	−0.144***	−0.130***	−0.0714***	−0.0718***	−0.0646***
	(0.0210)	(0.0215)	(0.0204)	(0.0214)	(0.0210)	(0.0189)	(0.0195)	(0.0145)	(0.0145)	(0.0144)
80–100	−0.252***	−0.276***	−0.336***	−0.235***	−0.246***	−0.371***	−0.338***	−0.242***	−0.224***	−0.169***
	(0.0211)	(0.0285)	(0.0273)	(0.0260)	(0.0268)	(0.0222)	(0.0237)	(0.0214)	(0.0203)	(0.0221)
N	4842	4958	5307	5452	6010	6967	7048	9897	9886	10751
Panel B1: Mortgage Conditional on No Pension										
65–79	−0.0784***	−0.0325	−0.139***	−0.170***	−0.0760***	−0.0875***	−0.0339	−0.0917***	−0.0125	0.0296**
	(0.0225)	(0.0203)	(0.0215)	(0.0203)	(0.0222)	(0.0204)	(0.0219)	(0.0157)	(0.0160)	(0.0150)
80–100	−0.185***	−0.120***	−0.248***	−0.219***	−0.238***	−0.201***	−0.272***	−0.143***	−0.111***	−0.0988***
	(0.0232)	(0.0201)	(0.0219)	(0.0242)	(0.0217)	(0.0235)	(0.0224)	(0.0223)	(0.0224)	(0.0196)
N	2950	3923	4393	4606	4397	4353	4610	6492	6285	6818
Panel A2: Mortgage Conditional on Pension, Homeowners										
65–79	−0.0895***	−0.259***	−0.291***	−0.215***	−0.155***	−0.181***	−0.181***	−0.136***	−0.157***	−0.123***
	(0.0239)	(0.0238)	(0.0226)	(0.0231)	(0.0227)	(0.0205)	(0.0203)	(0.0148)	(0.0150)	(0.0153)
80–100	−0.262***	−0.303***	−0.393***	−0.318***	−0.257***	−0.442***	−0.388***	−0.320***	−0.307***	−0.254***
	(0.0229)	(0.0333)	(0.0372)	(0.0312)	(0.0321)	(0.0244)	(0.0276)	(0.0230)	(0.0233)	(0.0234)
N	4316	4394	4758	4798	5318	6343	6278	8579	8675	9405
Panel B2: Mortgage Conditional on No Pension, Homeowners										
65–79	−0.126***	−0.0567**	−0.183***	−0.234***	−0.159***	−0.173***	−0.122***	−0.172***	−0.158***	−0.0571**
	(0.0335)	(0.0276)	(0.0283)	(0.0272)	(0.0278)	(0.0280)	(0.0279)	(0.0203)	(0.0219)	(0.0222)
80–100	−0.268***	−0.165***	−0.309***	−0.292***	−0.302***	−0.315***	−0.387***	−0.230***	−0.286***	−0.220***
	(0.0340)	(0.0285)	(0.0288)	(0.0320)	(0.0307)	(0.0336)	(0.0309)	(0.0298)	(0.0293)	(0.0265)
N	2271	3127	3717	3607	3400	3437	3765	4760	4436	4752

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 7. All models include controls for race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11
SCF: Education Heterogeneity in Mortgage Rate by Age Cohort over Time.

	(1) 1989	(2) 1992	(3) 1995	(4) 1998	(5) 2001	(6) 2004	(7) 2007	(8) 2010	(9) 2013	(10) 2016
Panel A1: Mortgage Conditional on HS Education or Less										
65–79	−0.0902***	−0.119***	−0.211***	−0.131***	−0.0851***	−0.0728***	−0.0938***	−0.119***	−0.0251	−0.0236**
	(0.0183)	(0.0190)	(0.0190)	(0.0188)	(0.0209)	(0.0196)	(0.0203)	(0.0154)	(0.0155)	(0.0114)
80–100	−0.201***	−0.173***	−0.316***	−0.200***	−0.203***	−0.238***	−0.322***	−0.171***	−0.0927***	−0.142***
	(0.0175)	(0.0205)	(0.0176)	(0.0215)	(0.0220)	(0.0200)	(0.0215)	(0.0210)	(0.0202)	(0.0162)
N	3994	3793	3998	3883	3779	3764	3918	5987	5790	13649
Panel B1: Mortgage Conditional on More than HS Education										
65–79	−0.165***	−0.218***	−0.197***	−0.198***	−0.183***	−0.176***	−0.0976***	−0.0470***	−0.0672***	−0.00262
	(0.0282)	(0.0254)	(0.0236)	(0.0250)	(0.0226)	(0.0204)	(0.0214)	(0.0151)	(0.0149)	(0.0273)
80–100	−0.301***	−0.386***	−0.302***	−0.295***	−0.327***	−0.331***	−0.293***	−0.250***	−0.275***	−0.129***
	(0.0387)	(0.0309)	(0.0354)	(0.0323)	(0.0270)	(0.0295)	(0.0271)	(0.0235)	(0.0209)	(0.0429)
N	3798	5088	5702	6175	6628	7556	7740	10402	10381	3920
Panel A2: Mortgage Conditional on HS Education or Less, Homeowners										
65–79	−0.105***	−0.178***	−0.264***	−0.201***	−0.150***	−0.133***	−0.189***	−0.232***	−0.190***	−0.105***
	(0.0246)	(0.0243)	(0.0230)	(0.0245)	(0.0250)	(0.0258)	(0.0245)	(0.0184)	(0.0201)	(0.0142)
80–100	−0.252***	−0.231***	−0.410***	−0.297***	−0.253***	−0.345***	−0.433***	−0.281***	−0.258***	−0.263***
	(0.0231)	(0.0278)	(0.0218)	(0.0293)	(0.0285)	(0.0278)	(0.0276)	(0.0253)	(0.0262)	(0.0191)
N	3113	2909	3219	2840	2815	2851	3014	4366	4096	10537
Panel B2: Mortgage Conditional on More than HS Education, Homeowners										
65–79	−0.141***	−0.281***	−0.235***	−0.247***	−0.165***	−0.216***	−0.135***	−0.0699***	−0.141***	−0.0656**
	(0.0329)	(0.0282)	(0.0258)	(0.0261)	(0.0250)	(0.0219)	(0.0221)	(0.0155)	(0.0157)	(0.0274)
80–100	−0.324***	−0.445***	−0.300***	−0.345***	−0.344***	−0.401***	−0.326***	−0.300***	−0.359***	−0.189***
	(0.0448)	(0.0379)	(0.0454)	(0.0365)	(0.0317)	(0.0326)	(0.0336)	(0.0269)	(0.0256)	(0.0477)
N	3474	4612	5256	5565	5903	6929	7029	8973	9015	3620

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 7. All models include controls for race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. In the education split, we do not control for education. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 12
HRS: Wealth Heterogeneity in Mortgage Rate by Age Cohort over Time.

	(1) 1998	(2) 2000	(3) 2002	(4) 2004	(5) 2006	(6) 2008	(7) 2010	(8) 2012	(9) 2014
Panel A1: Mortgage Conditional on Above Median Wealth									
65–79	−0.224***	−0.205***	−0.224***	−0.239***	−0.177***	−0.198***	−0.234***	−0.243***	−0.200***
	(0.021)	(0.024)	(0.025)	(0.025)	(0.027)	(0.029)	(0.025)	(0.026)	(0.027)
80–100	−0.284***	−0.260***	−0.279***	−0.336***	−0.305***	−0.323***	−0.362***	−0.379***	−0.354***
	(0.023)	(0.025)	(0.027)	(0.027)	(0.030)	(0.031)	(0.026)	(0.027)	(0.028)
N	3972	3221	2882	3089	2803	2593	3497	3216	3006
Panel B1: Mortgage Conditional on Below Median Wealth									
65–79	−0.107***	−0.101***	−0.088***	−0.114***	−0.084***	−0.097***	−0.066***	−0.005	−0.007
	(0.016)	(0.019)	(0.019)	(0.019)	(0.020)	(0.022)	(0.021)	(0.022)	(0.023)
80–100	−0.173***	−0.187***	−0.183***	−0.233***	−0.211***	−0.220***	−0.196***	−0.120***	−0.108***
	(0.017)	(0.019)	(0.020)	(0.020)	(0.021)	(0.024)	(0.021)	(0.023)	(0.024)
N	5028	4124	3736	4055	3639	3304	4671	4275	3868
Panel A2: Mortgage Conditional on Above Median Wealth, Homeowners									
65–79	−0.237***	−0.213***	−0.231***	−0.245***	−0.176***	−0.193***	−0.248***	−0.251***	−0.214***
	(0.022)	(0.024)	(0.025)	(0.025)	(0.028)	(0.029)	(0.026)	(0.027)	(0.028)
80–100	−0.299***	−0.265***	−0.283***	−0.342***	−0.308***	−0.314***	−0.366***	−0.392***	−0.368***
	(0.024)	(0.027)	(0.028)	(0.028)	(0.031)	(0.033)	(0.028)	(0.028)	(0.029)
N	3712	2994	2684	2895	2637	2459	3270	3007	2818
Panel B2: Mortgage Conditional on Below Median Wealth, Homeowners									
65–79	−0.191***	−0.148***	−0.125***	−0.169***	−0.153***	−0.148***	−0.274***	−0.211***	−0.239***
	(0.026)	(0.030)	(0.029)	(0.029)	(0.031)	(0.033)	(0.030)	(0.031)	(0.035)
80–100	−0.236***	−0.200***	−0.182***	−0.300***	−0.324***	−0.315***	−0.484***	−0.368***	−0.352***
	(0.032)	(0.035)	(0.037)	(0.035)	(0.039)	(0.043)	(0.035)	(0.039)	(0.042)
N	2750	2231	2052	2140	1860	1727	1984	1807	1620

Notes: Health and Retirement Study. This table includes the estimates for Fig. 7. All models include state fixed effects, as well as controls include number of children, logged income, greater than high school education, race, and marital status. Excluded age group is 50–64. Household weights are used in all specifications. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 13
Mortgage Interest Tax Treatment and Mortgage Rate: Household Fixed Effects.

	(1) Base	(2) + MID	(3) Base	(4) + MID
Age 65–79	−0.017***	−0.018**	−0.032***	−0.037***
	(0.005)	(0.007)	(0.007)	(0.010)
Age 80–100	0.012	0.007	0.024**	0.006
	(0.009)	(0.013)	(0.012)	(0.018)
65-79 X MID		−0.002		−0.001
		(0.002)		(0.003)
80-100 X MID		0.003		0.008*
		(0.003)		(0.005)
MID		−0.004		−0.013**
		(0.003)		(0.005)
Always Own			X	X
MSA FE	X	X	X	X
Year FE	X	X	X	X
Controls	X	X	X	X
Observations	71,327	71,327	41,063	41,063

* p < 0.10, ** p < 0.05, *** p < 0.01.
Notes: Health and Retirement Study. Each observation is a respondent-year. All models include MSA and year fixed effects and control for number of children, logged income, top state marginal income tax rate, urban area, greater than high school education, race, marital status, bequest motive, net worth quartiles, and subjective health measure. MID is the average marginal mortgage interest tax rate by state and year from the NBER.

Table 14
Mortgage Rate by State Unemployment and MSA Rent to Price Ratio (RTP): Household Fixed Effects.

	(1) Base	(2) +UE, RTP	(3) Base	(4) +UE, RTP
Age 65–79	−0.004	−0.019	−0.009	−0.028
	(0.006)	(0.028)	(0.008)	(0.039)
Age 80–100	0.015	0.069	0.039**	0.105*
	(0.011)	(0.042)	(0.016)	(0.063)
65-79 X Unemployment		0.005**		0.007**
		(0.002)		(0.003)
80-100 X Unemployment		0.010***		0.016***
		(0.004)		(0.005)
65-79 X RTP		−0.002		−0.004
		(0.005)		(0.007)
80-100 X RTP		−0.025***		−0.036***
		(0.008)		(0.012)
Unemployment		−0.008***		−0.012***
		(0.002)		(0.002)
RTP		0.023**		0.045***
		(0.010)		(0.014)
Always Own			X	X
MSA FE	X	X	X	X
Year FE	X	X	X	X
Controls	X	X	X	X
Observations	42,927	42,927	25,009	25,009

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Notes: Health and Retirement Study. Each observation is a respondent-year. All models include MSA and year fixed effects and control for number of children, logged income, urban area, greater than high school education, race, marital status, bequest motive, net worth quartiles, and subjective health measure. Unemployment rate is the state unemployment rate that year. RTP is rent to price ratio as estimated by Campbell et al. (2009).

Table 15
60 Days or More Late on Account by Age Cohort over Time.

	1995	1998	2001	2004	2007	2010	2013	2016
Panel A: Full Sample								
65–79	−0.0148***	−0.0519***	−0.0469***	−0.0248***	−0.0237***	−0.0486***	−0.0335***	−0.0158***
	(0.00503)	(0.00518)	(0.00424)	(0.00507)	(0.00476)	(0.00435)	(0.00394)	(0.00376)
80–100	−0.0152**	−0.0583***	−0.0540***	−0.0409***	−0.0447***	−0.0693***	−0.0528***	−0.0476***
	(0.00762)	(0.00515)	(0.00380)	(0.00521)	(0.00358)	(0.00442)	(0.00370)	(0.00248)
N	10140	10329	10661	11736	12040	17050	16745	18210
Panel B: Homeowners Only								
65–79	−0.00821*	−0.0522***	−0.0352***	−0.0133**	−0.00951**	−0.0476***	−0.0236***	−0.00999**
	(0.00498)	(0.00593)	(0.00425)	(0.00541)	(0.00485)	(0.00474)	(0.00416)	(0.00413)
80–100	−0.00996	−0.0615***	−0.0397***	−0.0266***	−0.0316***	−0.0651***	−0.0431***	−0.0387***
	(0.00790)	(0.00540)	(0.00383)	(0.00602)	(0.00315)	(0.00468)	(0.00329)	(0.00274)
N	8855	8591	8917	10084	10350	13835	13540	14685
Panel C: Homeowners Only, with Controls								
65–79	0.00813	−0.0516***	−0.0293***	−0.00843	−0.0155***	−0.0461***	−0.0122**	−0.00809*
	(0.00604)	(0.00734)	(0.00612)	(0.00661)	(0.00596)	(0.00581)	(0.00494)	(0.00473)
80–100	0.0133	−0.0550***	−0.0256***	−0.0189**	−0.0388***	−0.0601***	−0.0225***	−0.0353***
	(0.00806)	(0.00795)	(0.00636)	(0.00852)	(0.00598)	(0.00674)	(0.00503)	(0.00426)
N	8475	8405	8718	9780	10043	13339	13111	14157

Notes: Survey of Consumer Finances. This table includes the estimates for Fig. 10. All models include controls for race, marital status, and high school education indicators, as well as logged income, number of children, and net worth quartiles. Household weights are used in all specifications. Excluded age group is 50–64. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 16
Mortgage Rate by Mortgage Interest Tax Treatment: Initial State of Residence.

	(1) Base	(2) + MID	(3) Base	(4) + MID
Age 65–79	−0.148***	−0.147***	−0.017***	−0.020***
	(0.004)	(0.007)	(0.005)	(0.007)
Age 80–100	−0.250***	−0.247***	0.012	−0.004
	(0.005)	(0.009)	(0.009)	(0.013)
65-79 X MID		−0.006***		−0.002
		(0.002)		(0.002)
80-100 X MID		0.002		0.004
		(0.003)		(0.003)
MID		−0.000		−0.003
		(0.002)		(0.004)
HH FE			X	X
MSA FE	X	X	X	X
Year FE	X	X	X	X
Controls	X	X	X	X
N	71,327	71,327	71,327	71,327

* p < 0.10, ** p < 0.05, *** p < 0.01.
Notes: Health and Retirement Study. Linear probability models with robust standard errors clustered at the state-level in parentheses. Each observation is a respondent-year. All models include MSA and year fixed effects and control for number of children, logged income, top state marginal income tax rate, urban area, greater than high school education, race, marital status, bequest motive, net worth quartiles, and subjective health measure. MID is the average marginal mortgage interest tax rate by state and year from the NBER based on initial state of residence.

Table 17
Mortgage Rate by State Unemployment and MSA Rent to Price Ratio (RTP): Initial State of Residence.

	(1) Base	(2) + RTP, UE	(3) Base	(4) + RTP, UE
Age 65–79	−0.166***	−0.194***	−0.004	−0.038
	(0.005)	(0.028)	(0.006)	(0.027)
Age 80–100	−0.261***	−0.367***	0.015	0.050
	(0.007)	(0.036)	(0.011)	(0.043)
65-79 X Unemployment		0.009***		0.007***
		(0.002)		(0.002)
80-100 X Unemployment		0.015***		0.011***
		(0.003)		(0.004)
65-79 X RTP		−0.005		0.001
		(0.005)		(0.005)
80-100 X RTP		0.007		−0.022***
		(0.007)		(0.008)
Unemployment		−0.007***		−0.009***
		(0.002)		(0.002)
RTP		0.031***		0.019*
		(0.009)		(0.010)
HH FE			X	X
MSA FE	X	X	X	X
Year FE	X	X	X	X
Controls	X	X	X	X
N	42,927	42,928	42,927	42,928

* p < 0.10, ** p < 0.05, *** p < 0.01.
Notes: Health and Retirement Study. Linear probability models with robust standard errors clustered at the state-level in parentheses. Each observation is a respondent-year. All models include MSA and year fixed effects and control for number of children, logged income, urban area, greater than high school education, race, marital status, bequest motive, net worth quartiles, and subjective health measure. Unemployment rate is the state unemployment rate that year. RTP is rent to price ratio as estimated by Campbell et al. (2009).

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.regsciurbeco.2020.103524.

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