Why Do Couples and Singles Save during Retirement? Household Heterogeneity and Its Aggregate Implications

Mariacristina De Nardi

University of Minnesota, Federal Reserve Bank of Minneapolis, Centre for Economic Policy Research (CEPR), and National Bureau of Economic Research

Eric French

University of Cambridge, CEPR, and Institute for Fiscal Studies (IFS)

John Bailey Jones

Federal Reserve Bank of Richmond

Rory McGee

University of Western Ontario and IFS

We estimate a model of savings for retired couples and singles who face longevity and medical expense risks and in which couples can leave bequests both when the first spouse dies and when the last spouse dies. We show that saving motives vary by marital status, permanent income, and age. We find that most households save more for medical expenses than for bequests but that richer households and couples, who hold most of the wealth, save more for bequests. As a result, bequest motives are a key determinant of aggregate retirement wealth.

We thank Wilbert van der Klaauw, Monica Costa Dias, Tom Crossley, Ami Ko, Melanie Lührmann, Tatyana Koreshkova, Victor Ríos-Rull, many seminar participants, editor Harald

Electronically published January 28, 2025

Journal of Political Economy, volume 133, number 3, March 2025.

https://doi.org/10.1086/733421

I. Introduction

This paper studies the saving behavior of retired couples and singles, including the transition of couples to singles due to spousal death. It documents new facts about wealth and medical expenses during retirement and about bequests distributed to both surviving spouses and other heirs. It then estimates a structural life-cycle model of saving and bequeathing that matches many important aspects of the data. Finally, it uses the model to evaluate the determinants of savings during retirement, both at the household and at the aggregate level.

In terms of new facts, we show that current couples decumulate their wealth slowly but that when the first spouse dies, net worth drops sharply (by $160,000 on average). Although some of this drop is explained by end-of-life medical expenses, most of it is due to transfers to nonspousal heirs. These "side" bequests are evidence of bequest motives toward recipients other than the surviving spouse. Once single, surviving households continue to run down their wealth slowly but at a quicker pace than when they were married. By the time the second spouse dies, much of the couples' wealth has vanished.

Our model of retiree saving incorporates heterogeneity in permanent income, life expectancy, and medical expenses and accounts for the large jump in medical spending that typically precedes a death. Bequests are potentially left when the first and the last member of a couple dies. In the former case, the estate is optimally split between the surviving spouse and other heirs.

We estimate the model using the method of simulated moments (MSM) and Assets and Health Dynamics among the Oldest Old (AHEAD) data. It matches well both Medicaid recipiency and wealth holdings (which we target) and changes in out-of-pocket medical expenses and wealth around the time of death (which we do not target).

Our model delivers several novel findings. First, most households (53%) save more to self-insure against medical expenses than to leave bequests. However, because these households hold relatively little wealth, the aggregate effect of eliminating medical expenses is small (mean

Uhlig, and four anonymous referees for helpful comments. We also thank Karolos Arapakis, Justin Kirschner, Jeremy McCauley, Ali Merali, and Rachel Rodgers for research assistance. We gratefully acknowledge support from the National Science Foundation (grant SES-2044748), the Social Security Administration through the Michigan Retirement Research Center (grant UM17-15), the Economic and Social Research Council Centre for Microeconomic Analysis of Public Policy at the Institute for Fiscal Studies (RES-544-28-50001) and grants "Inequality and the insurance value of transfers across the life cycle" (ES/P001831/1) and "Intergenerational transfers, insurance, and the transmission of inequality" (ES/V001248/1). The views expressed in this paper are those of the authors and not necessarily those of the NBER, the Federal Reserve Bank of Minneapolis, the Federal Reserve Bank of Richmond, the Institute for Fiscal Studies, or the Centre for Economic Policy Research.

wealth drops by 3.1%). In contrast, removing bequest motives reduces aggregate wealth by nearly five times as much (mean wealth drops by 14.8%). This is because we estimate bequests to be stronger for couples and richer singles, who hold most of the wealth. Hence, although medical spending is more important than leaving bequests for most households, bequest motives are more important for aggregate saving. We also find that 44% of aggregate bequests are voluntary, again implying a large role for bequest motives at the aggregate level.

Second, the relative importance of bequest motives and medical expenses varies by marital status. While most singles (62%) save more for medical expenses than for bequests, most couples (69%) save more for bequests. This is because we estimate that bequests are luxury goods, that couples value both side and terminal bequests, and that couples are typically richer than singles.

Third, medical expenses and bequest motives interact in powerful ways. While eliminating bequest motives and medical spending in isolation causes aggregate wealth to fall by 14.8% and 3.1%, respectively, eliminating both motives leads aggregate wealth to fall by 42.5%. This interaction arises because eliminating medical spending still leaves households with bequest motives, while eliminating bequest motives still leaves them needing to save for medical expenses. When both motives are present, wealth can satisfy the two needs simultaneously (Dynan, Skinner, and Zeldes 2002), and when both motives are absent, households have little reason to save. This result is important because much of the previous literature has studied precautionary saving for medical expenses in the absence of a bequest motive. Given that we provide robust evidence that bequest motives are present, the strength of this interaction makes it essential to model the two saving motives together.

The main innovations of our paper are twofold. First, we model both couples and singles. Given that couples make up roughly half of the retiree population and hold substantial wealth, ignoring them would leave us uninformed about many important aspects of retiree saving, including the aggregate response to policy reforms. Second, we better capture household behavior upon the death of the first spouse. Because we find that wealth drops at the time of the first spouse's death, in large part because they leave "side bequests" to heirs other than their surviving spouse, we model this additional bequest motive and estimate its strength. We also better model household behavior by allowing for the pervasive income- and wealth-based heterogeneity that we estimate.

The rest of the paper is organized as follows. Section II summarizes the findings of key related papers and motivates our main modeling choices. Section III introduces our data and displays the key facts that we seek to understand. Section IV presents our model, and section V details our estimation procedure. Section VI displays important features of the data affecting households' saving decisions and evaluates our model fit. To build additional trust in our model's predictions, section VII evaluates its performance in terms of important aspects of the data that we do not match at the estimation stage. Section VIII evaluates the saving determinants for singles and couples and in the aggregate, and section IX concludes.

II. Related Literature and Modeling Choices

The goal of this paper is to document and explain the differences in the saving behavior of couples and singles and their contribution to aggregate retirement savings. Although much of the structural work on retiree saving has focused on singles, a few papers, including Braun, Kopecky, and Koreshkova (2017) and Nakajima and Telyukova (2020), include couples. De Nardi, French, and Jones (2016b) provide a detailed literature review.

Our paper builds on these contributions by considering what happens when a spouse dies. Like Poterba, Venti, and Wise (2011), we find that net worth falls when households lose a spouse. We document that the distribution of wealth to heirs other than the surviving spouse is crucial to explain this drop. These facts motivate a novel feature of our model, which is that we allow households to leave bequests to nonspousal heirs when the first spouse dies.

From a theoretical standpoint, the death of a spouse is a natural time to distribute resources because it resolves uncertainty about the time of death and medical expenses of the deceased. Moreover, in a collective model of the household in which each spouse cares about their own consumption and the bequests they leave to nonspousal heirs when they die, bequests to people other than the surviving spouse arise naturally when the first spouse dies. We highlight this point in appendix section A.1 (apps. A–M are available online), where we also show that given our data, this collective model is observationally equivalent to our unitary model with side bequests.

In our model, bequests to nonspousal heirs also occur when the final member of a household dies. The desire to leave such bequests has received considerable attention as a potential explanation why households retain high levels of wealth at very old ages, as in Dynan, Skinner, and Zeldes (2002), Ameriks et al. (2011, 2020), and Lockwood (2018). De Nardi, French, and Jones (2016a) show that this kind of bequest motive helps their model simultaneously fit the wealth and Medicaid recipiency profiles of singles.

Besides modeling household demographic transitions and bequest motives toward the surviving spouse and other heirs, we take into account health and medical expense risk, social insurance for couples and singles, and heterogeneity in life expectancy by permanent income (PI) and marital status. These features are important because households face potentially large out-of-pocket medical and nursing home expenses (Feenberg and Skinner 1994; Palumbo 1999; French and Jones 2004, 2011; Marshall, McGarry, and Skinner 2011; Braun, Kopecky, and Koreshkova 2017), which generate precautionary savings (as in Kopecky and Koreshkova 2014; Laitner, Silverman, and Stolyarov 2018). But these risks are partially insured by means-tested programs such as Medicaid and Supplemental Security Income, which provide strong saving disincentives (Hubbard, Skinner, and Zeldes 1995; De Nardi, French, and Jones 2010). Finally, previous work has shown that high-income individuals live longer than low-income individuals (Attanasio and Emmerson 2003; Hong, Pijoan-Mas, and Ríos-Rull 2015) and that married people live longer than single people.

Our analysis abstracts from several factors that other papers study in the context of related questions. For instance, we do not explicitly model housing, which is the focus of Nakajima and Telyukova (2017, 2020), Chang and Ko (2021), Barczyk, Fahle, and Kredler (2022), and McGee (2022). Likewise, while our model of medical spending indirectly captures the way in which informal care and payments from long-term care insurance reduce out-of-pocket medical spending, we do not model the determinants of either factor; papers addressing these topics include Barczyk and Kredler (2018), Lockwood (2018), Mommaerts (2020) and Ko (2022). Additionally, while we extend the previous literature by introducing side bequests, we do not explicitly model inter vivos transfers. Inter vivos transfers are substantially smaller than bequests (Hurd, Smith, and Zissimopoulos 2011; Barczyk, Fahle, and Kredler 2022), and accounting for them would make our model considerably more complex. Barczyk, Fahle, and Kredler (2022) capture inter vivos transfers by modeling the strategic interactions between parents and children.

We also abstract from issues of intrahousehold bargaining (for a survey, see Chiappori and Mazzocco 2017) and use a unitary decision-making framework instead. We do so for four main reasons. First, we want to extend the previous singles-only analysis to the simplest model with both couples and singles. Second, very few members of our sample exercise their “outside option” of divorce, meaning issues of commitment are not very important during retirement. Third, in our regression analyses of wealth growth, we find no evidence that the husband’s share of retirement income (a natural proxy for bargaining weights) is an important determinant of wealth trajectories after retirement; this suggests that most retired households have similar internal decision-making protocols. Fourth, appendix section A.1 shows that in a 2-period version of our model with collective decision-making under commitment, imposing equal bargaining weights on husbands and wives is a normalization.

III. Savings, Medical Spending, and Medicaid

A. AHEAD Dataset

We use the AHEAD dataset, which began in 1993–94 with households of noninstitutionalized individuals aged 70 or older and has surveyed their survivors every 2 years since. The unit of analysis in our paper is the household, and all of the financial values that we report are measured at the household level. Appendix B describes the details of our sample selection and data work.

Three important decisions are that (i) to abstract from labor supply decisions, we consider only retired households; (ii) to be consistent with the transitions in the model, we drop households who either get married or divorced during the sample period; and (iii) due to the well-known underreporting of assets and medical spending in the initial wave, we drop the 1993–94 data.

Our 1996 data include 4,634 households, of whom 1,388 are initially couples and 3,246 are initially singles. This represents 24,274 household-year observations for which at least one household member was alive.

B. PI

A contribution of this paper is distinguishing heterogeneity from risks. During retirement, differences in PI capture a large amount of household ex ante heterogeneity: households with different PI ranks receive different flows of retirement income and face different processes for health, mortality, and medical expenses.

To estimate a household's PI, we first sum all of its annuitized income sources (Social Security benefits, defined benefit pension benefits, veterans benefits and annuities).[1] Because there is a roughly monotonic relationship between lifetime earnings and our annuitized income measure, this measure is also a good indicator of income during the working period. We then construct a PI measure comparable across households of different ages and sizes. To do so, we regress annuitized income on a household fixed effect, dummies for household structure, a polynomial in age, and interactions between these variables. These variables jointly explain 72% of the variation in incomes across all years and households, of which 10% is explained by age and household structure, with the remainder being explained by fixed effects. Our specification thus captures most of the income variation in our data. The rank order of each household's estimated fixed effect provides our measure of its PI. This is

[1] Since we model means-tested social insurance from SSI and Medicaid explicitly in our model (through a consumption floor), we do not include SSI transfers.

a time-invariant measure that follows the household even after one of its members dies. See appendix C for details.

C. *Savings Patterns and Their Determinants*

Our measure of wealth (or net worth) is the sum of all assets less mortgages and other debts.[2] Figure 1 displays median net worth, conditional on birth cohort and PI tercile, for different configurations of couples and singles. We break the data into four cohorts containing people who in 1996 were aged 71–76, 77–82, 83–88, or 89–102. For clarity, we display data for two cohorts in this picture (app. D presents the data profiles for the remaining cohorts, as well as our model fit). To construct these profiles, we calculate the median for each cohort-PI tercile cell, for those alive in each calendar year. The line for each cohort starts at the cohort's average age in 1996.

"All singles" include those who are divorced, never married, or widowed when first observed in our sample, and those who become widowed over the sample period. Figure 1*A* displays their median net worth, including the value of bequests left in the period after death. It highlights that the savings of elderly singles depend on their income (which is predetermined at retirement). Individuals with the lowest lifetime incomes reach retirement with little wealth and then run it down. Elderly singles in the middle and top of the income distribution also run down their wealth as they age, but they do so slowly and carry some wealth into very old ages.

"Initial singles" include only those who were single when they first appear in our sample and exclude those who lose their spouse during our sample period—that is, the "new singles." Because new singles tend to have more wealth than initial singles and new singles become a larger share of all singles over time, the trajectories of all singles in figure 1*A* slope down slightly less than those of initial singles in figure 1*B*. However, overall the two sets of trajectories are similar.

"Current couples" include couples who remain intact (and drops them from the sample when they become single). Figure 1*C* plots their net worth and reveals several interesting results. First, relative to singles in the same tercile, couples reach retirement with more wealth. Second, the wealth profiles of the lower- and middle-income surviving couples display no decumulation. Third, couples in the top PI tercile increase their net worth until almost age 90.

[2] The AHEAD dataset has information on the value of housing and real estate, autos, liquid assets (which include money market accounts, savings accounts, Treasury bills, etc.), individual retirement accounts, Keoghs, other defined contribution plans, wealth, stocks, the value of a farm or business, mutual funds, bonds, and other assets.

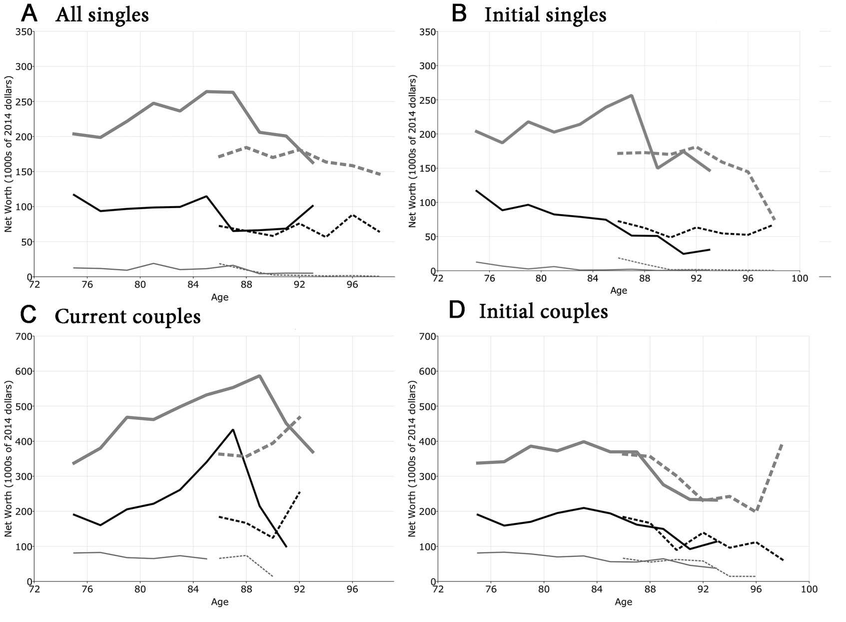

FIG. 1.—Median wealth by cohort, PI tercile, and age. Each line represents median wealth for a cohort-PI cell, traced over the time period 1996–2014. Solid lines indicate cohort ages 71–76 in 1996. Dashed lines indicate cohort ages 83–88 in 1996. Thicker lines denote higher PI terciles. Source: AHEAD data.

"Initial couples" include those who are initially in a couple but also retain those who subsequently lose a spouse. In that case, we report the wealth of the surviving spouse. Figure 1*D* shows that, relative to current couples, initial couples decumulate their wealth more quickly. Some of this decumulation reflects the higher decumulation rates of new singles. Some is due to the loss of wealth that occurs when one of the spouses dies. The remainder is due to sample composition: high-wealth couples live longer and comprise an increasing share of current couples over time.

To examine the correlates of wealth growth more closely, we regress wealth growth on a rich set of observables, including age, PI, their interaction, household composition (couples or singles), an indicator for being divorced (by 1994) or never married, the presence and number of children, initial homeownership, the husband's share of total annuitized income for couples, and an indicator for the death of a spouse in a couple. We report both mean and median regression results because theory does not imply that the effects should be constant (or proportional) across the distribution of wealth.

Table 1 reports the most relevant coefficients and their standard errors. It shows that PI and its interaction with age are important determinants of

TABLE 1
GROWTH IN WEALTH (in Thousands of 2014 Dollars) AND HOUSEHOLD CHARACTERISTICS

	Mean	Median
PI	260.79***	46.46***
	(106.14)	(9.72)
PI × age	−3.30***	−.59***
	(1.26)	(.12)
Couple	13.70*	.74
	(7.16)	(1.16)
Divorced or never marriedd	4.64	.05
	(9.44)	(.17)
Any children	−1.91	.13
	(7.29)	(.31)
Number of children	.71	.02
	(1.21)	(.03)
Initial homeowner	−5.83	−2.56***
	(5.27)	(.51)
Husband's income share	.51	2.10
	(19.21)	(2.64)
Death of spouse	−51.06***	−4.89***
	(10.82)	(1.74)
Observations	15,502	15,502

SOURCE.—AHEAD data.
NOTE.—The left-hand-side variable is change in wealth between adjacent waves. All regressions include a second-order polynomial in the household head's age and indicator variables for each individual's health status in both waves. "Husband's income share" is the husband's share of social security and defined benefit income. Standard errors are shown in parentheses.
* $p < .10$.
*** $p < .01$.

wealth growth. At the mean, couples save more than singles, even after controlling for a rich set of observables.

In contrast, and consistent with the assumptions that we make in our structural model, those who were divorced when first observed in our data or never married behave similarly to those who were married and then became single. Furthermore, differences in wealth growth between those with and without children, or with different numbers of children, are small and not statistically significant. It is worth noting that this result is consistent with several well-known studies that find little difference in the savings of households with and without children (Hurd 1989; Kopczuk and Lupton 2007).

Initial homeownership predicts slower wealth growth (although it is not significant at the mean). We take this surprising result as evidence that the relationship between homeownership and wealth growth is subtle and requires detailed modeling beyond the scope of this paper. Further analysis of homeownership and wealth growth can be found in Nakajima and Telyukova (2017, 2020), Chang and Ko (2021), Barczyk, Fahle, and Kredler (2022), and McGee (2022).

The husband's share of annuitized income is commonly used to measure the distribution of bargaining power within a couple (see, e.g., Browning 2000). The coefficient on this variable is statistically insignificant, which suggests that most retired households have similar internal decision-making protocols.

Finally, wealth drops significantly when a spouse dies. Taking stock, table 1 suggests that there are three important determinants of retiree saving: PI, marital status, and death. These elements will play key roles in our structural model.

D. *Spousal Death, Wealth, Medical Spending, and Side Bequests*

Because table 1 highlights that spousal death is important for saving, we next delve into what happens when couples experience the death of one spouse. To do so, we study the difference in net worth between two sets of couples. The first group consists of couples who lose a spouse. The second group consists of couples who are each similar along multiple dimensions to a couple in the first group (6 years before that couple's spousal death) but do not experience a spousal death around this time period.[3] Our matching analysis accounts for observable initial heterogeneity across couples and thus identifies the impact of death and the declining health that precedes it. Kopczuk (2007) and Kvaerner (2022) use similar methodologies to evaluate the wealth trajectories of those diagnosed with a terminal disease.

We use these data to estimate the following event study specification:

$$a_{i,t} = f_i + \sum_{j=-4}^{4} (g_j + d_j D_i) \times 1\{t - T_i = j\} + e_{i,t}, \tag{1}$$

where $a_{i,t}$ denotes the wealth of household i in calendar year t and D_i indicates whether i belongs to the group that does not lose a spouse ($D_i = 0$) or to the group that does ($D_i = 1$). We normalize the date of death, T_i, to occur at year 0 and follow the households for three waves before and two waves after the death. The coefficients of interest are the parameters $\{d_j\}$, which show the extent to which wealth rises or falls for households who experience the death of a spouse, relative to households in the matched sample who experience only a placebo death at date T_i.[4]

[3] We match on PI, initial wealth, and age. For details, see app. E; for additional outcomes, see Jones et al. (2020).

[4] The coefficients g_j and d_j are defined relative to their value 6 years before death (the omitted indicator category). In interpreting the summation, recall that AHEAD interviews occur every other year.

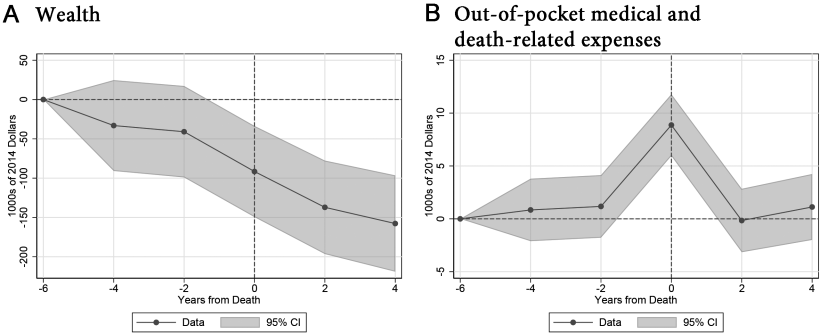

FIG. 2.—Average changes in wealth (A) and the sum of out-of-pocket medical and death-related expenses (B) around the death of a spouse in initial couples. Solid lines indicate estimates from the event study in equation (1); the shaded region denotes the 95% confidence interval (CI). Death dates are centered at year 0. Source: AHEAD/MCBS data.

Figure 2A reports our estimated death-related wealth decline (the values of d_j). On average, the net worth of households experiencing a death declines by an additional \$160,000 compared with those not experiencing one. While the decline begins up to 6 years in advance of death, a large share of the decline occurs in the final 2 years. Part of this decline reflects a gradual worsening of health and a related increase in medical expenses. The rest reflects bequests made at the time of death of the first spouse and changes in consumption. The gap between the treatment and control groups continues to widen during the postdeath years. This may reflect additional death-related effects—for instance, the loss of a spouse's income.

Some of these wealth declines are explained by high medical expenses before death. The AHEAD dataset contains high-quality data on what the household spends out of pocket on private insurance premia, drug costs, hospital stays, nursing home care, home health care, doctor visits, dental visits, and outpatient care, including those incurred during the last year of life. To construct our measure of out-of-pocket medical spending, we sum all of these components, along with funeral, other end-of-life expenses, and imputed Medicaid insurance contributions.

Figure 2B shows that when a member of the household dies, there is a sharp increase in medical expenses—they are \$8,000 larger during each of the 2 years preceding the death of a spouse, compared with similar couples experiencing no death. Over the 6 years preceding death, the total difference in medical expenses between these two households is about \$22,000. Thus, high end-of-life medical expenses can explain $22{,}000/160{,}000 = 14\%$ of the average fall in wealth. A similar event study reveals that the spending jump for singles is larger than for couples, totaling almost \$28,000.

If not medical and other end-of-life expenses, what explains the drop in wealth at the time of death of a spouse? When one spouse dies, a family member of the deceased, usually the surviving spouse, is asked how the estate is split between the surviving spouse and other heirs, such as children. The AHEAD data show that most of the wealth is left to the surviving spouse but that on average $87,000 is bequeathed to other heirs, transfers that we will refer to as "side bequests." Hence, the sum of reported nonspousal bequests and medical expenses explains about two-thirds of the observed wealth decrease.

To the best of our knowledge, these nonspousal side bequests are not well documented, the one exception being Fahle (2023). Panel A of table 2 shows that side bequests are positive in 30.6% of all spousal deaths, and when positive they have a large mean ($248,300) and make up a large fraction of the estate (42.9%).

Hence, these side bequests are common and large, both in absolute size and as a share of the couples' estates. Given that these transfers are

TABLE 2
Bequests at the Death of the First Spouse by Household Characteristics

	Share of Sample (%)	Fraction Positive (%)	Distribution when Positive: Mean Amount	Distribution when Positive: Share of Estate (%)
All	100	30.6	248,300	42.9
	A. By Children			
No children	6.7	39.6	369,700	43.9
Children	93.3	30.0	236,700	42.8
≥2 children	77.2	29.8	231,100	43.2
	B. By Homeownership Status			
Not a homeowner	22.4	24.4	257,900	58.1
Homeowner	77.6	32.4	246,200	39.6
	C. By Age of Death			
Age 72–81	25.9	26.6	216,700	37.8
Age 82–91	56.9	32.7	253,200	43.8
Age >91	17.2	29.9	273,000	46.3
	D. By PI			
Bottom PI tercile	18.8	27.9	165,500	53.1
Middle PI tercile	35.5	28.8	211,500	45.5
Top PI tercile	45.8	33.1	301,600	37.6

Source.—AHEAD and exit interview data.

Note.—Conditional mean was calculated by winsorizing values above the 99th percentile of overall sample. Homeownership status is measured in the wave preceding the death of the spouse. "No children" includes observations that are missing information on children (0.3% of the sample).

likely intentional, their presence supports the view that bequest motives are important. Although we do not require our estimated structural model to match either the decline in wealth around the death of a spouse or the transfers to other heirs, it does match these aspects of the data well, which helps validate its predictions.

Panel A of table 2 examines whether side bequests differ systematically by the presence or number of children. Contrary to what many expect, those without children are more likely to make nonspousal bequests and there is no strong behavioral relationship with the number of children. This is consistent with many earlier studies (e.g., Hurd 1989) that find no evidence of differences in saving behavior between those who do and do not have children, as well as evidence showing that saving for bequests is important even for those without children (Laitner and Juster 1996). While Fahle (2023, 4) finds that caregivers are more likely to receive side bequests, he concludes that "a warm-glow motive may be a reasonable characterization of bequest preferences for many decedents."

Panel B shows that homeowners are somewhat more likely to make side bequests but that, conditional on a transfer, nonhomeowners transfer a larger share. Panel C documents how bequests differ by the age at which the first spouse dies. Both the fraction of the deceased who transfer wealth to other heirs and the amount and share of wealth transferred tend to increase with age. This is consistent with the idea that, all else equal, older surviving spouses need fewer resources because they have shorter lifespans. Finally, panel D reports results by PI tercile. The fraction making nonspousal transfers and the size of these transfers are both increasing in PI, which is consistent with bequests being luxury goods.

E. Medicaid Recipiency

Because previous work has shown that means-tested social insurance programs affect saving, it is important to match the extent to which retirees use such programs. The AHEAD dataset has reliable measures of Medicaid recipiency, although not spending. Figure 3 plots Medicaid recipiency rates conditional on age, PI tercile, and cohort for all households in our sample. It shows that the lowest-income retirees are most likely to end up on Medicaid and that Medicaid recipiency rises with age. This is consistent with the asset-tested nature of these programs (high-asset households are not eligible) and the wealth rundown shown in figure 1.

IV. The Model

A retired household maximizes its expected discounted lifetime utility by choosing savings, consumption, and, upon death of the first spouse, the split of wealth between the survivor and other heirs. These choices

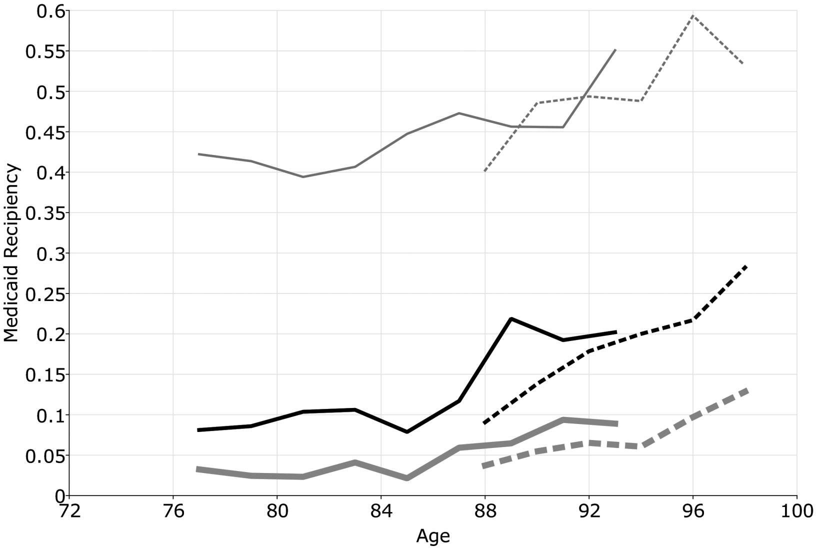

Fig. 3.—Medicaid recipiency by age, PI, and cohort. Singles and couples are pooled. Solid lines indicate cohort ages 71–76 in 1996. Dashed lines indicate cohort ages 83–88 in 1996. Thicker lines denote higher PI terciles. Source: AHEAD data, 1996–2014.

also determine final bequests upon the death of the last household member.

Households make these choices at household head age t, $t = t_r, t_r + 1 \ldots, T + 1$, where t_r represents the initial period that we consider (corresponding to age 70) and T represents the maximum potential lifespan (corresponding to age 102). Consistent with the AHEAD data frequency, our time period is 2 years long. For tractability, we assume that wives are always 2 years younger than their husbands (a single model period), so that one age is sufficient to characterize a household.

The household begins the period as either a couple, a newly widowed man or woman, or a single man or woman. It uses beginning-of-period cash on hand to consume and save. After that, mortality, health, and medical expense shocks occur, income net of taxes is received, and government transfers take place. At this point, the amount of cash on hand that is carried into the next period is known, and the household enters the next period.

People who are newly widowed have an additional decision: how to divide their estate between themselves and bequests to others.[5] Once that

[5] Because we have time-consistent preferences and a unitary model of the couple, there is no inconsistency between what the couple wants in terms of bequests and how the surviving spouse distributes bequests.

decision is made, they become single men or women, with wealth equal to the remainder of their estates.

When the final member of a household dies, all remaining net worth goes to its heirs. Consistent with reality, our timing implies that medical costs associated with death are collected before any bequests can be made and that Medicaid pays bills that are incurred even when a patient dies.

A. *Preferences*

The per-period utility functions for singles and couples are given by

$$u^S(c) = \frac{c^{1-\nu}}{1-\nu},\ u^C(c) = 2\frac{(c/\eta)^{1-\nu}}{1-\nu},\ 1 < \eta \leq 2, \nu \geq 0, \tag{2}$$

respectively, where c represents total consumption and the parameter η determines the extent to which couples enjoy economies of scale in the transformation of consumption goods to consumption services. The household weighs future utility with the factor β.

Our choice of how we model bequest motives is driven by both tractability and flexibility. This is because of the computational demands of solving our model and the lack of consensus in the literature about why households leave bequests. Our flexible but parsimonious functional form for bequests is consistent with several bequest motives, including dynastic, "warm glow," and strategic considerations.[6]

We thus assume that the household derives utility $\theta_j(b)$ from leaving bequest b, where $\theta_0(b)$ represents the utility from bequests when there are no surviving members in the household, while $\theta_1(b)$ represents the utility from bequests when there is a surviving spouse. It takes the form

$$\theta_j(b) = \phi_j\frac{(b+\kappa_j)^{1-\nu}}{1-\nu}, \tag{3}$$

where κ_j determines the curvature of the bequest function and ϕ_j determines its intensity. De Nardi (2004) shows that when $\kappa_j > 0$, bequests are luxuries and many households leave zero bequests, matching a key feature of the data.

B. *Sources of Uncertainty and Budget Constraints*

1. Income

Because there is less income uncertainty during retirement than during the working period, we simplify the model by assuming that the household's

[6] See, e.g., Abel and Warshawsky (1988), Andreoni (1989), and Carroll (1998) for "warm glow" formulations; see Bernheim, Shleifer, and Summers (1985), Brown (2003), Barczyk and Kredler (2018), and Barczyk, Fahle, and Kredler (2022) for strategic motives.

nonasset income at time t, $y_t(\cdot)$, is a deterministic function of the household's PI, I, age, and family structure f_t (single man, single woman, couple, all dead):

$$y_t(\cdot) = y(I, t, f_t). \tag{4}$$

We do not include received bequests as a source of income, because very few households aged 70 and older receive them.

2. Health and Survival Uncertainty

Health and survival are individual, rather than household-level, variables, and we use gender, $g \in \{h, w\}$, to differentiate between men and women. A person's health status, hs^g, indicates whether he or she is in a nursing home, in bad health, or in good health. The transition probabilities for a person's future health status depend on that person's current health status, PI, age, gender, and marital status

$$\pi_t(\cdot) = \Pr(hs_{t+1}|hs_t, I, t, g, f_t). \tag{5}$$

Survival depends on the same variables. Let $s_t(I, g, hs_t, f_t)$ denote the probability that an individual alive at age t survives to age $t + 1$.

3. Medical Expense Uncertainty

We use m_{t+1} to denote the sum of medical spending that is either paid out of pocket by the household or covered by Medicaid between periods t and $t + 1$. While we treat this total as exogenous, the division of expenses between the household and Medicaid depends on the household's financial resources, the total expenses that must be covered, and the level of the consumption floor. In other words, m_{t+1} gives the household's maximum possible medical spending obligation, but because of social insurance the amount paid by poorer households may be much smaller.

We allow m_{t+1} to depend on the health status of each family member at both the beginning and the end of the period, PI, age, household's family structure (also differentiating single men and single women) at the beginning and end of each period, and an idiosyncratic component, ψ_{t+1}:

$$\begin{aligned} \ln m_{t+1} = {} & m(hs_t^h, hs_t^w, hs_{t+1}^h, hs_{t+1}^w, I, t+1, f_t, f_{t+1}) \\ & + \sigma(hs_t^h, hs_t^w, hs_{t+1}^h, hs_{t+1}^w, I, t+1, f_t, f_{t+1}) \times \psi_{t+1}. \end{aligned} \tag{6}$$

We normalize the variance of ψ_{t+1} to be one.

Allowing medical expenses to depend on the household's composition and health status at both the beginning of a period (which was realized at the very end of the previous period) and the period's end (which will be carried over into the subsequent period) allows us to capture the jump in medical spending that occurs when a family member dies—that is, f_t changes—and to incorporate the impact of two subsequent health realizations on medical spending. The latter better helps us account for the cost of prolonged periods of bad health or nursing home stays. Our timing implies that the value of m_{t+1} is not known to the household when it decides how much to consume between periods t and $t+1$.

Following Feenberg and Skinner (1994) and French and Jones (2004), we assume that ψ_{t+1} can be decomposed as

$$\psi_{t+1} = \zeta_{t+1} + \xi_{t+1}, \xi_{t+1} \sim N(0, \sigma_{\xi}^2), \tag{7}$$

$$\zeta_{t+1} = \rho_m \zeta_t + \epsilon_{t+1}, \epsilon_{t+1} \sim N(0, \sigma_{\epsilon}^2), \tag{8}$$

where ξ_{t+1} and ϵ_{t+1} are serially and mutually independent. We discretize ξ and ζ, using the methods described in Tauchen (1986).

4. Budget Constraints

Let a_t denote net worth at the beginning of period t and r denote its constant pretax rate of return. Total posttax income is given by $Y(ra_t + y_t(\cdot), \tau_{f_t})$, with the vector τ_{f_t} summarizing the tax code, which depends on family structure. Define the resources available *before* government transfers as

$$\tilde{x}_t = a_t + Y(ra_t + y_t(\cdot), \tau_{f_t}) - m_t. \tag{9}$$

To capture Medicaid and SSI, we assume that government transfers bridge the gap between a minimum consumption floor and the household's financial resources,

$$tr_t(\tilde{x}_t, f_t) = \max\{0, c_{min}(f_t) - \tilde{x}_t\}, \tag{10}$$

where we allow the guaranteed consumption level c_{min} to vary with family structure. As defined in equation (9), the resource measure used to determine transfer eligibility accounts for medical expenses, along with income and wealth.

To save on state variables, we follow Deaton (1991) and sum the household's financial resources *after* government transfers into cash on hand:

$$x_t = a_t + Y(ra_t + y_t(\cdot), \tau_{f_t}) - m_t + tr_t(\tilde{x}_t, f_t). \tag{11}$$

Households divide their cash on hand between consumption and savings:

$$a_{t+1} = x_t - c_t, \tag{12}$$

$$c_t \in [c_{min}(f_t), x_t], \forall\ t. \tag{13}$$

Equation (13) ensures that consumption is at least as high as the consumption floor and that savings are nonnegative.

Next period's resources before transfers and next period's cash on hand can then be expressed in terms of this period's cash on hand and are, respectively,

$$\tilde{x}_{t+1} = (x_t - c_t) + Y(r(x_t - c_t) + y_{t+1}(\cdot), \tau_{f_{t+1}}) - m_{t+1}, \tag{14}$$

$$x_{t+1} = \tilde{x}_{t+1} + tr_{t+1}(\tilde{x}_{t+1}, f_{t+1}). \tag{15}$$

C. *Recursive Formulation*

Let $f_t = S$ indicate a single-person household. The value function for a single person of age t and gender g is

$$\begin{aligned} V_t^g(x_t, hs_t, I, \zeta_t) = \max_{c_t}\{&u^S(c_t) + \beta s_t(I, g, hs_t, S) \\ &\times E_t(V_{t+1}^g(x_{t+1}, hs_{t+1}, I, \zeta_{t+1})) \\ &+ \beta[1 - s_t(I, g, hs_t, S)]E_t\theta_0(x_{t+1})\}, \end{aligned} \tag{16}$$

subject to equations (4)–(8) and (13)–(15).

A newly single person—one who was part of a couple in the previous period and is single now—distributes bequests toward other heirs before making savings and consumption decisions as a single person:

$$V_t^{ng}(x_t, hs_t, I, \zeta_t) = \max_{b_t}\{\theta_1(b_t) + V_t^g(x_t - b_t, hs_t, I, \zeta_t)\}, \tag{17}$$

subject to equation

$$b_t \in [0, x_t - c_{min}(f_t)], \tag{18}$$

which prohibits the surviving spouse from using bequests to become eligible for government transfers.

The value function for couples ($f_t = C$) can be written as

$$\begin{aligned} V_t^C(x_t,\ hs_t^h, hs_t^w, I, \zeta_t) = \max_{c_t}\{&u^C(c_t) \\ &+ \beta s_t(I, w, hs_t^w, C)s_t(I, h, hs_t^h, C)E_t(V_{t+1}^C(x_{t+1}, hs_{t+1}^h, hs_{t+1}^w, I, \zeta_{t+1})) \\ &+ \beta s_t(I, w, hs_t^w, C)[1 - s_t(I, h, hs_t^h, C)]E_t(V_t^{nw}(x_{t+1}^w, hs_{t+1}^w, I, \zeta_{t+1})) \\ &+ \beta[1 - s_t(I, w, hs_t^w, C)]s_t(I, h, hs_t^h, C)E_t(V_{t+1}^{nh}(x_{t+1}^h, hs_{t+1}^h, I, \zeta_{t+1})) \\ &+ \beta[1 - s_t(I, w, hs_t^w, C)][1 - s_t(I, h, hs_t^h, C)]E_t\theta_0(x_{t+1})\}, \end{aligned} \tag{19}$$

subject to equations (4)–(8) and (13)–(15). The dating of the continuation value for new widows, $V_t^{nw}(\cdot)$, reflects that wives are one model period (2 years) younger than their husbands. We solve our model numerically; see appendix F for more details.

V. Estimation

We adopt a two-step strategy to estimate the model. In the first step, we estimate or calibrate those parameters that, given our assumptions, can be cleanly identified outside our model. These include health transitions, out-of-pocket medical expenses, and mortality rates from raw demographic data. In addition, we fix the discount factor β at an annual value of 0.97, and we set the consumption floor for couples to be 150% of the consumption floor for singles in accordance with the statutory rules for Medicaid and Supplemental Social Insurance.[7]

In the second step, we estimate the rest of the model's parameters, which include risk aversion, the consumption equivalence scale, bequest parameters, and the consumption floor for singles,

$$\Delta = (\nu, \eta, \phi_0, \phi_1, \kappa_0, \kappa_1, c_{min}(f_t = S)),$$

with the MSM, taking as given the parameters that were estimated in the first step. In particular, we find the parameter values that allow the simulated life-cycle decision profiles to "best match" (as measured by a generalized method of moments [GMM] criterion function) those from the data. These profiles are calculated using a large number of simulated life histories. Each simulated history begins with a draw of age, PI, and wealth from the initial joint distribution of the data and uses the observed history of health and survival shocks for each household member. Consequently, we generate attrition in our simulations that exactly matches the attrition in the data (including its variation by initial wealth). Appendix F provides more details on the mechanics of our MSM procedure.

Because our goal is to explain why retirees save so much and at rates that differ by income, we match moments of the distribution of wealth by cohort, age, and PI tercile. Because we wish to study differences in savings patterns of couples and singles, we match wealth profiles for the singles and couples separately. Finally, because Medicaid is an important program insuring the medical expenses and consumption of the poor, we also match Medicaid recipiency. More specifically, the moment conditions that comprise our estimator are given by

(1) the 25th percentile, median, and 75th percentile of wealth holdings by cohort-PI tercile-year for all singles (including bequests);

[7] For more on SSI spousal benefits, see https://www.ssa.gov/oact/cola/SSI.html.

(2) the 25th percentile, median, and 75th percentile of wealth holdings by cohort-PI tercile-year for those who are currently couples with both members currently alive;[8] and
(3) Medicaid recipiency by cohort-PI tercile-year for all households currently alive.

Appendix G contains a detailed description of our moment conditions, the weighting matrix in our GMM criterion function, and the asymptotic distribution of our parameter estimates.

When there is a death in a couple, we drop the household from the current couples' moments and add the surviving spouse to the moments for all singles. The moments for all singles thus combine new singles and initial singles. We do so because the number of new singles is small, especially earlier in our sample. This grouping also aligns with our model's assumption that, conditional on our state variables, new singles behave like initial singles. Such an assumption is consistent with the regression evidence in table 1. Moreover, in section VII we show that our model matches the jumps in wealth and medical expenses occurring at the death of the first spouse (which are not moments we target). This implies that our model also captures well the starting wealth of new singles.

When estimating our model, we face two well-known problems. First, in a cross section, older households were born in earlier years than younger households and, due to secular income growth, have lower lifetime incomes. Because of this, the wealth levels of households in older cohorts will likely be lower as well. As a result, comparing older households born in earlier years with younger households born in later years leads to understated wealth growth. Second, lower-income households and singles tend to die at younger ages than higher-income households and couples. The average survivor in a cohort thus has higher lifetime income, and thus more wealth, than the average deceased member of the same cohort. This "mortality bias" is more severe at older ages, when a greater share of the cohort members are dead. As a result, not accounting for mortality bias leads to overstated wealth growth. We address both problems by starting our simulations with initial conditions that come from the data, by explicitly modeling heterogeneity in mortality, and by giving simulated households the same mortality histories as in the data.

VI. Estimation Results

This section reports some of the most relevant features of our first-step estimates and discusses our second-step estimates and their identification.

[8] We also include bequests for the small number of couples where both spouses die between adjacent waves.

A. *First-Step Estimation Results*

Because they are key elements affecting saving behavior, the most important features of our first-step estimates pertain to life expectancy and nursing home risk, income and its drop when one of the spouses dies, and medical spending. Appendix H describes our first-step estimation procedures in detail.

1. Life Expectancy and Nursing Home Risk

We estimate health transitions and mortality rates simultaneously by fitting the transitions observed in the AHEAD dataset to a multinomial logit model. We allow the transition probabilities to depend on age, sex, marital status, current health status, PI, and interactions of these variables.

Table 3 shows life expectancies at age 70 for single and married people, respectively, which we obtain by using our estimated transition probabilities to simulate demographic histories, beginning at age 70, for different gender-PI-health-family structure combinations. It shows that rich people, women, married people, and healthy people live much longer than their poor, male, single, and sick counterparts. For instance, a single man at the 10th PI percentile and in a nursing home expects to live only

TABLE 3
Life Expectancy in Years, Conditional on Reaching Age 70

	Men			Women			
Income Percentile	Nursing Home (1)	Bad Health (2)	Good Health (3)	Nursing Home (4)	Bad Health (5)	Good Health (6)	All (7)
	Singles						
10	3.0	6.9	8.7	4.1	11.3	13.2	10.2
50	3.0	7.8	10.3	4.0	12.3	14.9	11.5
90	2.9	8.1	10.9	3.8	12.5	15.4	12.0
	Couples						
10	2.7	7.8	9.8	3.9	12.1	14.1	11.3
50	2.8	9.4	12.2	4.0	13.7	16.3	13.4
90	2.7	10.4	13.5	3.9	14.6	17.3	14.5
Single men							9.0
Married men							11.5
Single women							13.9
Married women							15.8
Oldest survivor*							17.9
Probability that oldest survivor is a woman (%)							63.7

Note.—Life expectancies were calculated through simulations using estimated health transition and survivor functions.
* Oldest survivor among households who were couples at age 70.

three more years, while a single woman at the 90th percentile and in good health expects to live 15.4 more years. Column 7 of the top two panels shows average life expectancy conditional on PI, averaging over both genders and health states. Singles at the 10th percentile of the PI distribution live on average 10.2 years, while singles at the 90th percentile live on average 12.0 years.

People in couples at age 70 live about 2 years longer than singles: single women live on average 13.9 years versus 15.8 for married women but, conditional on PI and health, the differences in longevity are much smaller. Thus, married people live longer than singles but a significant part of the difference is explained by the fact that married people tend to have higher PI and to be in better health. The bottom part of table 3 shows the expected years of remaining life for the oldest survivor in a household when both the man and the woman are 70. On average, the last survivor lives 17.9 more years. The woman is the oldest survivor 63.7% of the time.

Table 4 shows that single men and women face on average a 26% and 37% chance of being in a nursing home for an extended stay (at least 60 days in a year), respectively, while married men and women face on average a 20% and 36% chance of being in a nursing home for an extended stay. Married people are much less likely to transition into a nursing home at any age, but married people, especially women, often become single as their partner dies. Furthermore, married people tend to live longer than singles and thus have more years of life to potentially enter a nursing home. Compared with gender or marital status, PI and age-70 health have

TABLE 4
Probability of Ever Entering a Nursing Home, Conditional on Being Alive at Age 70

	Men		Women		
Income Percentile	Bad Health	Good Health	Bad Health	Good Health	All
			Singles		
10	23.6	25.3	35.8	37.9	32.8
50	22.8	24.8	35.5	38.2	32.5
90	20.3	22.8	32.2	35.8	30.1
			Couples		
10	17.3	19.2	34.4	37.0	28.7
50	16.6	18.8	34.1	37.3	28.7
90	14.6	16.8	31.4	34.5	26.3
Single men					26.4
Married men					19.5
Single women					37.2
Married women					36.3

Note.—Probabilities are calculated through simulations using estimated health transition and survivor functions.

smaller effects on ever being in a nursing home. This is because those with high PI, or in good health, are less likely to be in a nursing home at any given age, but they tend to live longer.

2. Income

As discussed above and in appendix C, we model nonasset income as a function of PI, age, and family structure. Figure 4 presents predicted income profiles for those at the 20th and 80th percentiles of the PI distribution. The average income of couples ranges from about $14,000 at the 20th percentile to over $30,000 at the 80th. As a point of comparison, median wealth holdings in the bottom and top PI terciles were $80,000 and $340,000, respectively, at age 75.

To illustrate how household income drops when one of the spouses dies, figure 4 displays three income scenarios for each PI level, all commencing with the income of a couple. Under the first scenario, the household remains a couple until age 100. Under the second, the man dies at age 80, while under the third, the woman dies at age 80. Our estimates imply that couples in which the husband dies at age 80 suffer a 40% decline in income, while couples in which the wife dies at 80 suffer a decline of 30%. The income losses that occur at the death of a spouse reflect the fact

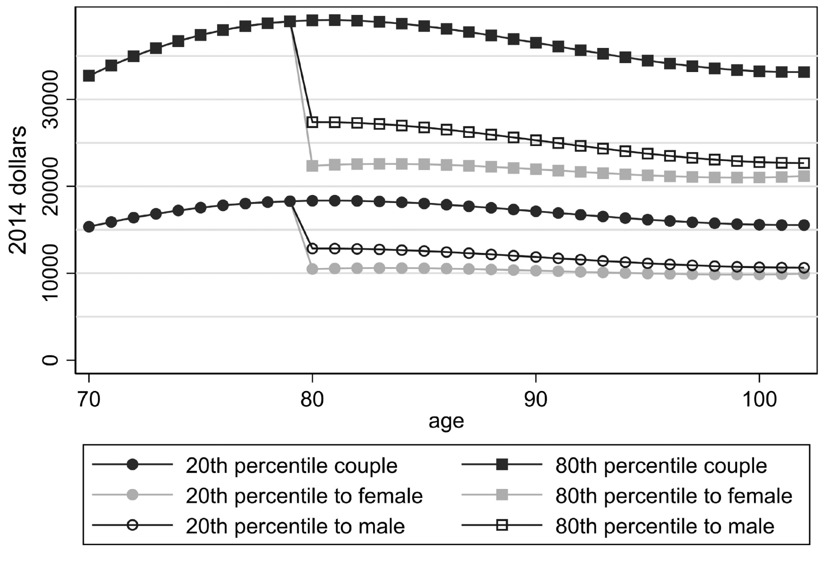

FIG. 4.—Income, conditional on PI and family structure. All households begin as couples and then either stay in a couple or switch to being a single man or single woman at age 80. The graph uses estimates of equation (4) from AHEAD data. See appendix C for details.

that even though Social Security and private defined benefit pensions have survivors' benefits, these benefits replace only a fraction of the deceased spouse's income.

3. Medical Spending

Because our model explicitly accounts for Medicaid payments, which depend on a household's savings, the measure of medical expenses that we need is the sum of out-of-pocket spending by the household and Medicaid payments.[9] Although the AHEAD dataset contains detailed data on out-of-pocket medical spending, it does not contain Medicaid payments. A key empirical contribution of this paper is to construct the sum of these two components by combining out-of-pocket medical spending information in the AHEAD data with Medicaid payment data from the Medicare Current Beneficiary Survey (MCBS).

The MCBS contains extremely high-quality administrative and survey information on both Medicaid payments and out-of-pocket medical spending (De Nardi et al. 2016). Like the HRS, it tracks household members as they enter nursing homes. Its main limitation for our purposes is that the data are collected at the individual (rather than the household) level; although the MCBS contains marital status, it lacks information on the medical spending or health of the spouse. To exploit the strengths of each dataset, we use the conditional mean matching procedure described in appendix section H.2 to impute a Medicaid payment for each individual in each period in the AHEAD data. The procedure preserves both the mean and the distribution of combined medical spending, conditional on Medicaid recipiency, age, income, out-of-pocket spending, and other health and medical utilization variables. The regression of Medicaid payments on these variables has an R^2 statistic of 0.67, suggesting that our predictions are accurate.

We model medical spending as a function of a polynomial in age, a polynomial in PI, marital status, health of each spouse (at the beginning and the end of the period), interactions of these variables, and persistent and transitory spending shocks (see eq. [6]). To estimate these profiles, we use fixed effects rather than ordinary least squares for two reasons. First, differential mortality causes the composition of our sample to vary with age, whereas we are interested in how medical expenses vary for the same individuals as they grow older. Second, by controlling for fixed effects we control for all time-invariant characteristics, including cohort effects.

We estimate the medical spending persistence parameter ρ_m and the variance of the transitory and persistent medical spending shocks using

[9] A large share of the elderly's medical spending is covered by Medicare co-pays, which are not means-tested. Our measure is net of those co-pays.

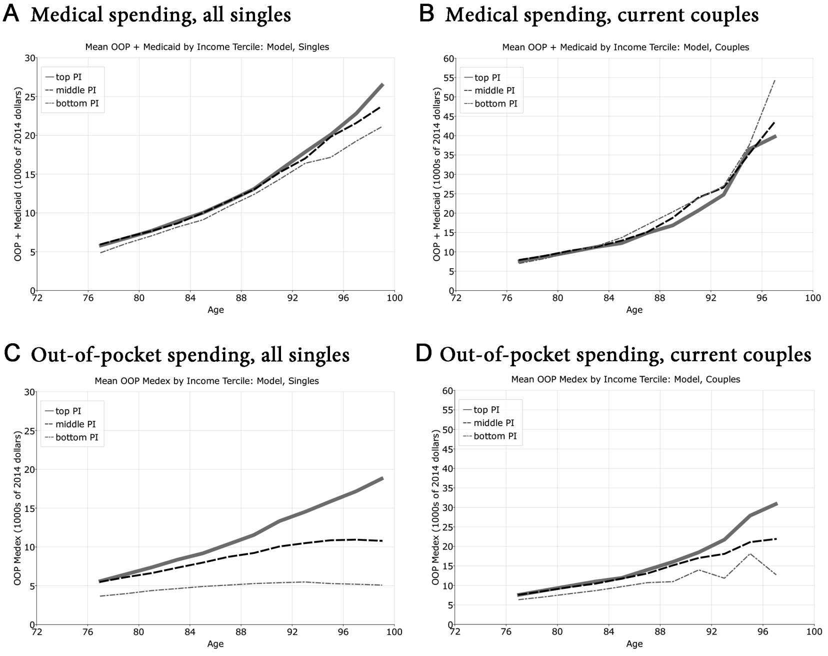

FIG. 5.—Household-level mean medical (top row) and out-of-pocket (bottom row) spending for all singles and current couples by PI tercile.

a standard error components model. Our estimates imply that approximately 40% of the cross-sectional variation in log medical spending is explained by observables. Of the remaining cross-sectional variation, 40% comes from the persistent shock and 60% comes from the transitory shock. Our estimated value of ρ_m is 0.85. See appendix section H.3 for details.

The top row of figure 5 shows model-predicted mean medical spending for the AHEAD cohort aged 71–76 in 1996, where we simulate the households through age 101.[10] Three general trends are apparent. First, medical expenses rise rapidly with age, in part because older individuals are more likely to reside in nursing homes or die.[11] Second, spending rises only modestly with PI, if at all. Although our underlying coefficients show that medical expenses rise with PI when health is held constant, lower-income

[10] Because of the structure of our medical spending model, which requires two periods of health realizations, the simulation results start at age 77.

[11] Our simulations include end-of-life spending.

households are often in worse health. Finally, in most cases the spending of couples (fig. 5*B*) is less than twice that of singles (fig. 5*A*). Given that we measure spending at the household level, this suggests that there are modest economies of scale in the consumption of medical goods and services.

The bottom row of figure 5 shows out-of-pocket medical spending. We find out-of-pocket expenses by simulating our estimated structural model and calculating Medicaid payments. Subtracting these payments from total medical spending (shown in the top row) yields out-of-pocket spending. Because Medicaid covers a larger share of medical expenses in poorer households, out-of-pocket spending has a strong income gradient. Likewise, as medical expenses rise with age, the share covered by Medicaid rises as well. This leads out-of-pocket medical spending to rise more slowly with age than total spending, especially among the low income. For instance, among singles in the bottom PI tercile, out-of-pocket medical spending stays between \$3,700 and \$5,400; among those at the top, spending rises by a factor of three, from \$5,600 to \$18,000. Because couples tend to be wealthier, their Medicaid recipiency rates are lower and thus Medicaid covers a smaller share of their costs.

B. Second-Step Parameters: Estimates and Identification

We require our model to match the observed variation in savings and Medicaid recipiency by cohort, income, age, and wealth rank. More specifically, we target the 25th percentile, the median, and the 75th percentile of wealth, conditional on cohort, PI tercile, and age, for both couples and singles. We also target average Medicaid recipiency by cohort, PI tercile, and age. As we will see below, these targets help separately identify households' precautionary saving motives, the strength of their bequest motives, and the degree to which bequests are luxury goods.

Table 5 reports our estimated preference parameters. Our estimate of the consumption equivalence scale η (1.53) is almost identical to the "modified" Organization for Economic Cooperation and Development scale. It also lies within the confidence interval estimated by Hong and Ríos-Rull (2012), who estimate it using data on life insurance holdings and a structural life-cycle model of consumption and saving decisions. After reviewing a variety of estimates, Fernández-Villaverde and Krueger (2007) argue in favor of similar economies of scale. In combination with our estimated value of ν, our estimate of η implies that to have the same marginal utility of consumption as a single, the consumption of a couple must be 1.64 times as large.[12]

[12] To see this, note that the marginal utilities of singles and couples are $\partial u^S(c^S)/\partial c = (c^S)^{-\nu}$ and $\partial u^C(c^C)/\partial c = (2/\eta^{1-\nu})(c^C)^{-\nu}$. Equating these marginal utilities yields $c^C/c^S = (2/\eta^{1-\nu})^{1/\nu}$.

TABLE 5
Estimated Second-Step Parameters

	Estimate
η: consumption equivalence scale	1.528
	(.195)
ϕ_0: bequest intensity, single (in thousands)	6,826
	(1,208)
κ_0: bequest curvature, single (in thousands)	3,517
	(352)
ϕ_1: bequest intensity, surviving spouse	4,447
	(656)
κ_1: bequest curvature, surviving spouse (in thousands)	211.2
	(23.3)
ν: coefficient of RRA	3.701
	(.096)
$c_{min}(f = 1)$: annual consumption floor, singles	4,101
	(124)

Note.—Standard errors are shown in parentheses. We set $c_{min}(f = 2) = 1.5 \cdot c_{min}(f = 1)$.

Intuitively, η is identified by the extent to which couples save, relative to singles, to self-insure future risks. To better illustrate this intuition, appendix I evaluates the sensitivity of our model-generated profiles to changes in parameter values. It shows that when we reduce the household consumption equivalence scale η, the savings of initial singles remain unchanged while those of couples increase. This is because, holding consumption constant, a lower value of η reduces the marginal utility of consumption for a couple relative to that of a single. Couples respond by deferring consumption to the future, when they might be singles who value consumption more highly at the margin. Setting η below its estimated value thus raises the savings of couples relative to singles in a counterfactual way.

The parameters ϕ_0 and κ_0 govern terminal bequest motives. The left-hand side of figure 6 shows, using the estimated values of ϕ_0 and κ_0, the share of resources that would be bequeathed by single households that know with certainty that they will die next period. In that scenario, single households with less than \$29,600 in resources will leave no bequests,[13] while those having \$100,000 will leave over 75% of their resources in bequests. Repeating the exercise for couples (with certain death for both spouses) reveals that couples require almost \$50,000 in resources before they choose to leave bequests to other heirs. These differences in behavior for singles and couples do not come from differences in the bequest parameters, which we constrain to be the same when there are no survivors.

[13] This is an annual value. In our 2-year framework, the threshold will (approximately) double. See app. sec. A.2.

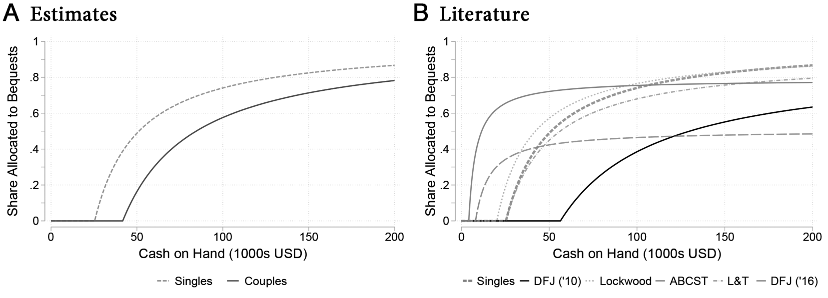

FIG. 6.—Estimated bequest motives. *A*, Expenditure share allocated to bequests for couples (solid line) and singles (dashed line) facing certain death in the next period. *B*, Comparing our results for singles (thick dashed line) with those in De Nardi, French, and Jones (2010) (DFJ '10), De Nardi, French, and Jones (2016a) (DFJ '16), Lockwood (2018), Ameriks et al. (2020) (ABCST), and Lee and Tan (2019) (L&T).

Rather, they are due to differences in household size and the presence of the equivalence scale. The left-hand side of figure 6 shows that bequests are a luxury good for singles and even more of a luxury good for couples. Figure 6*B* compares our estimated bequest motives for singles with those from several previous papers. Our estimated bequest motive for singles is of similar strength and slightly more of a luxury good than those estimated by Lockwood (2018) and Lee and Tan (2019).

To provide insights on the identification of ϕ_0 and κ_0, appendix I evaluates the sensitivity of our model-generated profiles to changes in their values. The two key findings are the following. First, increasing the marginal propensity to leave final bequests (MPB) by increasing ϕ_0 affects the savings of rich singles more than those of rich couples because singles have a shorter (effective) life expectancy and because couples also care about the side bequests made when one spouse dies, lowering the relative importance of terminal bequests. Second, raising κ_0, which raises the extent to which final bequests are a luxury good, increases the resource level beyond that which people actively save to leave these bequests. In contrast to changes to ϕ_0, which primarily affect rich households, changes to κ_0 affect households across much of the PI and wealth distribution.

Appendix I also discusses the sensitivity of our model-generated profiles to changes in ϕ_1 and κ_1, which govern the utility from bequests to nonspousal heirs at the death of the first spouse. Similarly to final bequests, decreasing the MPB of side bequests affects richer couples who are likely to leave a bequest, leading them to hold less wealth. Changing the threshold κ_1, in contrast, affects saving rates further down the PI and wealth distributions. However, the effects of changing ϕ_1 and κ_1 are also mediated by the fact that when the desire to leave side bequests is reduced, couples leave a larger share of their wealth to surviving spouses. This raises the savings of all singles and lowers Medicaid recipiency rates, because surviving spouses have more wealth to self-insure high medical expenses. Appendix section A.2 provides additional intuition on the side bequest decision.

A related issue is whether the data allow us to differentiate the parameters governing the terminal and side bequests. Appendix J reports a specification where we constrain the two sets of parameters to be equal, showing that this constraint substantially worsens the model's fit and generates different bequest behavior.

Our estimate of ν, the coefficient of relative risk aversion, is 3.7, a value similar to that estimated for retired singles in De Nardi, French, and Jones (2010) and to those typically used in the life-cycle literature. Appendix I shows that reducing our risk-aversion parameter reduces the wealth holdings of couples and singles and raises Medicaid recipiency.

Our estimate of the consumption floor c_{min} implies that the consumption of a single household is bounded below at \$4,101 per year. The floor for couples is set to 150% of this value. Our estimated floor is best interpreted as an "effective" consumption floor that accounts for transactions costs, stigma, and other determinants of Medicaid and SSI usage. Appendix I shows that raising the consumption floor reduces saving and raises Medicaid recipiency.

Appendix I also shows that even though ν and c_{min} have similar effects on savings, they have different effects on Medicaid recipiency. Decreasing the level of risk aversion and increasing the consumption floor both decrease saving, which in turn leads to higher Medicaid recipiency rates. This increase in Medicaid recipiency is concentrated at older ages, when households are most likely to face large medical expenses. Moreover, the effect is similar across the PI distribution. Raising the consumption floor, however, increases Medicaid recipiency even if savings are unchanged. This additional effect is largest for low-PI households, which are more likely to rely on Medicaid and more likely to receive Medicaid at younger ages. In sum, relative to lowering risk aversion, raising the consumption floor is more likely to increase Medicaid recipiency at younger ages and lower PI ranks.

Consequently, even if a decrease in relative risk aversion and simultaneous decrease in the consumption floor had no effect on the savings moments that we target, it would change the profile of Medicaid recipiency. More specifically, it would decrease the average Medicaid recipiency rate of low-PI households and would generate a steeper increase in their recipiency rate with age. It would likewise decrease the average Medicaid recipiency rate of higher-PI households, particularly at older ages. These changes in the model's fit of the Medicaid recipiency moments help us identify the level of risk aversion separately from the value of the consumption floor.

Finally, to evaluate our assumption that couples and singles have the same preferences, we estimate our model for singles only. Appendix K shows that estimated parameters from this alternative specification are in line with those from our baseline specification.

C. Model Fit

Figure 7 plots median net worth by age, PI, and birth cohort for current couples (fig. 7*A*) and all singles (fig. 7*B*), in the data (solid line) and from our model (dashed line).[14] It shows that our model matches the key features of retirement savings well. First, higher-PI households dissave more slowly than lower-PI households throughout retirement. Second, these patterns are more pronounced for couples, as long as both members of the couple stay alive. More specifically, singles in the lowest PI tercile have almost no wealth, while couples in the same PI tercile hold onto their retirement savings until age 90. Singles in the middle PI tercile start decumulating their wealth from the time that we start tracking them (age 75), while couples of the same age and PI tercile display flat wealth trajectories over much of the period that we observe them. Finally, households in the highest PI tercile, and especially current couples, have highest savings during their retirement years.

Figure 8 compares the Medicaid recipiency profiles generated by our model (dashed line) with those in the data (solid line). While the model matches the general patterns of Medicaid usage across age and household PI, it overstates the rate of increase of Medicaid recipiency among households in the bottom PI tercile. De Nardi, French, and Jones (2016a) experience similar issues with matching Medicaid recipiency trajectories, despite having separate asset tests and Medicaid rules that distinguish between the categorically and medically needy eligibility provisions. We are not able to capture all of the heterogeneity in Medicaid savings incentives, including that the Medicaid housing exemption depends on one's state of residence.

Appendix D shows all the moments that we match and our model's fit. Matching multiple wealth percentiles across multiple PI terciles requires the model to reproduce saving behavior across households with different incomes, household structures, and initial wealth holdings. High-PI households and couples save at higher rates than their low-PI and single counterparts, and this is especially evident at the 25th and 75th wealth percentiles, as shown in figures A3 and A4 (figs. A1–A25 are available online). Among couples at the top of the PI distribution, wealth rises with age at the 75th percentile of wealth but is constant at the 25th percentile. Among singles at the bottom of the PI distribution, wealth is constant at the 75th percentile, while it falls rapidly, or is zero throughout, at the

[14] For clarity, we only show targeted moments for two of our birth cohorts in each panel of these set of graphs, but the model fit is similarly good across cohorts (see app. D).

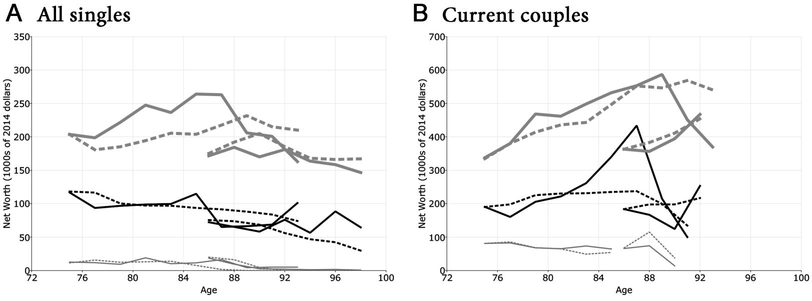

FIG. 7.—Median wealth by cohort and PI tercile. Solid lines indicate AHEAD data for cohorts aged 71–76 and 83–88 in 1996. Dashed lines indicate model simulations. Thicker lines denote higher PI terciles. Source: AHEAD data for 1996–2014.

25th percentile. This variation helps disentangle the saving motives operating within our model.

VII. Model Validation

To build additional trust in the predictions of our estimated model, we now turn to comparing its implications with aspects of the data that are

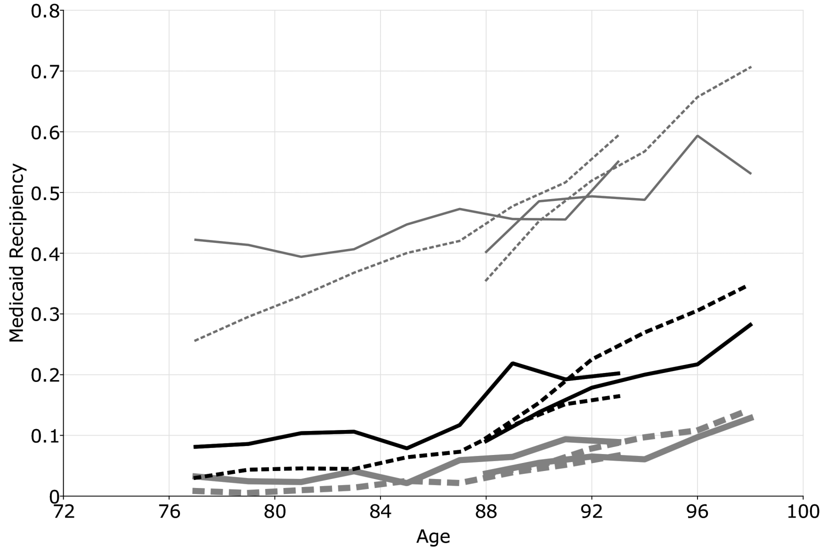

FIG. 8.—Medicaid recipiency by cohort and PI tercile. AHEAD data for 1996–2014. Solid lines indicate AHEAD data for cohorts aged 71–76 and 83–88 in 1996. Dashed lines indicate model simulations. Thicker lines denote higher PI terciles.

important given our questions but are not targeted in our estimation procedure. Our first validation exercise focuses on the rise in out-of-pocket medical spending around the death of a spouse and uses the same event study approach used for figure 2. Figure 9*A* shows that our model generates a trajectory of out-of-pocket medical expenses around the time of death that matches the one observed in the data. This is notable because we are not requiring the model to match it by construction. Although the sum of out-of-pocket and Medicaid payments is exogenous in our model, the out-of-pocket component is partly a function of household wealth, which determines Medicaid eligibility and thus the share of expenses paid by Medicaid. Hence, the fact that our model replicates the dynamics of out-of-pocket medical spending through the dynamics of saving and means-tested transfers implies that it endogenously generates the correct exposure of wealth to medical expense risk. The figure further shows that the model matches well the jump in out-of-pocket spending by initial wealth. In both model and data, low-wealth households spend less out of pocket because their low wealth makes them eligible for Medicaid in the event of high medical spending.

Our second validation exercise pertains to the wealth dynamics of couples when one of their spouses dies. The bottom row of figure 9 displays results from our event study analyses for the samples of all initial couples (fig. 9*D*), those with initial wealth above the median (fig. 9*E*), and those with initial wealth below the median (fig. 9*F*). It shows that the net worth dynamics around a spousal death generated by our model lie well within the 95% confidence interval of their AHEAD data counterpart, even when

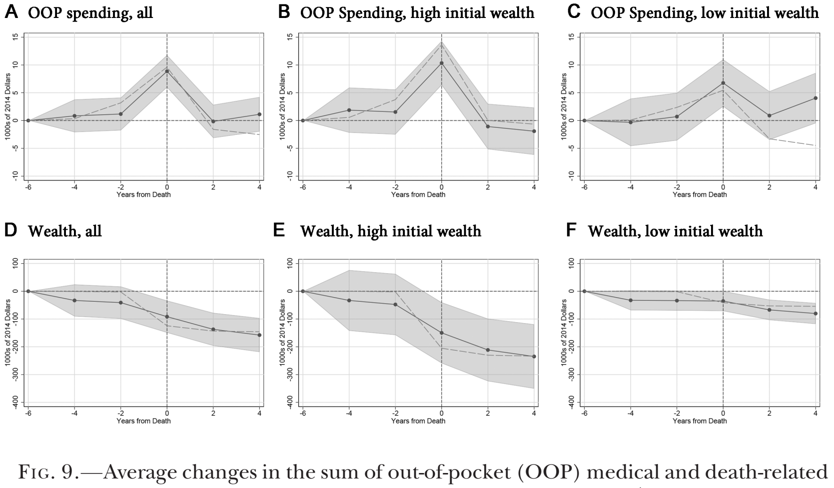

FIG. 9.—Average changes in the sum of out-of-pocket (OOP) medical and death-related expenses and in wealth. AHEAD data (solid dotted line) and their 95% confidence interval (shaded region) and differences-in-differences estimates (dashed line) are from model-simulated data. Death dates are centered at year 0.

we condition on household wealth. For the full sample of initial couples, both the data and the simulations predict a decline of $160,000, while for the sample of wealthier households we replicate the decline of $235,000 around death. Matching well the wealth dynamics for households around the time of death, including by initial wealth, means that our luxury good specification of bequest motives generates realistic saving behavior across the wealth distribution.

Our model thus captures well the dynamics of both medical spending and net worth around the time of a spousal death, across the wealth distribution. This implies that the model also matches well the extent to which the decline in wealth at death is due to out-of-pocket medical expenses, as opposed to nonspousal bequests. These features of the data, in turn, have important implications about the relative importance of the precautionary savings and bequest motives, which help identify the risk aversion and bequest motive parameters (given the consumption floor, which is pinned down by Medicaid recipiency).

Appendix L shows the model's fit of additional untargeted moments. These include: the effect of mortality bias on wealth trajectories; Medicaid recipiency rates for singles and couples; differences in wealth accumulation across genders (among singles); the 90th percentile of the wealth distribution for different age, cohort, PI, and household structure cells; and additional disaggregated plots of wealth and medical spending trajectories around the time of a spousal death. By and large, our model fits these additional untargeted moments well.

VIII. What Drives Savings?

To quantify the determinants of retiree savings, we perform several decomposition exercises and calculate the changes in retiree wealth that occur when we switch off bequest motives and/or medical spending. In doing so, we assume that household wealth accumulation before retirement is unchanged. Hence, our approach focuses on the drivers of postretirement savings and helps us understand policy reforms that are not announced far in advance. Because our model generates smaller wealth changes than one in which people can reoptimize their savings at younger ages, our results provide a lower bound of their impacts on retiree saving.

As a cohort ages, its wealth holdings change because of both household saving decisions and changes in household composition. In particular, as individuals die, single households exit the simulations and married households become widow(er)s (or "new singles"). The set of initial singles and current couples thus shrinks over time, while the set of all singles both loses and adds members. In addition, the financial position of new singles is affected by the amount of side bequests given to other heirs upon the death of the first spouse. In such a complex environment, examining each type of household separately allows us to better understand the mechanisms that drive savings. To make our analysis clearer, we focus on our youngest cohort, aged 71–76 in 1996. Starting at this point, we simulate households through age 99, using the processes for health and mortality estimated from the AHEAD data. Our simulations thus reflect the same mortality bias that is in the data.

In section VIII.A, we document how savings motives vary across different groups of households, which is important for understanding distributional implications. However, because wealth is unequally distributed, a change affecting the wealth of many poor households may have little effect on aggregate savings. In contrast, a change affecting a small number of rich households may have substantial aggregate effects. Hence, we finish our analysis by collecting all households alive at each age in our simulations into a pooled sample, containing both singles and couples, and describing (in sec. VIII.B) how various saving motives affect summary statistics for the distribution of wealth. We then perform the same analysis for the pooled sample of side and terminal bequests.

A. Heterogeneity in Retiree Savings Motives

To understand heterogeneity in saving motives, we focus on four groups of households—initial singles, new singles, all singles, and current couples—and examine the effects of eliminating one or more saving motives on their savings. Each row in figure 10 compares baseline savings with savings under a counterfactual described below, and each column refers to a particular group of households.

Eliminating terminal bequest motives has little to no effect on the savings of initially single households in the lower two PI terciles, who are too poor to save for bequests (panel *A*). In contrast, it reduces the savings of initial singles in the top PI tercile, especially at older ages. Among new singles (panel *B*), the wealth of high-PI households is lower at all ages. This occurs because in the absence of a terminal bequest motive, high-PI couples both reduce their savings (panel *D*) and tend to give more away as side bequests. Hence, new singles are left with less wealth upon the death of their spouse. The savings of all singles (panel *C*) initially resemble those of initial singles because few people lose their spouse in their early seventies. As the sample ages, however, new singles become increasingly common and dominate the wealth profiles of the all singles group.

Eliminating side bequests has no effect on the savings of initial singles (panel *E*), as they have only a terminal bequest motive. In contrast, it substantially increases the wealth of new singles in the top two PI terciles (panel *F*). As we eliminate side bequests, richer couples save less (panel *H*) but also give less to others when the spouse dies. Because the second effect dominates, new singles in the top two PI terciles start out richer.

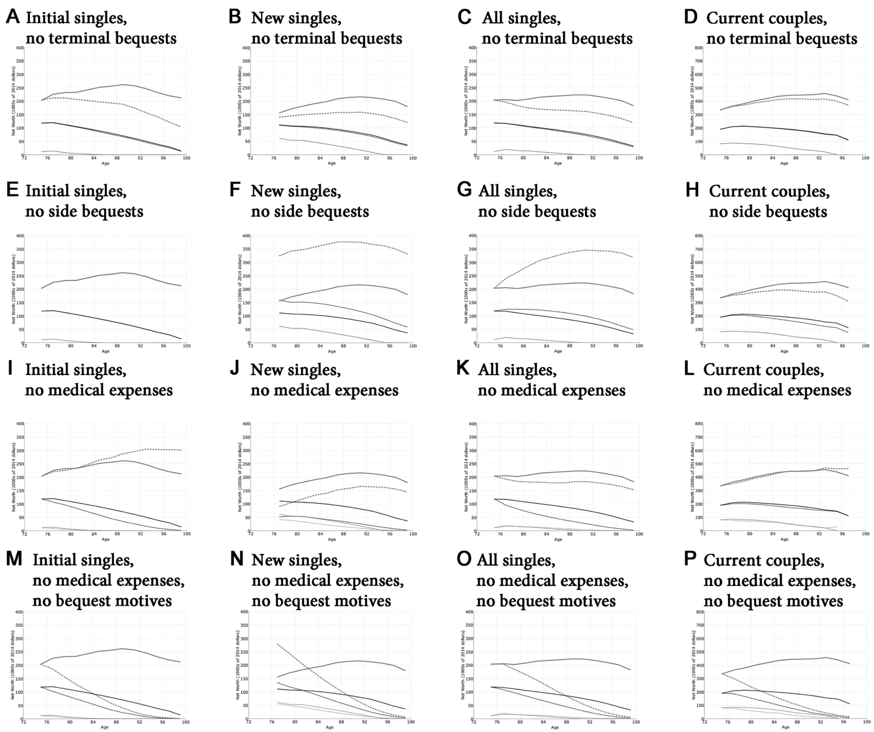

Fig. 10.—Median wealth for initial singles (leftmost column), new singles (center left column), all singles (center right column), and current couples (rightmost column) by PI tercile. Solid lines indicate the baseline, and dashed lines indicate the experiment. Thick lines denote the top PI tercile, medium lines denote the middle PI tercile, and thin lines denote the bottom PI tercile.

Eliminating medical expenses can have either positive or negative effects on the savings of initial singles (panel *I*). Those in the lowest two PI terciles save less because they no longer need to self-insure against future medical expenses. For the poorest singles, who have little wealth to begin with, the magnitude of these reductions is small.[15] The impact in the middle PI tercile is more substantial.

In contrast, initial singles in the highest PI tercile save substantially more after age 81. This seemingly counterintuitive result occurs because medical expenses reduce household wealth. Removing these expenses thus generates a positive wealth effect. Because we estimate bequest motives to be luxury goods, the richest initial singles choose to spend much of their windfall on bequests, and this wealth effect dominates the reduction in precautionary savings. To confirm this explanation, appendix M eliminates the variation in medical expenses generated by health and medical expense shocks but holds constant their average (conditional on household structure, age, and PI). This exercise reduces savings at all PI levels and thus shows that in the absence of wealth effects, high-PI households save against medical spending risk.

In the absence of medical expenses, new singles start out with much less wealth (panel *J*). This is because couples barely change their savings (panel *L*) but distribute larger side bequests, which leaves less resources for their surviving spouses, who no longer have medical expenses to finance.

Eliminating both bequest motives and medical expenses lowers the wealth profiles of initial singles in the bottom and middle PI terciles (panel *M*) only slightly more than eliminating medical expenses in isolation (panel *I*). This happens because households in these groups are too poor to prioritize leaving bequests. In contrast, the savings of initial singles in the top PI tercile drop markedly. To avoid repetition, we explain the reasons for this result in the next subsection.

Eliminating side bequests implies that many new singles start off with more resources (panel *N*). However, eliminating terminal bequest motives and medical expenses leads them to consume more, and any increases in their initial wealth soon evaporate. This fast decumulation is also present for current couples (panel *P*). As all singles include initial and new singles, their wealth is a composite of the wealth of these two groups (panel *O*).

B. *What Drives the Aggregate Distributions of Savings and Bequests?*

As we have just seen, the drivers of retirement savings differ substantially across household types, PI ranks, and age. Given this heterogeneity,

[15] As we show below, however, the proportional effects are large.

which drivers are most important for understanding aggregate retirement savings and bequests? And which drivers are most important for the largest number of households? To answer these questions, we compare the cross-sectional distributions of savings and bequests in our baseline model to counterfactuals where we eliminate one or more saving motives from our model.

We start with retirement savings. Table 6 includes every household in our age-75 simulated cohort for as long as they live, which amounts to computing the cross-sectional distribution of retirement wealth under a demographic steady state. Experiment 1 generates the expected result that eliminating terminal bequest motives causes people to consume more and save less. Savings drop at all wealth levels, especially among the rich (4.0% at the 25th percentile and 17.3% at the 75th), consistent with these bequests being luxury goods. In contrast, eliminating side bequest motives (experiment 2) increases wealth at all wealth levels by roughly similar percentages (11.0% at the 25th percentile and 12.2% at the 75th). This is because, as we discussed in the above section, in the absence of side bequests, new singles start out with more wealth.

Eliminating all bequest motives (experiment 3) increases the wealth of poorer retirees (7.5% at the 25th percentile). This is because at lower wealth levels, the effect of eliminating side bequests dominates. In contrast, wealth holdings drop at the upper end of the wealth distribution (7.5% at the 75th percentile), where terminal bequest motives are stronger. While the effect at the top of the wealth distribution is similar to that in many models with only terminal bequest motives, the one at the bottom is more unexpected. It showcases that ignoring the side bequest decision biases our understanding of retiree saving.

Eliminating medical expenses (experiment 4) drastically reduces savings at the lower end of the wealth distribution (60.0% at the 25th wealth percentile) because it reduces precautionary savings. The reduction at

TABLE 6
Implications of Retiree Saving Motives on the Distribution of Wealth

Experiment	25th Percentile	Median	75th Percentile	Mean
Baseline wealth (thousands of 2014 dollars)	50.3	149.3	387.8	360.8
(1) No terminal bequest motive (%)	−4.0	−8.7	−17.3	−23.0
(2) No side bequest motive (%)	11.0	16.6	12.2	12.2
(3) No bequest motives (%)	7.5	7.4	−7.5	−14.8
(4) No medical expenses (%)	−60.0	−21.1	−0.4	−3.1
(5) No medical expenses or bequest motives (%)	−62.5	−45.4	−42.3	−42.5

Note.—The first row reports baseline wealth. The subsequent rows refer to percentage changes in wealth resulting from the counterfactual experiments.

the upper end of the wealth distribution (0.4% at the 75th) is much smaller. This is because eliminating medical expenses makes households wealthier, and households with an active bequest motive save some of this additional wealth for bequests.

When we compare the elimination of all bequest motives with the elimination of medical expenses (experiment 3 vs. experiment 4) on a household-by-household basis, we find that most households (53%) save more to self-insure against medical expenses than to leave bequests. However, because these households hold relatively little wealth, the aggregate effect of eliminating medical expenses is small. Mean wealth drops by only 3.1%. In contrast, removing bequest motives reduces aggregate wealth by nearly five times as much (the mean drops by 14.8%), because it has its largest effects on the richest households, who hold most of the wealth. Hence, although medical spending is more important than leaving bequests for the majority of households, bequest motives drive aggregate saving.

The same household-by-household comparison also reveals that most singles (62%) save more for medical expenses rather than to leave bequests, while most couples (69%) save more for bequests. This is because couples value both side and terminal bequests and are also typically richer than singles.

Simultaneously removing medical expenses and all bequest motives (experiment 5) has a very large effect that exceeds the sum of the individual effects. Mean wealth drops by 14.8% when we remove bequest motives, by 3.1% when we remove medical expenses, and by a whopping 42.5% when we remove both.

This interaction arises because eliminating medical spending still leaves households with bequest motives, while eliminating bequest motives still leaves them needing to save for medical expenses. When both motives are present, wealth can satisfy the two needs simultaneously (Dynan, Skinner, and Zeldes 2002). When both motives are absent, households have little reason to save. Not surprisingly, these interactions are weakest at the 25th percentile, where bequest motives are weak. This interaction constitutes an important finding because much of the previous literature has focused on precautionary saving for medical expenses in the absence of a bequest motive.

We next turn to determining the drivers of the cross-sectional distribution of all bequests, including both side and terminal bequest motives. Table 7 has the same structure as table 6, but because the 25th percentile of the bequest distribution is approximately zero, we replace it with the 90th percentile. This allows us to focus on its upper tail. The first row of table 7 shows that, as in the data, the mean bequest ($251,800) is significantly larger than the median one ($77,900).

Eliminating terminal bequest motives (experiment 1) decreases bequests across their entire distribution. This effect is strongest at the upper

TABLE 7
Implications of Retiree Saving Motives on the Cross-Sectional Distribution of Bequests

Experiment	Median	75th Percentile	90th Percentile	Mean
Baseline value (thousands of 2014 dollars)	77.9	256.7	614.5	251.8
(1) No terminal bequest motive (%)	−11.8	−16.9	−22.4	−28.6
(2) No side bequest motive (%)	−100.0	−29.1	14.7	−2.2
(3) No bequest motives (%)	−100.0	−45.2	−33.3	−44.0
(4) No medical expenses (%)	28.3	19.2	15.6	14.3
(5) No medical expenses or bequest motives (%)	−97.9	−77.8	−67.5	−69.6

Note.—The first row reports baseline bequests left. Subsequent rows refer to percentage changes in bequests resulting from the counterfactual experiments. This includes all side and terminal bequests, including zeros, left during a period.

tail (22.4% at the 90th percentile compared with 11.8% at the median) because large bequests are less likely to be accidental.

Eliminating side bequest motives (experiment 2) changes the distribution of bequests but leaves the average bequest virtually unchanged. Because every side bequest would be zero in this case, the observation that the median bequest is now zero indicates that many smaller bequests are side bequests and thus intentional. In contrast, bequests at the 90th percentile increase by 14.7%. This reveals substitution between side bequests and terminal bequests: when side bequest motives are eliminated and terminal bequest motives remain, some households leave larger terminal bequests. Experiments 1 and 2 thus reveal that side bequests dominate the lower end of the bequest distribution and that terminal bequests dominate the upper end.

Eliminating all bequest motives (experiment 3) causes the median bequest to become zero, the 90th percentile to decrease by 33.3%, and the mean to fall by 44%. The large fall in mean bequests is especially important, because it implies that 44% of aggregate bequests are voluntary.

Because eliminating medical expenses (experiment 4) generates a positive wealth effect, bequests tend to increase in their absence. The proportional increase is larger for smaller bequests (28.3% at the median, as opposed to 15.6% at the 90th percentile). This is because the positive wealth effect from removing medical expenses is proportionally larger for poorer households.

Eliminating both medical expenses and all bequest motives (experiment 5) generates large declines across the entire bequest distribution, especially at the lower end. The drop is 97.9% at the median and 67.5% at the 90th percentile. The observation that the mean bequest drops by 69.6% implies that roughly 70% of bequests are due to either bequest motives or saving for medical expenses.

IX. Conclusions

This paper documents new facts about the retirement savings and risks of couples and singles. It then develops and estimates a rich structural model that includes these risks and explains their savings.

In terms of new facts, we compare the saving behavior of couples and singles. Households with high PI, and especially couples, tend to accumulate wealth, whereas those with low PI, and especially singles, tend to decumulate it. Furthermore, when the first spouse dies, net worth drops sharply. Although some of this drop is explained by end-of-life medical expenses, most of it is due to transfers to nonspousal heirs.

To understand the role of risks, it is crucial to properly measure them for both couples and singles. While medical expenses for couples and singles are not very different on a per capita basis until someone dies, medical spending jumps at the time of a spouse's death. At the same time, household income falls, exposing households to a substantial loss in financial resources upon a spouse's death.

We embed these risks in a rich structural model of savings that incorporates heterogeneity in financial resources, life expectancy, and medical expense risks, including the large jump in end-of-life medical expenses. It accounts for means-tested social insurance, which helps insulate households against those risks. It also allows households to derive utility from leaving bequests, both upon the death of a spouse (when present) and upon the death of the last survivor. In addition, and importantly, households choose how to split the estate between the surviving spouse and other heirs.

We estimate our model using MSM and targeting the savings of both couples and singles, and Medicaid recipiency rates by cohort, PI, and wealth levels. It fits these key features of the data well. In addition, although we do not require our model to match the dynamics of out-of-pocket medical spending and wealth around the time of a spouse's death, it matches those as well. This helps build confidence in its predictions. Finally, we use our estimated model to measure the extent to which the savings of retirees are driven by medical expenses, bequest motives, and their interaction.

We find that medical expenses are more important for singles, whereas bequest motives are more important for couples. This is due to two main reasons. First, couples receive utility from leaving bequests at the time of the first as well as the last spouse's death. Second, bequests are a luxury good, and couples are wealthier.

We also find that introducing bequest motives reduces the effects of medical expenses on savings. This is because savings intended for medical spending that go unspent due to early death are still valued when bequest motives are present. This finding implies that we need to model both medical spending and bequests. Last, these forces imply that, while the savings of most households is driven more by medical expenses than by bequest motives, aggregate retirement savings are driven by the bequest motives of a small fraction of richer households.

Hence, to understand the drivers of retirement savings, it is essential to model the bequest motives and medical spending of both couples and singles. Our findings have important policy implications. They suggest that couples and high-PI singles can easily self-insure against medical spending risk because they save to leave bequests. Low-PI singles are well insured through Medicaid and do not need to save for medical expenses. In contrast, middle-PI singles set aside significant amounts of wealth for precautionary purposes because they are not rich enough to want to leave bequests but are too rich to qualify for Medicaid. It is thus the middle-PI singles who would respond most to changes in public health insurance.

We leave many interesting issues for future research. They include modeling the household in a collective rather than a unitary fashion, explicitly modeling marriage and divorce after age 70, allowing for heterogeneous preferences, and evaluating government policies such as the relative generosity of Medicaid for couples and singles.

Data Availability

Code replicating the tables and figures in this article can be found in the Harvard Dataverse, https://doi.org/10.7910/DVN/V5VEXR (De Nardi et al. 2024).

References

Abel, A. B., and M. Warshawsky. 1988. “Specification of the Joy of Giving: Insights from Altruism.” *Rev. Econ. and Statis.* 70 (1): 145–49.

Ameriks, J., J. Briggs, A. Caplin, M. D. Shapiro, and C. Tonetti. 2020. “Long-Term Care Utility and Late in Life Saving.” *J.P.E.* 128 (6): 2375–451.

Ameriks, J., A. Caplin, S. Laufer, and S. V. Nieuwerburgh. 2011. “The Joy of Giving or Assisted Living? Using Strategic Surveys to Separate Bequest and Precautionary Motives.” *J. Finance* 66 (2): 519–61.

Andreoni, J. 1989. “Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence.” *J.P.E.* 97 (6): 1447–58.

Attanasio, O. P., and C. Emmerson. 2003. “Mortality, Health Status, and Wealth.” *J. European Econ. Assoc.* 1 (4): 821–50.

Barczyk, D., S. Fahle, and M. Kredler. 2022. “Save, Spend or Give? A Model of Housing, Family Insurance, and Savings in Old Age.” *Rev. Econ. Studies* 90 (5): 2116–87.

Barczyk, D., and M. Kredler. 2018. “Evaluating Long-Term-Care Policy Options, Taking the Family Seriously.” *Rev. Econ. Studies* 85 (2): 766–809.

Bernheim, B. D., A. Shleifer, and L. H. Summers. 1985. “The Strategic Bequest Motive.” *J.P.E.* 93 (5): 1045–76.

Braun, R. A., K. A. Kopecky, and T. Koreshkova. 2017. “Old, Sick, Alone and Poor: A Welfare Analysis of Old-Age Social Insurance Programs.” *Rev. Econ. Studies* 84 (2): 580–612.

Brown, M. 2003. "End-of-Life Transfers and the Decision to Care for a Parent." Working paper.

Browning, M. 2000. "The Saving Behaviour of a Two-Person Household." *Scandinavian J. Econ.* 102 (2): 235–51.

Carroll, C. D. 1998. "Why Do the Rich Save So Much?" Working Paper no. 6549, NBER, Cambridge, MA.

Chang, M., and A. Ko. 2021. "Marital Transitions, Housing, and Long-Term Care in Old Age." Working paper.

Chiappori, P.-A., and M. Mazzocco. 2017. "Static and Intertemporal Household Decisions." *J. Econ. Literature* 55 (3): 985–1045.

Deaton, A. 1991. "Saving and Liquidity Constraints." *Econometrica* 59 (5): 1221–48.

De Nardi, M. 2004. "Wealth Inequality and Intergenerational Links." *Rev. Econ. Studies* 71 (3): 743–68.

De Nardi, M., E. French, and J. B. Jones. 2010. "Why Do the Elderly Save? The Role of Medical Expenses." *J.P.E.* 118 (1): 39–75.

———. 2016a. "Medicaid Insurance in Old Age." *A.E.R.* 106 (11): 3480–520.

———. 2016b. "Savings after Retirement: A Survey." *Ann. Rev. Econ.* 8 (1): 177–204.

De Nardi, M., E. French, J. B. Jones, and J. McCauley. 2016. "Medical Spending of the U.S. Elderly." *Fiscal Studies* 37 (3/4): 717–47.

De Nardi, M., E. French, J. B. Jones, and R. McGee. 2024. "Replication Data for: 'Why Do Couples and Singles Save during Retirement? Household Heterogeneity and Its Aggregate Implications.'" Harvard Dataverse, https://doi.org/10.7910/DVN/V5VEXR.

Dynan, K. E., J. Skinner, and S. P. Zeldes. 2002. "The Importance of Bequests and Life-Cycle Saving in Capital Accumulation: A New Answer." *A.E.R.* 92 (2): 274–78.

Fahle, S. 2023. "What Do Bequests Left by Couples with a Surviving Member Tell Us about Bequest Motives?" Working paper.

Feenberg, D., and J. Skinner. 1994. "The Risk and Duration of Catastrophic Health Care Expenditures." *Rev. Econ. and Statis.* 76:633–47.

Fernández-Villaverde, J., and D. Krueger. 2007. "Consumption over the Life Cycle: Facts from Consumer Expenditure Survey Data." *Rev. Econ. and Statis.* 89 (3): 552–65.

French, E., and J. B. Jones. 2004. "On the Distribution and Dynamics of Health Care Costs." *J. Appl. Econometrics* 19 (4): 705–21.

———. 2011. "The Effects of Health Insurance and Self-Insurance on Retirement Behavior." *Econometrica* 79 (3): 693–732.

Hong, J., J. Pijoan-Mas, and J.-V. Ríos-Rull. 2015. "Health Heterogeneity and the Preferences for Consumption Growth." Working paper.

Hong, J. H., and J.-V. Ríos-Rull. 2012. "Life Insurance and Household Consumption." *A.E.R.* 102 (7): 3701–30.

Hubbard, R. G., J. Skinner, and S. P. Zeldes. 1995. "Precautionary Saving and Social Insurance." *J.P.E.* 103 (2): 360–99.

Hurd, M. D. 1989. "Mortality Risk and Bequests." *Econometrica* 57 (4): 779–813.

Hurd, M. D., J. P. Smith, and J. M. Zissimopoulos. (2011). Intervivos giving over the lifecycle. Labor and Population Working Paper no. WR-524-1, RAND, Santa Monica, CA.

Jones, J. B., M. De Nardi, E. French, R. McGee, and R. Rodgers. 2020. "Medical Spending, Bequests, and Asset Dynamics around the Time of Death." *Econ. Q.* 106 (4): 135–57.

Ko, A. 2022. "An Equilibrium Analysis of the Long-Term Care Insurance Market." *Rev. Econ. Studies* 89 (4): 1993–2025.

Kopczuk, W. 2007. "Bequest and Tax Planning: Evidence from Estate Tax Returns." *Q.J.E.* 122 (4): 1801–54.

Kopczuk, W., and J. Lupton. 2007. "To Leave or Not to Leave: The Distribution of Bequest Motives." *Rev. Econ. Studies* 74:207–35.

Kopecky, K., and T. Koreshkova. 2014. "The Impact of Medical and Nursing Home Expenses and Social Insurance Policies on Savings and Inequality." *American Econ. J.: Macroeconomics* 6:29–72.

Kvaerner, J. 2022. "How Large Are Bequest Motives? Estimates Based on Health Shocks." *Rev. Financial Studies* 36 (8): 3382–422.

Laitner, J., and T. F. Juster. 1996. "New Evidence on Altruism: A Study of TIAA-CREF Retirees." *A.E.R.* 86 (4): 893–908.

Laitner, J., D. Silverman, and D. Stolyarov. 2018. "The Role of Annuitized Wealth in Post-retirement Behavior." *American Econ. J.: Macroeconomics* 10 (3): 71–117.

Lee, S., and K. T. K. Tan. 2019. "Bequest Motives and the Social Security Notch." HCEO Working Paper no. 2019-061, Human Capital and Econ. Opportunity Global Working Group, Chicago.

Lockwood, L. M. 2018. "Incidental Bequests and the Choice to Self-Insure Late-Life Risks." *A.E.R.* 108 (9): 2513–50.

Marshall, S., K. McGarry, and J. S. Skinner. 2011. "The Risk of Out-of-Pocket Health Care Expenditure at the End of Life." In *Explorations in the Economics of Aging*, edited by D. A. Wise, 101–28. Chicago: Univ. Chicago Press.

McGee, R. 2022. "Old Age Savings and House Price Shocks." Working paper.

Mommaerts, C. 2020. "Long-Term Care Insurance and the Family." Working paper.

Nakajima, M., and I. A. Telyukova. 2017. "Reverse Mortgage Loans: A Quantitative Analysis." *J. Finance* 72 (2): 911–50.

———. 2020. "Home Equity in Retirement." *Internat. Econ. Rev.* 61 (2): 573–616.

Palumbo, M. G. 1999. "Uncertain Medical Expenses and Precautionary Saving Near the End of the Life Cycle." *Rev. Econ. Studies* 66:395–421.

Poterba, J. M., S. F. Venti, and D. A. Wise. 2011. "The Composition and Drawdown of Wealth in Retirement." *J. Econ. Perspectives* 25:95–117.

Tauchen, G. 1986. "Finite State Markov-Chain Approximations to Univariate and Vector Autoregressions." *Econ. Letters* 20 (2): 177–81.