The Risk of Financial Hardship in Retirement: A Cohort Analysis

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This paper explores the likely prevalence of hardship in old age for individuals now nearing retirement. We use two decades of longitudinal data from the Health and Retirement Study to determine what observable demographic, socioeconomic, and financial factors in late middle age predicted economic hardship in old age for the cohort that was nearing retirement age in the mid-1990s. It then uses these findings to predict economic hardship in old age for the cohort nearing retirement age in the mid-2010s. Our analysis suggests that the more recent cohort is likely to realize higher economic insecurity, particularly among men.

KEYWORDS: Aging, Debt, Retirement Security

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The economic security of current and future generations of the elderly is a leading public policy concern, particularly as the population of the elderly soars in the United States. The elderly appear to be more economically secure than other age groups by some metrics. According to the Federal Reserve Board's Survey of Consumer Finances (SCF), median net worth for the age 75 and older population, at $265,000 in 2016, was higher than for all other age groups and also at an all-time high (in inflation-adjusted terms). Moreover, the social safety net provides considerably more protection for the elderly than other age groups through Medicare, Medicaid, SNAP, SSI, and other programs. Yet, other considerations point to greater risks facing the elderly. The poverty rate falls with age before age 65 but rises thereafter. The elderly are also at greater risk for catastrophic health care expenses related to physical disability and dementia. And the elderly, having largely left the labor force, have fewer ways to address economic vulnerabilities than younger individuals.

Moreover, changes in the economic and demographic profile of the population mean that future cohorts of the elderly will face a different landscape in terms of economic security risks (Gale et al. 2018). Some factors will enhance their economic security compared with earlier generations—higher female labor force participation rates and greater real Social Security benefits, for example. Yet future generations of the elderly will also confront challenges relative to their earlier counterparts: longer life expectancies to finance and possibly lower rates of return on assets, for example. The balance sheets of today's near elderly also suggest that they are less financially prepared for the years to come than earlier generations. According to the SCF, 77 percent of households approaching retirement age (with heads between the ages of 55 and 64) held some debt in 2016, up slightly from 74 percent in 1995. The median amount of debt for those with debt was

$31,000 in 2016, more than double the median in 1995 (adjusted for inflation). Median net worth was 3.1 times normal income for this group in 2016, little changed from 1995, even though a considerably smaller share of these households have defined benefit (DB) pensions to supplement their savings in retirement (37 percent in 2016, down from 53 percent in 1995).

Much of what we know about economic insecurity among older Americans is based on patterns that have been observed in the current or past population of retired people (see, for example, Clark and Liu 2020). Given changes in demographics and the economic environment, the patterns of the past provide only limited information about the prevalence of hardship and economic insecurity of future generations of the elderly. This paper seeks to help remedy this gap by identifying factors earlier in life that are correlated with hardship when elderly and using those factors to predict future hardship for individuals who are now approaching retirement.

In particular, using the Health and Retirement Study, a rich data set with over 20 years of information on the same households, we look at households as they are approaching their elderly years in the mid-1990s and then again when they are well into their elderly years in the mid-2010s. This exercise sheds light on how economic insecurity later in life (measured in a number of ways) is shaped by factors during late middle age. We use the results of this exercise to project the economic insecurity that the current generation of households in late middle age, with their different traits than earlier cohorts, will in old age. We go on to consider how changes across the cohorts in various specific factors—increasing debt burdens, longer careers, and different demographics—contribute to differences in predicted old-age hardship for the two cohorts. Of course, some factors might have a very different effect on future economic insecurity than they did in the past, most notably initial wealth because of the potential for asset returns to be different than they were for households approaching retirement two decades ago. Our final exercise that

effectively allows for different realizations of asset returns for those approaching retirement in 2014 shows how the results would change if rates of return on assets turn out to be lower than for households who were nearing retirement in the mid-1990s.

Our analysis suggests that, for most measures of economic insecurity, observable traits in late middle age predict that the incoming generation of retirees will face somewhat more hardship in old age than their earlier counterparts. For most measures, the prevalence of old-age hardship for women is projected to be little changed from that experienced by those in old age now. By contrast, men now in late middle age are projected to fare considerably worse when old than their earlier counterparts. As a result, although women have traditionally been more likely to experience most types of hardship in old age, the gender gaps are predicted to narrow or reverse for most of the measures that we explore. In counterfactual simulations, we find that reversing the increase in the share of the population represented by race and ethnicity groups that tend to have lower income and wealth undoes much of the predicted increase in old-age hardship. We also find that hardship would not be predicted to rise quite as much if the population currently in late middle age held amounts of debt that were more similar to the amounts held by cohort that was in late middle age two decades ago.

The results, if they come to fruition, would have a material impact not only the affected individuals but also on government finances given that the government-provides a safety net that the economically vulnerable elderly population uses extensively. Exploring this possibility well in advance is particularly important given that households have limited options of their own to reverse their economic misfortunes once they are in old age. A long lead time, for example, allows individuals more years to do additional saving, the choice of raising their labor supply when still of working age, and the option to purchase insurance of various forms. It gives policymakers the

ability to create incentives for individuals to act now to increase their future economic security, and it also gives them more flexibility to make needed adjustments to the safety net.

Past Research on Economic Security in Retirement

A considerable literature exists on the economic security of the elderly; we do not review it in detail here. We do, however, highlight past research that is particularly relevant in order to provide context to our work here.

One relevant strand of earlier literature looks at the retirement readiness of pre-retirees using contemporaneous information about the basic demographic characteristics and wealth of the pre-retiree population. Much of the focus is on whether households have sufficient wealth to meet their expected retirement needs, either in an absolute sense or relative to their pre-retirement standard of living. Some of these papers model optimal wealth accumulation and decumulation to gauge whether savings of pre-retirees are adequate (Engen et al. 2000; Scholz et al. 2006; Pang and Warshawsky 2014). Others assess retirement preparedness of households by projecting replacement rates to determine whether households can maintain their pre-retirement standard of living based on demographics, assets, and liabilities (Munnell et al. 2018). Microsimulation techniques have also been used to project not only economic security but changes in the factors at the individual level that shape that security (Butrica et al. 2007).

This literature yields varying conclusions about the overall level of retirement preparedness, with many of the differences owing to conceptual issues (Gale et al. 2018). For example, some papers consider retirement savings to be adequate if individuals can expect to experience the average standard of living that they enjoyed during their younger years while others judge savings to be adequate only if individuals can expect to live at the standard of living they

experienced in the years immediately preceding retirement (which is likely to be higher given productivity growth in the economy). Another conceptual issue is whether the focus is on households having sufficient wealth to meet their *expected* retirement needs (either in an absolute sense or relative to their pre-retirement standard of living) or on households having enough resources such that they are insured against all types of risk; with most of the literature focusing on the former consideration.

A second relevant strand of the earlier literature studies contemporaneous factors that contribute to economic insecurity among the elderly population. Costly health shocks can deplete a household's savings, leaving them vulnerable (Coile and Milligan 2009). Family structure matters as well. For example, marriage provides risk protection in the event one spouse suffers an income, health or other shock, leading to married couples tending to have greater economic security in retirement than single individuals (Tamborini 2007). Interfamily transfers can deplete or increase an elderly household's economic security.

Our paper is distinct from both strands of earlier literature. It exploits many years of longitudinal data to assess both how households now nearing retirement will fare in old age and how they are likely to compare to earlier cohorts. We tie the observable traits of households in their pre-retirement years to a range of poor outcomes in old age. In doing so, we are able to capture both the effects of lack of preparation for expected needs *and* lack of insurance against downside risk. We focus on the later retirement years (aged 77 to 82) because those are the ones in which major risks such as widowhood, dementia, and physical disability are most likely to manifest themselves. Further, our use of a framework that links hardship in old age to earlier observable traits rather than using actuarial calculations to predict such hardship may pick up a richer set of channels that drive poor outcomes.

Data and Methods

We use the Health and Retirement Study (HRS), a longitudinal survey of individuals age 50 and older that collects information about households' demographic characteristics, their financial and economic situation, and their health.[1] The HRS surveys individuals every two years, re-interviewing the same households from prior waves and periodically replenishing the sample with new birth cohorts as they surpass age 50. The HRS has been conducted on an ongoing basis since 1992, but we rely only on the 1994 and 2014 waves.[2] From the 1994 wave, we examine respondents born between 1932 and 1937 (aged 57 to 62) and use information on factors that might influence their economic security 20 years later (when they are aged 77 to 82), including demographic, economic, financial, and health indicators.[3] From the 2014 wave, we use information

[1] Specifically, we use the RAND HRS which spans years from 1992 to 2014 (version 2) matched with the pension wealth data files from 1992 to 2010 compiled by Gustman et. al. (2014), the HRS fat files for the 12th wave, and the RAND HRS family data file spanning years from 1992 to 2014 (version 1).

[2] We refer to the 2nd wave of the HRS as the '1994 wave' because all but two of the observations in our sample of those born in 1932 to 1937 are interviewed in 1994. A similar logic holds for the 12th wave of the HRS being referred to as the '2014 wave'—95 percent of observations in our sample of those born in 1952 to 1957 are interviewed in 2014.

[3] In creating our sample, we make the following sample restrictions. For the married households in the 1932 to 1937 cohort, we limit the sample to individuals who respond to the 1994 wave of the HRS (3,564 observations) and then sequentially exclude those who having a missing ethnicity (7), those who are missing pension wealth from Gustman, et. al. (2014) in the 1994 wave (4), those who are missing predicted Social Security wealth from the 1st wave (29), those who are missing self-reported health in the 1994 wave (1), those who are missing self-reported details on health incidences, such as smoking and cancer (2), those who are missing number of resident kids or kids that live within 10 miles (155), those missing self-reported spouse health (147), those missing data on the value of the second house (29), and those missing information on our economic security variables in the 2014 wave (57). For the single male households in the 1932 to 1937 cohort, we limit the sample to individuals who respond to the 1994 wave of the HRS (341 observations) and then sequentially exclude those who are missing number of resident kids or kids that live within 10 miles (13) and those missing information on our economic security variables in the 2014 wave (3). For the single female households in the 1932 to 1937 cohort, we limit the sample to individuals who respond to the 1994 wave of the HRS (815 observations) and then sequentially exclude those who are missing number of resident kids or kids that live within 10 miles (40), those who are missing self-reported details on health incidences, such as smoking and cancer (2), and those missing information on our economic security variables in the 2014 wave (12).For the married households in the 1952 to 1957 cohort, we limit the sample to individuals who respond to the 2014 wave of the HRS (2,741 observations) and then sequentially exclude those who having a missing race and/or ethnicity (27), those missing self-reported spouse health (175), those who are missing predicted household Social Security wealth from the 10th wave (236), those who are missing number of resident kids or kids that live within 10 miles (199), those who are missing self-reported health in the 2014 wave (1), those missing self-reported spouse health (17), those missing information on our economic security variables (18), and those missing the number of

on those same households, creating metrics of economic security and hardship at that time. The resulting data set enables us to see what factors in late middle age predicted economic insecurity for these individuals when they were well into their elderly years.

The next step is to tap the 2014 survey for information on the population more recently in late middle age—those born between 1952 and 1957. We draw the same information on the factors that could contribute to future economic security as for their earlier counterparts in the 1994 wave. Based on what we have learned about how the economic security of the current generation of elderly was shaped their traits in late middle age, we project the future economic security of the incoming elderly generation.

Measures of economic insecurity

We assess economic insecurity and hardship among the elderly with a number of measures. First, we look at several measures related to the resources households have to finance their spending needs. We start with poverty, as it is the most commonly used metric to gauge whether a household has adequate income to afford a subsistence standard of living. Also, because wealth (in its financial, nonfinancial, and pension forms) is an especially important resource for the elderly, we also use a measure of resource adequacy that combines income and wealth, along the lines of the

household children (13). For the single male households in the 1952 to 1957 cohort, we limit the sample to individuals who respond to the 2014 wave of the HRS (449 observations) and then sequentially exclude those who having a missing race and/or ethnicity (3), those who are missing predicted household Social Security wealth from the 10th wave (50), those who are missing number of resident kids or kids that live within 10 miles (22), those missing the number of household children (9), those who are missing self-reported details on health incidences, such as smoking and cancer (1), and those missing information on our economic security variables (9). For the single female households in the 1952 to 1957 cohort, we limit the sample to individuals who respond to the 2014 wave of the HRS (945 observations) and then sequentially exclude those who having a missing race and/or ethnicity (5), those who are missing predicted household Social Security wealth from the 10th wave (103), those who are missing number of resident kids or kids that live within 10 miles (79), those who are missing number of children (6), those who are missing self-reported details on health incidences, such as smoking and cancer (6), and those missing information on our economic security variables (16).

measures used by Love et al. (2008) and Brown and Dynan (2017). We call this measure 'annuitized wealth,' and it is designed to capture the expected annual resources that individuals would have to fund consumption and other expenditures were they to invest their accumulated wealth in an annuity and combine the payout from that annuity with other forms of income.

To calculate this measure, we start by aggregating all sources of financial and non-financial wealth for each household. To this amount, we add predicted wealth from various sources. For those respondents and spouses who have not yet retired, we assume that their annual earnings will remain constant until their predicted retirement age. The HRS also provides a predicted Social Security retirement wealth measure for individuals and households that have not claimed Social Security retirement benefits; we add that amount, assuming currently scheduled benefits. We also add the HRS's measure of predicted DB and defined contribution (DC) wealth (Gustman et al. 2014).

We then calculate a hypothetical annuitized value of wealth for HRS participants. For single people, the annuitized value is the amount of income a no-load annuity would pay for the expected remaining years of their lives, assuming life expectancies reported by the Social Security actuary and a real interest rate of 2.5 percent. For married people, this annuity would have one payout when both members are alive and a smaller payout when only one is alive. Following the convention of many annuities, we calculate the payout as a joint-and-two-thirds annuity, whereby the annuity pays a surviving spouse two-thirds the amount when both spouses are alive. Although this calculation overstates the value of an annuity one could actually purchase, given loading costs and the transactions costs from liquidating assets, it provides a rough conversion of wealth into an annual metric.

To this estimated payout, we then add other sources of regular income not captured in the wealth measure, including veterans' benefits, welfare (as defined by the HRS), food stamps, and Social Security retirement benefits for those who are claiming. We do not include one-time or short-term sources of income, like insurance payments or unemployment insurance benefits, given that recent sources of such income would already be incorporated in wealth and would not likely constitute an important ongoing source of wealth.

We use this comprehensive measure of annuitized wealth to assess economic insecurity in two ways. First, we use it to calculate an absolute measure of well-being based on the poverty threshold, with values below 150 percent of the threshold as indicating insecurity, as in Love et al. (2018). (We use a value higher than 100 percent because we think about the actual threshold taking into account the fact that many households have wealth to supplement their income.) We are also interested in the evolution of the measure over time, because a large decline in the measure may indicate that households are 'living beyond their means' and thus likely to face economic insecurity in the future. To do this, we take our measure of annualized resources for each household in both 1994 and 2014 and note whether the amount in the latter year has fallen by 30 percent or more. We adjust this calculation for changes in household size, using the joint-and-two-thirds annuity benchmark from above. For example, we would indicate that a household that has gone from a married couple to a single person has experienced a large drop in wealth if the annuitized wealth measure in the second period is less than 47 percent [2/3*(1-0.3)] of the annuitized wealth in the first period.

We also look at material hardship among elderly households in 2014, using HRS data reporting consumption patterns that may indicate economic hardship. While these measures are correlated with other measures of economic hardship like poverty, many older people above the

poverty line also report material hardship (Levy 2015). Another difference between these measures and those based on income, wealth, and participation in means-tested program is that the thresholds do not depend on household size and composition. We identify a respondent as experiencing material hardship if the individual answered affirmatively to the following questions:

(1) Food insecurity: 'In the last two years, have you always had enough money to buy the food you need?'

(2) Medication cutbacks: 'At any time in the last two years, have you ended up taking less medication than was prescribed for you because of the cost?'

We also identify a respondent as experiencing hardship based on whether they are participating in the means-tested programs of Medicaid or SNAP (food stamps) in 2014. By definition, participants in means-tested programs are experiencing measured economic insecurity, although the eligibility rules have multiple criteria that attempt to capture the complexity of economic insecurity.

Table 1 here.

Table 1 shows the means of these indicators in 2014 for respondents in our sample that were born between 1932 and 1937 (and thus who were 77 to 82 years old in 2014). We show means for the full sample and for men and women separately. All results are weighted using the person-level weights from the HRS to correct for the survey's oversampling of Blacks, Hispanics, and Floridians. (We use weights throughout the analysis given that the outcomes of most interest—the means of predicted realizations of different types of hardship—would otherwise be too high given the oversampling of race and ethnicity groups that tend to be poorer. For the observed outcomes of individuals born between 1932 and 1937, we use the combined person-level and nursing home resident weight from the 2014 wave of the HRS. In the regression analyses to

generate the predicted outcomes, we weight the estimation by the person-level weight from the 1994 wave of the 1932 to 1937 birth cohort. For the predicted outcomes of individuals born between 1952 and 1957, we use the person-level weight from the 2014 wave of the HRS.)

For the full sample, the poverty rate, at 6.5 percent, suggests lower poverty than does the Census Bureau measure (which was around 12 percent for individuals over the age of 75 in 2014), but the lower level is consistent with other work suggesting that the Census measures may overstate the actual degree of poverty (Hurd and Rohwedder 2006; Bee and Mitchell 2017). The shares of this cohort having a low value of annuitized wealth or experiencing a big decline in annuitized wealth was almost double the share in poverty, at around 12 percent. Around 5 percent of respondents in this group reported having to cut back their medication, being food insecure, or using food stamps.

By nearly all measures, women were more likely to be experiencing economic insecurity than men at older ages, consistent with findings in other studies (see, for example, Brown and Dynan 2017). Only 3.6 percent of men between ages 77 and 82 were in poverty in 2014, compared with 8.6 percent of females. The share of elderly men with annuitized wealth below 150 percent of the poverty threshold, at 7.4 percent in 2014, was also less than half as much as the comparable share for women, which was 16 percent in 2014. (That said, men were a bit more likely to have experienced a large decline in the measure than women.) Elderly men were also somewhat less likely to be cutting back their medications or on Medicaid than their female counterparts and less than half as likely to use food stamps.

Factors potentially predicting economic security

We use a variety of individual and household characteristics of the 1932 to 1937 birth cohort sample as of 1994 to predict future economic insecurity. We look at real household wealth

in 1994, disaggregated by source. Different sources of wealth could have a differential impact on future economic security because of different asset returns, different tax treatment, different liquidity, and behavioral factors. We have separate measures for housing wealth and non-housing wealth. We also make use of the HRS projections of Social Security wealth assuming individuals claim at their full retirement age, as well as projected wealth in DB plans and actual wealth in DC accounts.

We also include separate terms for different types of outstanding household debt. As Brown, et al. (2020) and others have highlighted, a key feature distinguishing households now approaching retirement from their earlier counterparts is that they hold more debt. Table 2 shows SCF data documenting how the share of households between ages 55 and 64 holding different types of debt and median outstanding balances for borrowers have evolved since the early 1990s. The share of households in this age group holding debt of different types has changed little on net, except for education debt where the share has doubled. But, for all types of debt, the median amount of debt for borrowers in this age group has risen considerably. As documented by Dynan and Kohn (2007), greater holdings of debt probably reflect both developments related to the supply of credit (for example, financial innovation) and developments related to demand for credit (such as the rise in real home prices over time and less stigma associated with holding debt). The trend toward more holding of debt by older households makes it very important that we estimate the link between debt in late middle age and future hardship for the 1994 wave so that we can control for the greater debt of households in the 2014 when projecting the likelihood that they will face economic insecurity.

Table 2 here.

For our analysis, we separate debt between mortgage and non-mortgage debt. Ideally, we would like to include separate terms for different types of non-mortgage debt like vehicle debt and credit card balances, as research suggests that different types of debt have different relationships to the likelihood of financial distress among older households (Lusardi et al. 2018). However, we are only able to include a single term capturing all non-mortgage debt because the HRS does not provide information about the separate components.

Continued labor force participation as an individual approaches retirement might have a differential impact on future retirement security than other forms of income. Thus, we include income divided between labor and non-labor income.

We also use measures of initial health status and health history for the respondent and the spouse where present. Nearly every person over 65 years old has comprehensive health insurance, yet out-of-pocket health care costs can be high and drain household savings, particularly for those with a chronic illness or a history of acute illness that predicts future health care expenses. Thus, we include indicators of self-reported fair or poor health for the respondent and the spouse if present. We also include an indicator of whether the respondent ever smoked.

In addition, we include educational background, which may be correlated with preferences (such as patience and risk aversion) as well as behavioral traits (such as the ability to plan ahead and financial sophistication). Education may also be related to health, employment opportunities when older, and other factors that we are not fully able to control for with the other variables along these lines that we have included in the analysis.

We use respondent-level data for the regressions, and we run regressions separately for married respondents, single male respondents, and single female respondents given the different insurance and risks that come with having a spouse and being of different genders. All regressions

include measures of family composition. We include counts of the number of children the respondent has, as well as separate counts of children living at home with the respondents and children living outside the home but within 10 miles.

Appendix Table 1 shows summary statistics for the factors described above for the respondents in our sample from the 1994 wave. (Recall that we are restricting the analysis to households who were between age 57 and 62 in 1994.) Several of the results are of particular note. Social Security is a very considerable source of wealth, on average, for all groups. Men have substantially more wealth than women, by all measures, yet mean debt is higher for men than for women (suggesting that the debt may be partially financing assets such as homes and vehicles). Women have, on average, more children living at home and more children living nearby than the other groups.

Appendix Table 2 shows summary statistics for the same late-middle-age traits as Appendix Table 1 for the generation born in 1952 through 1957 and observed in the 2014 wave of the HRS. Social Security is not only still a considerable source of wealth but, for the median household, somewhat larger than other types of wealth put together. Looking at the medians for key variables (in the lower part of the table), several patterns stand out. First, women look better off than their earlier counterparts shown in Appendix Table 1 in terms of earned income and Social Security wealth (owing to their longer careers in paid work). Social Security wealth is a little higher for the full sample but down a bit for men. However, non-Social-Security wealth is much lower relative to the 1994 cohort for all groups. The size of the decline in the median for females is smaller than the increase in the median of their Social Security wealth, but the same comparison for men suggest that they are much worse off on net. Although the value of primary residences looks to be little changed, the means for debt on those residences are considerably higher.

Consistent with the results from the SCF in Table 2, the value of non-mortgage debt is also considerably higher (with the mean nearly three times as high as for the 1994 cohort).

Estimation and simulation

We establish the relationship between the characteristics of respondents age 57 to 62 years old in 1994 with measures of economic insecurity 20 years later, in 2014. We separately estimate the relationship for married respondents, single females, and single males. One important consideration is that a number of survey respondents die in the period between observations, and the factors that predict economic security may also predict survival. Thus, we estimate the relationship between economic security and predictors in two steps. First, we predict the probability that the survey respondents we observe in the first wave survive 20 years later, using our economic security predictors. Then we estimate the likelihood of being economically insecure conditional on surviving, correcting for the non-randomness of the surviving sample using the Heckman correction.[4] We estimate these equations using ordinarily least squares separately for different household types in 1994: single men, single women, and married couples.

As discussed before, our outcome measures are the probability of having various traits that would be associated with being economic insecure in 2014, when the respondents are between ages 77 and 82. These traits include being in poverty; having 'annuitized wealth' that leaves the household that the respondent is living in below 150 percent of the poverty line; facing a 30 percent or more decline in household annuitized wealth (adjusted for any changes in marital status)

[4] To ensure the model is identified, we include in the first stage (the estimation of the probability of being alive at age 77 to 82) an indicator for whether or not the respondent ever smoked, but exclude whether or not the respondent ever smoked from the second stage (the estimation of the effect on the economic security measures).

between 1994 and 2004; reporting experiencing material hardship in the form of food insecurity or medication cutbacks; and participating in the means-tested programs of Medicaid or SNAP.

The explanatory variables are all characteristics of the respondent and the household in which the respondent was living in 1994. With these estimates in hand, we then turn to understanding what our findings mean for the incoming generation of retirees. We apply the estimated effects of the factors predicting future economic insecurity for the 1994 cohort of respondents in late middle age to the 2014 cohort of respondents in late middle age. All of our predicted factors from 1994 are also included in the 2014 questionnaire, allowing for out-of-sample predictions with the 2014 cohort of near-retirees.

To interpret this exercise as a prediction of economic insecurity in 2034 requires the assumption that each factor would have the same predictive effect on economic insecurity between 2014 and 2034 as it did in 1994 and 2014. This assumption is strong, but we nonetheless believe that this exercise is useful in establishing a benchmark in understanding to what extent future economic insecurity of the elderly might be different than in the past based on observable demographic, social, health, and economic changes. Among the other factors that could have a different impact on the 2014 cohort than on the 1994 cohort, the wealth of people now nearing retirement might evolve differently as they approach old age in ways that influence future economic insecurity. In particular, asset returns appear to have significantly boosted the accumulated lifecycle wealth of households in their older years since the early 1990s (Sabelhaus and Feiveson 2019), but the global decline in the real interest rates (Del Negro et al. 2017) and the possibility that the recent period was an above-average realization (on net) suggest that the coming generation of elderly may not be nearly as fortunate in the returns they enjoy. We address this limitation of our baseline analysis below through an additional exercise that effectively allows for

different realizations of asset returns for those approaching retirement in 2014. (Although we only concretely explored the possibility of different realizations of asset returns, we acknowledge that there are many other factors that might play out differently for the more recent cohort. For example, self-reported health may have different implications for future health now than in the past.) Finally, we note that this population is heavily reliant on government programs like Social Security, Medicare, Medicaid, and SNAP; changes to these programs could affect the likelihood of hardship among future cohorts of elderly, although we do not explore the impact of any possible changes in this paper.

Results

In all, we run 21 separate regressions (7 measures of hardship modelled for three different groups—married households, single men, and single women), with the regressions each having a vector of explanatory variables. Between the number of coefficient estimates and the collinearity of some of the explanatory variables, looking at the individual estimates as a way of divining which factors matter is not particularly useful. Thus, we do not present these detailed results here (although they are available upon request). We can say that many of the point estimates make sense. For example, having more Social Security wealth, owning more housing, and having children living within 10 miles is generally associated with a lower probability of hardship.

Proceeding to the next stage, Figure 1 compares observed rates of economic insecurity in 2014 for the sample that was age 57 to 62 in 1994 (age 77 to 82 in 2014) with the predicted 2034 rates for the sample that was age 57 to 62 in 2014 (and will be age 77 to 82 in 2034). Given that we are using the regression results for the earlier cohort to make the predictions for the more recent cohort, the differences can be attributed to changes in the observable demographic, economic, and

financial characteristics of the late-middle-age population. For every measure but the poverty rate, the results suggest an increase in the share of the older population that is economically vulnerable. For example, 4.1 percent of the age 77 to 82 population was food insecure in 2014. Using the composition and characteristics of the 1952 to 1957 birth cohort and applying the relationship between the pre-elderly factors and future economic vulnerability observed for the 1932 to 1937 birth cohort, the food insecure rate is predicted to be 5.5 percent (an increase of about one-third). Notably, the predicted share of people in old age on Medicaid is predicted to rise from 8.4 percent in 2014 to 9.7 percent in 2034 (an increase of 15 percent). This change, if realized, would have important implications for federal and state budgets, which already devote around $100 billion of dollars a year to Medicaid spending on the elderly population.

Figure 1 here.

Figures 2 and 3 show the observed and simulated levels of economic security for each gender. The figures have some striking implications. First, by most metrics, today's female near-retirees are not predicted to experience more hardship in old age than the cohort of females that are currently in their late 70s and early 80s. The predicted shares of women cutting back medications or experiencing food insecurity are higher but the predicted shares for other types are hardship are little changed or lower. Second, today's male near-retirees are expected to experience considerably more hardship in old age than their earlier counterparts by all metrics that we consider. As a result, the gender gap that we documented in Table 1, whereby females experience more hardship of nearly all types in old age, is predicted to narrow and in some cases reverse. The implied improvements in the *relative* old-age outcomes for women suggest that the greater economic security resulting from the higher female labor force participation of the more recent cohort helps

offset factors that are likely to diminish economic security (such as less DB pension coverage and less accumulated financial and non-financial wealth).

To better understand what drives the implied deterioration in outcomes for the full sample, we next explore some possible factors. We describe these analyses below and show the results in Figure 4.

Figure 4 here.

The changing indebtedness of households

As noted above, more recent generations of near elderly have higher levels of debt than prior generations, which shows up in both housing and non-housing debt. Such burdens could presage greater insecurity for the incoming generation in retirement. Indeed, survey data analyzed by Lusardi et al. (2020) suggest that households now approaching retirement are uneasy with their current debt level, with more than one-third of people age 56-61 reporting being over-indebted.

As a crude way of assessing how big of a role greater indebtedness plays in the differences we observe between the data on the 1932 to 1937 birth cohort and the predictions for the 1952 to 1957 birth cohort, we re-run the analyses, normalizing the average debt levels of the 1952 to 1957 birth cohort to the levels of the 1932 to 1937 birth cohort. Thus, we remove the overall increase in the debt burden and compare the new simulations to the prior simulations and the observed outcomes of the earlier birth cohort. Note that this exercise will understate the role of debt since it only removes the increases on the intensive margin; it does not capture the fact that there are more households in late middle age holding debt now compared with two decades ago (as indicated in Table 2).

Comparing the first columns in each grouping in Figure 4 (which show the original simulation) with the second columns, we find that reversing the increase in debt modestly reduces

predicted old-age hardship for most measures. The exception is for the poverty rate, which is predicted to be higher than in the base case when the increase in debt is reversed. This latter result may seem surprising, but we note that debt might have a complex relationship with predicted hardship since the poorest households presumably have little access to credit.

Changing demographics

The racial and ethnic makeup of the population has changed over the last two decades. As shown in Table 3, the share of the HRS sample in late middle age that reported being White was about 7 percentage points lower in 2014 than in was in 1994 (on a weighted basis). The share reporting being Black rose by a little more than a percentage point (to 11 percent) and the share reporting being Hispanic rose by 5 percentage points (to 10 percent). To assess the importance of these changes, we divide our simulation results for the 1952 to 1957 birth cohort by race and ethnicity and reweight the sample to match the race and ethnicity distribution of the 1932 to 1937 birth cohort. We then recalculate population-wide predictions of financial hardship, with the results shown in the third columns of each group in Figure 4.[5]

Removing the effects of changing race and ethnicity makes a considerable difference in the predicted share of the population experiencing different types of economic insecurity. For example, the predicted poverty rate of the 1952 to 1957 birth cohort is 6 percent but, holding the distribution fixed to 1932 to 1937 proportions, the predicted poverty rate would only be 5.2 percent. Also of note, the predicted Medicaid enrollment rate households in their late 70s and early 80s in 2034 would be materially lower if the race and ethnic composition were unchanged. The

[5] Specifically, we divide the sample into six unique cells – white non-Hispanic, black non-Hispanic, other non-Hispanic, white Hispanic, black Hispanic, and other Hispanic. The weighted shares of the cells, using the HRS combined person-level and nursing home resident weight from the 2014 wave, are as follows: white non-Hispanic (0.8561), black non-Hispanic (0.0791), other non-Hispanic (0.0158), white Hispanic (0.0385), black Hispanic (0.0004), and other Hispanic (0.0101). We then calculate the predicted outcomes for each cell for the 1952 to 1957 cohort (weighted by the person-level weight from the 12th wave), multiply the predicted outcome for each cell by the weighted share of the 1932 to 1937 cohort, and sum the products to get the population average.

Medicaid enrollment rate would be 8.6 percent (instead of 9.7 percent), only slightly higher than the observed 8.4 percent for the 1932 to 1935 cohort.

We note that these results are not inconsistent with the view that the lower observed financial, non-financial, and private pension wealth for today's near-retirees documented in Appendix Tables 1 and 2 is playing a central role in raising predicted hardship. Wealth disparities across different race and ethnicity groups continue to be large and concerning. According to the SCF, the ratio of the wealth of the median White non-Hispanic household to the median Black household and the median Hispanic household has fluctuated between 5 to 1 and 10 to 1 for more than 20 years.

Career lengths

While many of the factors discussed would intuitively increase economic insecurity, one major factor that could counteract it is the longer careers of the later cohort of retirees. Working longer helps households build wealth and strengthen their balance sheets more generally. Indeed, Butrica and Karamcheva (2020) find that older households with more debt have a higher propensity to work and a later expected date of retirement, consistent. Working longer can also forestall public and private pension benefit claiming, which could ultimately increase the stream of income one receives upon claiming. Bronshtein et al. (2018) finds that delaying retirement by three to six months has the equivalent impact on retirement standard of living as a one percentage point increase in saving of labor income over 30 years. And what we observe in the data is that of those not yet retired, the median worker in the 1952 to 1957 birth cohort expects to work two years more than the median worker in the 1932 to 1937 birth cohort.

To assess the potential of this factor, we rerun our models including a variable of predicted remaining labor earnings, which we calculated for the outcomes variables that relied on annuitized

wealth. Because we have predicted retirement for the 1952 to 1957 birth cohort, we then run the simulations with this predicted labor wealth variable. The result of this exercise is shown in the third column of Figure 4. The additional labor earnings lower the predicted rates of most types of hardship, although the changes are fairly modest. Overall, the results suggest that we should not expect the longer careers people may be expecting to offset most of the effects of other factors that are likely to weaken economic security.

Uncertainty about asset returns

As stated before, the above exercise holds all of the observed factors constant in terms of their predicted impact on future economic security, although all of the factors are likely to have a different impact on the incoming generation than the current generation. The financial security of today's elderly has been enhanced by the capital gains they have experienced on the saving they did prior to retirement. One limitation of our baseline analysis is that it assumes that the returns on assets experienced by individuals nearing retirement now will be the same as those enjoyed by those who were nearing retirement in the mid-1990s. Real equilibrium safe interest rates have dropped sharply since the early 1980s—as can be seen in Figure 5a, for example, the real rate of interest on one-year Treasury rates securities has declined from an average exceeding 7 percent between 1980 and 1985 to an average of -1 percent over the past five years. Rates in recent years have been held down by the easy monetary policy put in place to support the economy in the wake of the Great Recession, but, many economists believe that safe interest rates will remain very low even after central banks normalize monetary policy (see, for example, Kiley and Roberts 2017, and Horneff et al. 2018). That said, the decline in real safe interest rates largely preceded the period we used for our regressions, so it may not be a large source of bias for our results. (Indeed the real one-year Treasury rate averaged 0.8 percent per year over this period).

Figure 5 here.

Uncertainty about rates of return on risky assets poses a larger challenge, as risk asset returns even when averaged over long periods of time. Figure 5b and Figure 5c show 20-year growth rates of real stock prices and real home prices, respectively. The mean of the 20-year growth rate of real stock prices series since the late 1800s is 2.1 percent but the standard deviation of the series is 3.2 percentage points. Importantly, the 1994 HRS cohort of near-elderly that we study enjoyed average annual real returns of 4.5 percent on stock that they held—more than double the average over history. The mean of the average 20-year growth rate of real home prices series (which goes back to the early 1900s) is 0.4 percent, with a standard deviation of 1.2 percentage points. The 1994 HRS cohort of nearly elderly on average experienced annual growth of 1.4 percent in real home prices between 1994 and 2014, also well above the longer-term historical average.

As a rough way of judging the possible importance of lower rates of return on risky assets for the coming generation of the elderly, we redo our simulation assuming that 2014 near-elderly households start with smaller amounts of stocks and housing assets than they actually had. It is difficult to map an assumption about lower returns to lower starting levels of wealth because the calculation turns out to be very sensitive to the timing of the lower returns as well as the speed with which older households are spending down their assets. Thus, to keep things very simple, we assume that the more recent cohort starts with half the amounts of stocks and housing as they actually have. As can be seen in Figure 6, this change does indeed increase predicted rates of several types of hardship. The predicted poverty rate is 0.4 percentage points higher than in the base case (going from 6 percent to 6.4 percent), predicted Medicaid enrollment is 1.1 percentage point higher (going from 9.7 percent to 10.7 percent), and the rate of low annuitized wealth is 1.1

percentage point higher (going from 14.8 percent to 15.9 percent). One might be surprised not to see even larger changes given the dramatic counterfactual assumption, but we note that the part of the population that has any of these risky assets at all in later middle age is better off than most of the households that tend to face the types of hardship we consider.

Conclusion

Our paper represents a distinct contribution to the retirement security literature in that it uses a rich longitudinal data set that spans 20 years to show how economic insecurity in old age relates to observable demographic, socioeconomics, and financial traits in late middle age for the cohort of the US population nearing retirement in the mid-1990s. It then uses these findings to examine how the cohort nearing retirement in the mid-2010s, which has different traits on average than the earlier cohort, is likely to fare in old age. In doing so, our paper complements the literature that focuses on actuarial calculations (i.e. calculations that consider how well the accumulated wealth of a cross-section of near-retirees will meet their likely consumption needs in retirement).

Our results imply that a material share of the individuals approaching retirement age in the mid-2010s are likely to face hardship in their late 70s and early 80s. One in twenty are predicted to be unable to purchase needed medications or food on a consistent basis. One in ten is predicted to be on Medicaid, and one in seven is predicted to have annuitized resources that are below 1.5 times the poverty line for their household. If realized, this incidence of hardship will be somewhat higher than for the cohort born 20 years earlier (around 1 to 2 percentage points higher for most measures). Women (who traditionally have experienced much higher economic insecurity in old age) are predicted to fare about the same as their earlier counterparts, but men are predicted to see considerably higher rates of hardship in old age. Simulations that effectively undo some of the

changes in traits of the more recent cohorts suggest that increases in the share of the population accounted for by race and ethnicity groups that tend to have lower wealth and income explain much of the increase in predicted hardship.

Our unique approach involved the strong assumption that the traits of the cohort that was in late middle age in the mid-2010s will have the same association with hardship in old age as did the traits of the cohort that was in late middle age twenty years earlier. This paper touched on some of the factors that could change these relationships (different asset returns and the ability to work longer) but future research should further explore how these relationships might change and what influence the changes might have on the results.

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Table 1: Summary measures of economic security for 1932-1937 birth cohort, in 2014

	All (N=2,047) Mean	Male (N=823) Mean	Female (N=1,224) Mean
In poverty (including nursing homes)	0.065	0.036	0.086
Cutback Meds	0.049	0.044	0.053
Food Insecure	0.041	0.031	0.049
Receiving SNAP	0.052	0.028	0.070
Receiving Medicaid	0.084	0.074	0.091
Annuitized wealth decline by 30%+	0.121	0.136	0.111
Annuitized wealth under 150% FPL	0.124	0.074	0.160

Notes: Observations are weighted by the Health and Retirement Study (HRS) provided the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. All outcomes are measures in the 2014 (12th) wave of the HRS.
Source: Authors' analysis of the Health and Retirement Study.

Table 2: Evolution of debt among households with heads age 55-64

	Share holding debt (%)		Median for those holding debt (thousands of 2016 $)	
	1992	2016	1992	2016
Mortgage Debt on Primary Residence	39	42	72.95	111.00
Other Residential Debt	6	6	41.93	100.00
Credit Card Debt	44	44	1.68	2.30
Education Debt	11	22	5.53	19.00
Vehicle Debt	30	34	11.36	17.19

Source: Authors' analysis of the Survey of Consumer Finances.

Table 3: Distribution of Race and Ethnicity

	Born 1932 to 1937		Born 1952 to 1957
	All (N= 4,217) Mean	Alive in 2014 (N=2,047) Mean	All (N=3,135) Mean
Race			
White	0.877	0.895	0.805
Black	0.095	0.080	0.108
Other	0.028	0.026	0.087
Ethnicity			
Non-Hispanic	0.945	0.951	0.896
Hispanic	0.055	0.049	0.104

Notes: The sample of all observations from the 1932 to 1937 birth cohort, observations are weighted by the Health and Retirement Study (HRS) provided person-level weight for the 1994 (2nd) wave of the HRS. The sample of observations from the 1932 to 1937 birth cohort alive in 2014 are weighted by the HRS provided the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. Observations from the 1932 to 1937 birth cohort are considered alive in 2014 if they responded to the HRS survey in the 2014 (12th) wave. The remaining respondents from the 1932 to 1937 birth cohort were interviewed in 2015. The sample of observations from the 1952 to 1957 birth cohort are weighted by the HRS provided person-level weight for the 2014 (12th) wave of the HRS.
Source: Authors' analysis of the Health and Retirement Study.

Appendix Table 1: Summary statistics for 1932-1937 birth cohort, in 1994

	All (N=4,217) Mean	Male (N=1,948) Mean	Female (N=2,269) Mean
Age	59.07	59.09	59.04
Number of Living Children	3.337	3.256	3.409
Number of Resident Children	0.304	0.289	0.318
Number of Children Living within 10 miles	1.126	1.043	1.202
Self-Reported Health (1=Excellent, 5=Poor)	2.620	2.619	2.620
Spouse Self-Reported Health	2.522	2.460	2.589
Ever Smoked?	0.644	0.747	0.551
HH Pre-claiming Social Security Wealth (at FRA)	278,420	298,861	259,915
Respondent DB Pension Wealth	97,360	156,472	43,850
Respondent DC Pension Wealth	20,010	23,384	16,955
HH Wealth, Excl. Social Security	775,201	644,911	282,243
Excl. Social Security and DB/DC Pensions	686,019	772,419	607,804
Excl. Social Security, DB/DC Pensions, and Housing	527,018	575,243	483,361
HH Value of Primary Residence	379,999	425,813	338,527
HH Value of Secondary Residence	20,109	20,996	19,306
HH Net value of Other Real Estate	86,508	92,187	81,366
HH Net value of Vehicles	24,447	26,786	22,329
HH Debt on Primary Residence	35,624	41,772	30,058
HH Debt on Secondary Residence	3,309	3,829	2,838
HH Other Debt	4,600	5,980	3,352
HH Earned Income	54,356	64,558	45,121
HH Unearned Income, Including Government Transfers	38,169	40,141	36,383
Education: Less than High School	0.288	0.283	0.293
Education: High School	0.348	0.295	0.397
Education: Some College	0.187	0.199	0.177
Education: College or More	0.176	0.223	0.133
MEMO: Median values			
HH Pre-claiming Social Security Wealth (at FRA)	303,285	328,531	260,758
HH Wealth, Excl. Social Security	375,466	430,360	327,120
Excl. Social Security and DB/DC Pensions	245,678	262,622	228,735
Excl. Social Security, DB/DC Pensions, and Housing	106,743	123,178	94,883
HH Value of Primary Residence	128,769	135,547	127,075
HH Earned Income	39,099	52,131	27,803
HH Unearned Income, Including Government Transfers	13,971	13,728	15,306

Notes: Dollar amounts in 2018 dollars. Observations are weighted by the Health and Retirement Study (HRS) provided person-level weight for the 2nd wave of the HRS. All outcomes are measures in the 1994 (2nd) wave of the HRS. Only observations that have non-missing responses for each variable are included in the sample.
Source: Authors' analysis of the Health and Retirement Study

Appendix Table 2: Summary statistics for 1952-1957 birth cohort, in 2014

	All (N=3,135) Mean	Male (N=1,352) Mean	Female (N=1,783) Mean
Age	59.00	58.98	59.03
Number of Living Children	2.635	2.658	2.615
Number of Resident Children	0.395	0.434	0.360
Number of Children Living within 10 miles	0.660	0.653	0.666
Self-Reported Health (1=Excellent, 5=Poor)	2.687	2.691	2.683
Spouse Self-Reported Health	2.577	2.559	2.595
Ever Smoked?	0.540	0.596	0.490
HH Pre-claiming Social Security Wealth (at FRA)	321,594	324,706	318,771
Respondent DB Pension Wealth	73,304	76,800	70,134
Respondent DC Pension Wealth	57,092	73,542	42,170
HH Wealth, Excl. Social Security	908,221	1,085,752	747,178
Excl. Social Security and DB/DC Pensions	727,689	893,681	577,113
Excl. Social Security, DB/DC Pensions and Housing	507,683	644,382	383,680
HH Value of Primary Residence	229,130	228,549	229,657
HH Value of Secondary Residence	73,186	104,762	44,543
HH Net value of Other Real Estate	61,083	81,075	42,947
HH Net value of Vehicles	23,754	13,166	7,911
HH Debt on Primary Residence	66,210	68,146	64,453
HH Debt on Secondary Residence	9,475	10,292	8,734
HH Other Debt	11,947	15,737	8,509
HH Earned Income	75,581	82,281	69,504
HH Unearned Income, Including Government Transfers	47,613	53,099	42,637
Education: Less than High School	0.129	0.136	0.123
Education: High School	0.244	0.247	0.241
Education: Some College	0.290	0.291	0.289
Education: College or More	0.337	0.326	0.347
MEMO: Median values			
HH Pre-claiming Social Security Wealth (at FRA)	311,083	315,919	308,090
HH Wealth, Excl. Social Security	294,987	295,161	293,696
Excl. Social Security and DB/DC Pensions	184,352	180,342	187,768
Excl. Social Security, DB/DC Pensions and Housing	53,042	47,738	58,346
HH Value of Primary Residence	159,126	159,126	159,126
HH Earned Income	48,496	53,884	42,030
HH Unearned Income, Including Government Transfers	11,822	10,863	12,932

Notes: Dollar amounts in 2018 dollars. Observations are weighted by the Health and Retirement Study (HRS) provided person-level weight for the 2014 (12th) wave of the HRS. All outcomes are measures in the 2014 (12th) wave of the HRS. Only observations that have non-missing responses for each variable are included in the sample.
Source: Authors' analysis of the Health and Retirement Study.

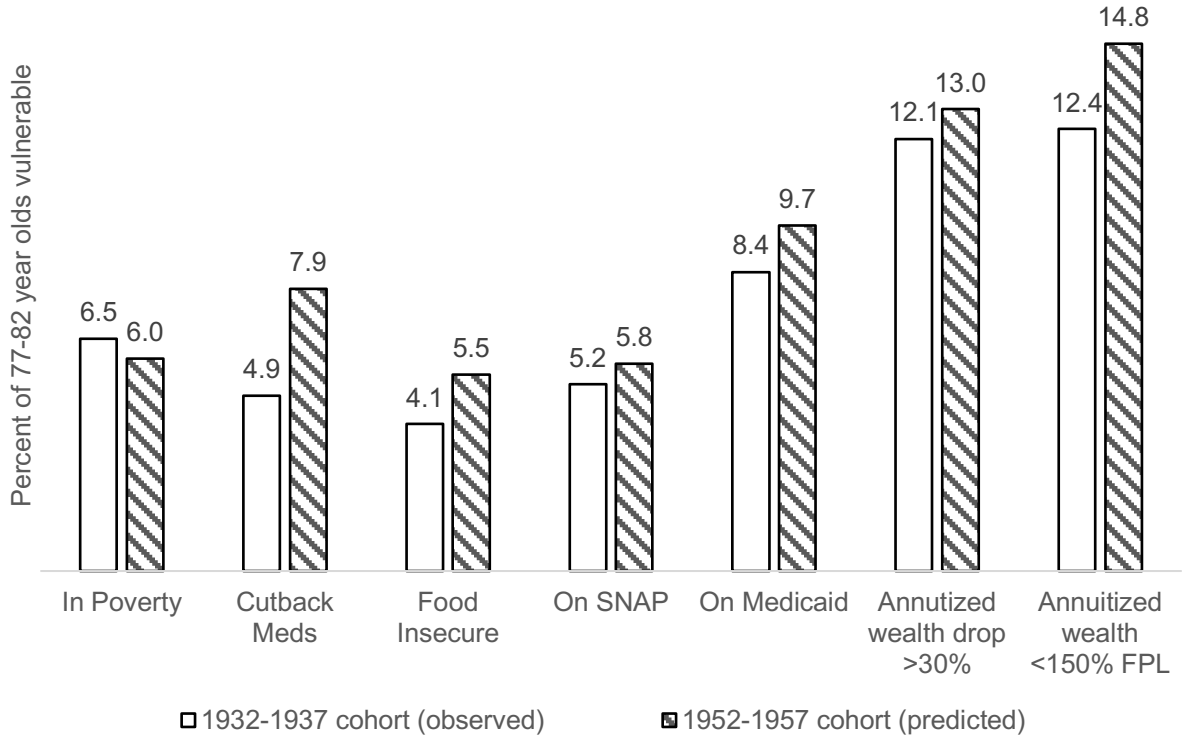

Figure 1. Percent of 77-82 year old population economically vulnerable, by metric of vulnerability and birth cohort.

Notes: When calculating the outcome for the 1932 to 1937 cohort, observations are weighted by the Health and Retirement Study (HRS) the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. When calculating the outcome for the 1952 to 1957 cohort, observations are weighted by the HRS provided person-level weight for the 2014 (12th) wave. In the regression analyses, observations are weighted using the 1932 to 1937 cohort's person-level weight from the 1994 (2nd) wave.

Source: Authors' calculations from the Health and Retirement Study

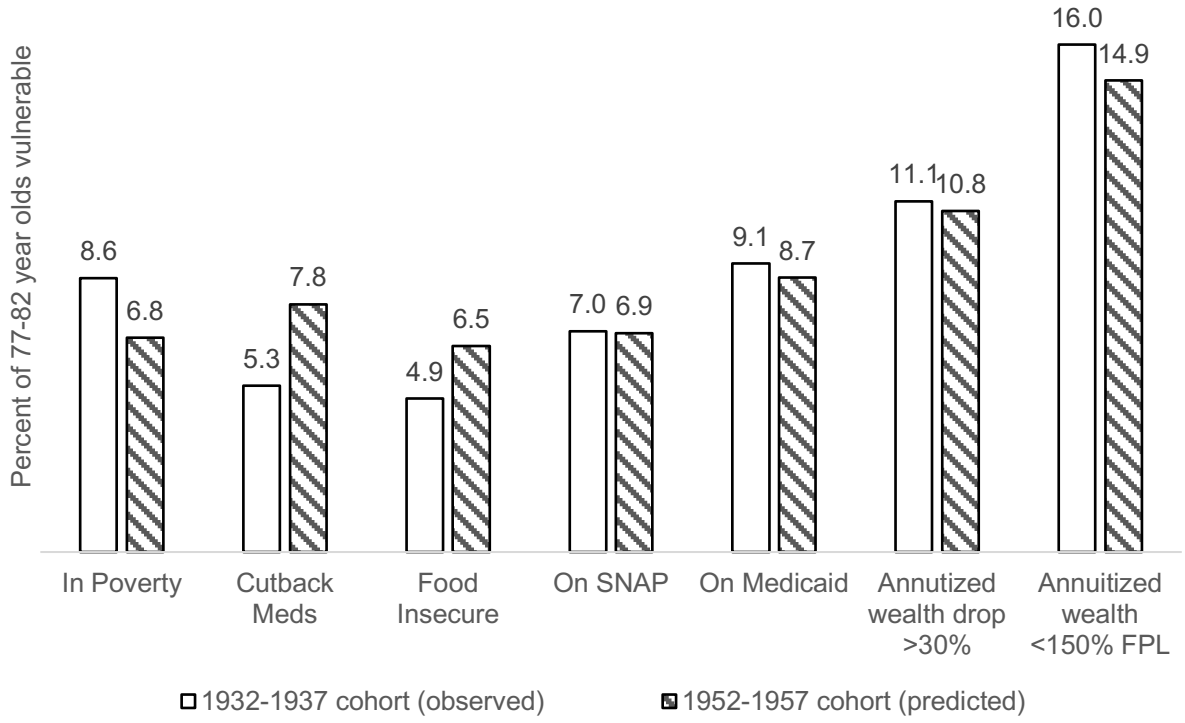

Figure 2. Percent of 77-82 year old female population economically vulnerable, by metric of vulnerability and birth cohort.

Notes: When calculating the outcome for the 1932 to 1937 cohort, observations are weighted by the Health and Retirement Study (HRS) the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. When calculating the outcome for the 1952 to 1957 cohort, observations are weighted by the HRS provided person-level weight for the 2014 (12th) wave. In the regression analyses, observations are weighted using the 1932 to 1937 cohort's person-level weight from the 1994 (2nd) wave.

Source: Authors' calculations from the Health and Retirement Study

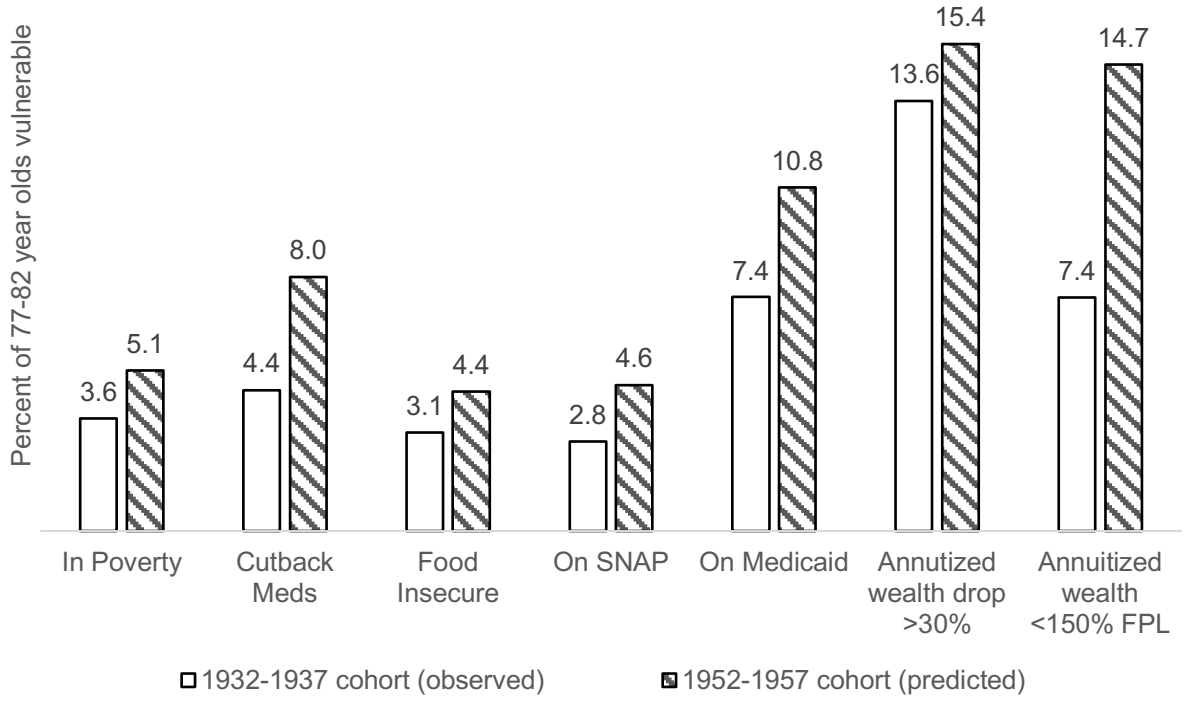

Figure 3. Percent of 77-82 year old male population economically vulnerable, by metric of vulnerability and birth cohort.

Notes: When calculating the outcome for the 1932 to 1937 cohort, observations are weighted by the Health and Retirement Study (HRS) the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. When calculating the outcome for the 1952 to 1957 cohort, observations are weighted by the HRS provided person-level weight for the 2014 (12th) wave. In the regression analyses, observations are weighted using the 1932 to 1937 cohort's person-level weight from the 1994 (2nd) wave.

Source: Authors' calculations from the Health and Retirement Study

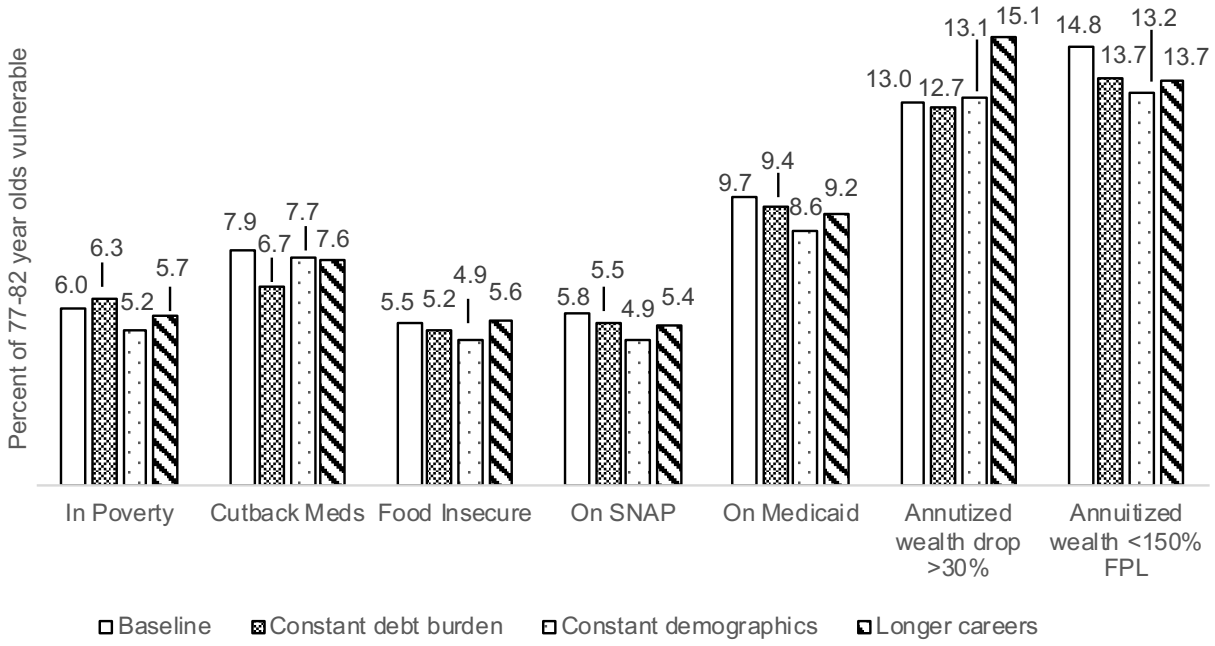

Figure 4. Percent of 77-82 year old population (1952-57 birth cohort) economically vulnerable, by metric of vulnerability, baseline simulation and simulations with other assumptions.

Notes: Baseline corresponds to original simulation for the 1952 to 1957 birth cohort based on estimates from the 1932 to 1937 cohort. The constant demographics analysis holds the racial and ethnic composition fixed to 1932 to 1937 birth cohort proportions by creating six cells – white non-Hispanic, black non-Hispanic, other non-Hispanic, white Hispanic, black Hispanic, and other Hispanic. The racial and ethnic composition is fixed at the shares of the 1932 to 1937 cohort alive in the 2014 (12th) wave of the Health and Retirement Study (HRS) weighted using the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. The (weighted) shares of the cells are as follows: white non-Hispanic (0.8561), black non-Hispanic (0.0791), other non-Hispanic (0.0158), white Hispanic (0.0385), black Hispanic (0.0004), and other Hispanic (0.0101). The longer careers analysis includes a variable in the estimation and simulation for individuals' expected remaining labor earnings. When calculating the outcome for the 1932 to 1937 cohort, observations are weighted by the HRS the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. When calculating the outcome for the 1952 to 1957 cohort, observations are weighted by the HRS provided person-level weight for the 2014 (12th) wave. In the regression analyses, observations are weighted using the 1932 to 1937 cohort's person-level weight from the 1994 (2nd) wave.

Source: Authors' calculations from the Health and Retirement Study

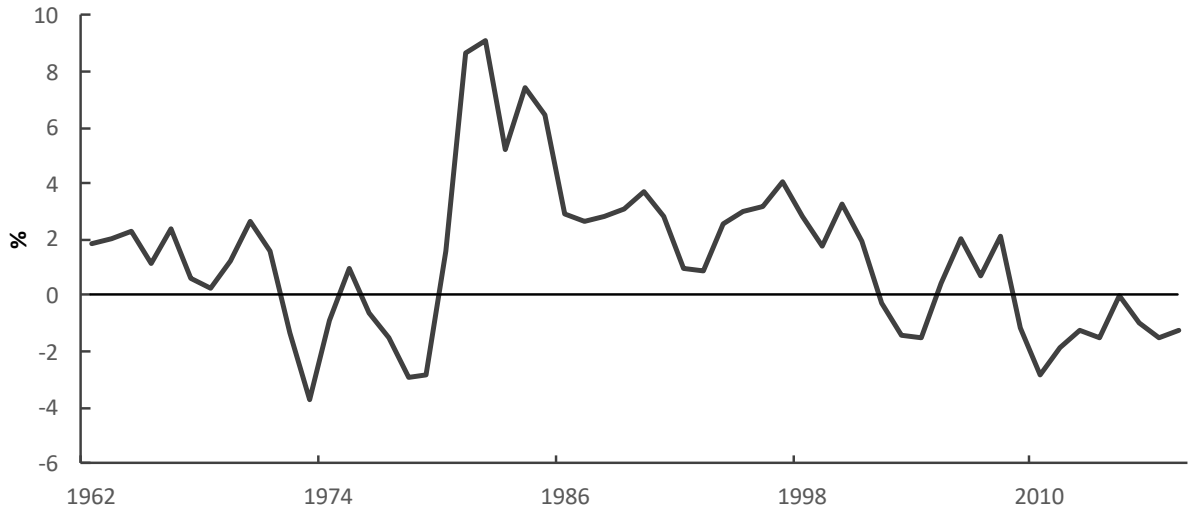

Figure 5a. Real 1-Year Treasury Rate

Note. The real Treasury rate in period *t* is calculated as the nominal Treasury rate in period *t* minus CPI inflation between period *t* and period *t*+1.

Source. Authors' calculations based on data from the Board of Governors from the Federal Reserve System and the Bureau of Labor Statistics.

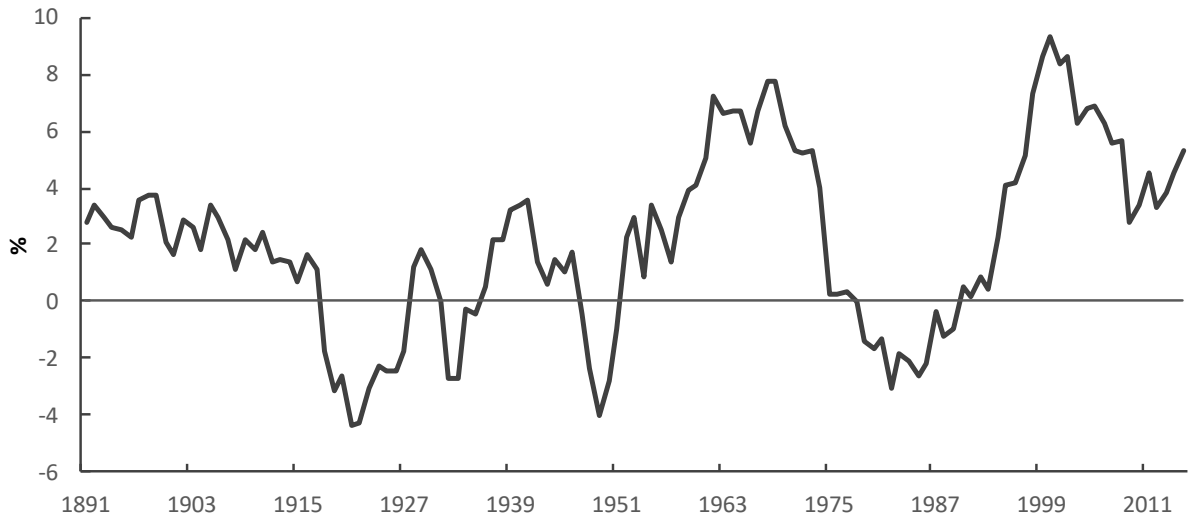

Figure 5b. 20-Year Average Annual Growth in Real Stock Prices

Source. Authors' calculations based on data from Robert Shiller.

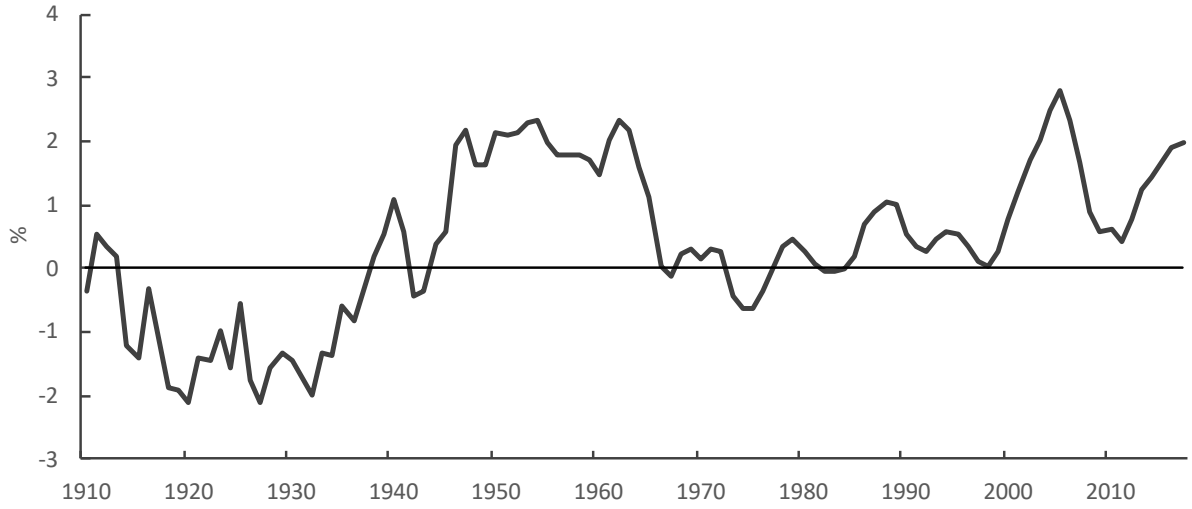

Figure 5c. 20-Year Average Annual Growth in Real Home Prices

Source. Authors' calculations based on data from Robert Shiller.

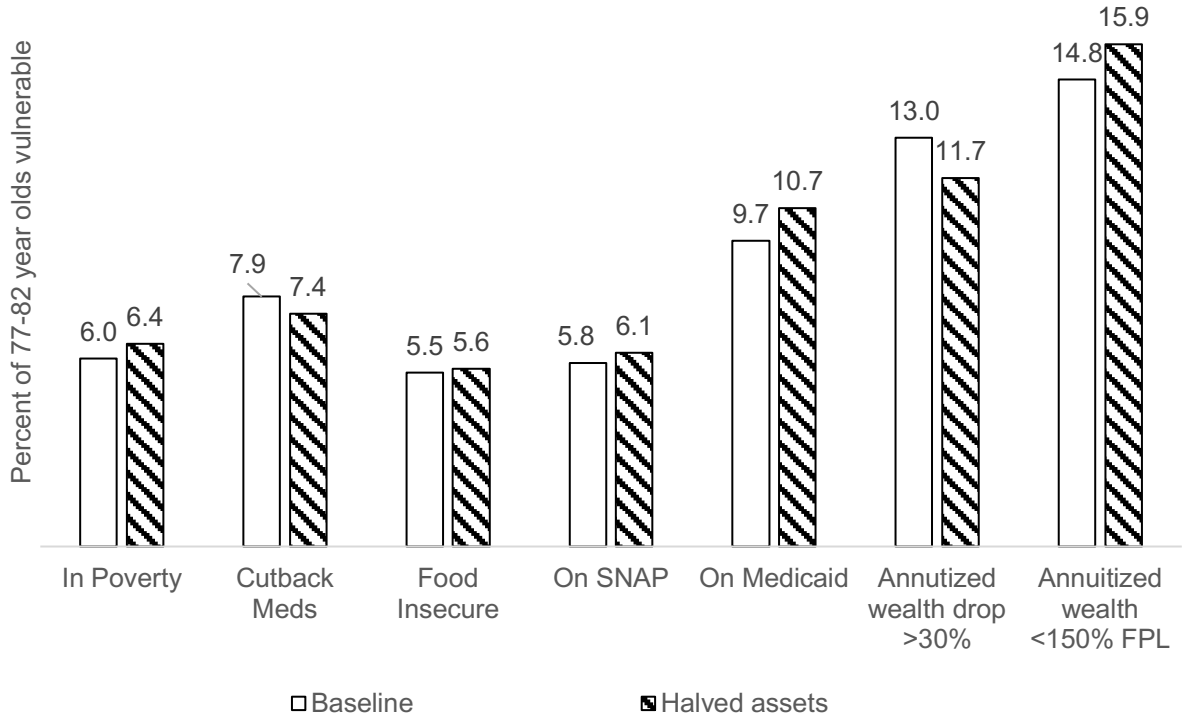

Figure 6. Percent of 77-82 year old population (1952-57 birth cohort) economically vulnerable, by metric of vulnerability, baseline simulation and simulation with halved assets.

Notes: Baseline corresponds to original simulation for the 1952 to 1957 birth cohort based on estimates from the 1932 to 1937 cohort. The halved assets analyses reduces the assets of the 1952 to 1957 cohort by half to account for lower expected asset returns relative to the experience of the 1932 to 1937 birth cohort. When calculating the outcome for the 1932 to 1937 cohort, observations are weighted by the Health and Retirement Study (HRS) the combined person-level and nursing home resident weight for the 2014 (12th) wave of the HRS. When calculating the outcome for the 1952 to 1957 cohort, observations are weighted by the HRS provided person-level weight for the 2014 (12th) wave. In the regression analyses, observations are weighted using the 1932 to 1937 cohort's person-level weight from the 1994 (2nd) wave.

Source: Authors' calculations from the Health and Retirement Study