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Neha Bairoliya
Giovanni Gallipoli
Kathleen McKiernan

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1126 E. 59th Street Box 107
Chicago IL 60637

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End-of-Life Liquidity*

Neha Bairoliya[†]
Neha.Bairoliya@marshall.usc.edu

Giovanni Gallipoli[‡]
giovanni.gallipoli@ubc.ca

Kathleen McKiernan[§]
kathleen.mckiernan@vanderbilt.edu

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Abstract

The interaction between late-life uncertainty and end-of-life (EOL) motives generates demand for death-contingent liquidity, shaping saving, insurance, and labor-supply behaviour. Using evidence on wills, life insurance, and bequest intentions, we document the prevalence of EOL motives across household types. A quantitative life-cycle model embeds three motives—precautionary, survivor, and warm-glow—and exploits the asymmetry between liquid wealth and life insurance to identify EOL preferences. We examine how these motives interact with Social Security's illiquid annuity and assess reforms that replace part of annuity benefits with guaranteed death-contingent payouts or expand access to actuarially fair life insurance. Both policies generate portfolio "de-risking," shifting resources toward guaranteed EOL liquidity. Significant welfare gains accrue to single, low-wealth individuals, a group often overlooked in the debate over EOL motives.

Keywords: liquidity, life insurance, portfolio choice, old age security, annuity, consumption, labor supply, marriage, inequality, wealth.

JEL Classification Numbers: D31, G11, G51, G52, J26, E21, H55

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[†]University of Southern California, Department of Finance and Business Economics, Los Angeles, CA 90089-1422, United States.

[‡]University of British Columbia, Vancouver School of Economics, Vancouver, BC V6T 1L4, Canada.

[§]Vanderbilt University, Department of Economics, Nashville, TN 37235, United States.

1 Introduction

In late life, individuals experience complex financial motives and risks. Some may plan to leave bequests to loved ones, others aim to protect surviving spouses, and all must manage uncertainty surrounding medical expenditures and longevity. In such settings, the objectives and constraints of expected utility maximization imply that individuals may value holding wealth at the time of death (Yaari, 1965). Despite their importance, end-of-life (EOL) motives are difficult to identify empirically and are often conflated with precautionary saving or consumption smoothing. When EOL motives are present, the life-cycle problem involves allocating resources between consumption while alive and resources left behind at death. This portfolio problem entails modelling demand for annuities, assets, and life insurance.

A large body of literature documents limited wealth annuitization (Mitchell et al., 1999; Inkmann et al., 2011; Chalmers and Reuter, 2012; Brown et al., 2017). This fact is not, by itself, decisive evidence of strong EOL motives because market incompleteness can reduce the appeal of annuities (e.g., Davidoff et al., 2005). However, there is a growing recognition that EOL motives do shape saving, insurance, and retirement behavior (Dynan et al., 2002; French et al., 2006; Ameriks et al., 2011; De Nardi et al., 2016; Lockwood, 2012, 2018; Ameriks et al., 2020; Jones et al., 2020; De Nardi et al., 2025; Kvaerner, 2023).

The confounding role of precautionary saving complicates identification of EOL motives (Dynan et al., 2002). To address this issue, researchers resort to surveys that elicit bequest motives (Ameriks et al., 2011), use models of medical expenditures that isolate precautionary motives (Lockwood, 2012; De Nardi et al., 2016), or leverage policy variation (Lee and Tan, 2023).

Our paper combines empirical evidence and quantitative modelling to study the determinants and consequences of EOL liquidity demand. Using data from the Health and Retirement Study (HRS), we document that preparation for end-of-life transfers—through wills, life insurance (LI), and bequest intentions—is widespread across education and family types. Evidence on wills, designated beneficiaries, and life insurance suggests that end-of-life motives are prevalent in many types of households, and are not exclusive to those with legal beneficiaries, such as spouses or children (consistent with evidence in Laitner and Juster, 1996; Kopczuk and Lupton, 2007).

Motivated by these facts, we develop and estimate a life-cycle model of consumption, labor supply, saving, and LI choices. The model nests three distinct late-life motives: a precautionary motive associated with medical-expenditure risk, a survivor motive within married households, and a warm-glow bequest motive operative across all individuals. The identification of EOL preferences exploits the asymmetry between liquid savings—which can finance consumption while alive—and life insurance—which pays only at death. This asymmetry makes LI holdings informative for identifying the EOL preference parameters.

Using the model, we estimate preference parameters and life-insurance shadow prices to match observed life-cycle patterns in labor supply, asset accumulation, and LI holdings. LI prices vary by age, education, marital status, and contract face value. They reflect both the pecuniary costs of obtaining LI and the frictions that limit access to these markets. As noted above, observing life insurance is especially useful for pinning down the strength of the warm-glow bequest motive, because LI pays only at death. At the same time, access to the life insurance markets may differ across agents. By matching observed patterns of asset accumulation, LI coverage, and labor supply, we recover the strength of each motive and the implicit (shadow) prices that rationalize observed participation in imperfect LI markets. A key finding from this analysis is that fewer than 5 percent of individuals face actuarially fair LI prices, and premiums are especially high at older ages. High effective prices limit households' ability to use private LI to meet end-of-life needs.

We use the model to evaluate how private and public insurance institutions shape household welfare and portfolio choices. Two experiments illustrate the main mechanisms. First, introducing actuarially fair LI prices generates substantial reallocation from riskier-to-carry assets towards death-contingent wealth, revealing strong latent demand for LI and highlighting the role of market imperfections in suppressing coverage. Second, a small reform that replaces a fraction of the Social Security annuity entitlement with a guaranteed lump-sum at death raises welfare (especially among low-wealth singles) by allowing households to reduce exposure to late-life expenditure risk without sacrificing bequest intentions. These results underscore an end-of-life "de-risking" channel that links mortality risk, asset composition, and welfare.

The intuition for the de-risking channel is simple. Since liquid assets are exposed to medical-expenditure tail risk and to means-tested programs that can force rapid spend-down, holding wealth as a means to provide for EOL needs is risky, unlike death-contingent payouts (life insurance). The experiments show that households reshuffle their portfolios away from liquid assets and toward instruments that pay at death (private LI or a public EOL transfer). This mechanism interacts with the classic annuity–EOL trade-off: annuities insure longevity but not bequests, while LI and EOL transfers insure bequests but not longevity. The presence of tail risk heightens this trade-off by raising the marginal value of guaranteed death benefits relative to annuities and risk-exposed savings.

Our findings suggest that modest policy interventions that improve access to guaranteed EOL resources can meaningfully enhance welfare, particularly for financially constrained households. All households — especially the least affluent — stand to gain from broader access to EOL protection. This result is not surprising insofar many lack access to actuarially fair LI, particularly at older ages (Bernheim, 1991). These findings are consistent with evidence that LI markets do not always satisfy EOL motives (Chambers et al., 2011) and that access is misaligned with households' financial vulnerabilities (Auerbach and Kotlikoff, 1985, 1991; Bernheim et al., 2003). Existing research suggests LI adoption would be higher in the absence of financial constraints, information frictions, or market imperfections (Chambers et al., 2011; Hong and Rios-Rull, 2012); concerns about nonpayment risk and inadequate compensation also dampen take-up (Briggs et al., 2023). A caveat is in order: the prevalence of LI among the elderly does not imply that mandatory annuitization lacks value (see Brown, 2001). Instead, we interpret these findings as evidence that the marginal value of annuities and life insurance varies significantly across households. The heterogeneity reflects the degree to which EOL motives can be satisfied through the existing patchwork of old-age insurance and private LI.

End-of-life motives have been studied before in life cycle models where households have no concerns over others (Abel, 1986; Hubbard and Judd, 1987; İmrohoroglu et al., 1995; Conesa and Krueger, 1999) or where such concerns apply only to multi-person households (Hong and Ríos-Rull, 2007; Hong and Rios-Rull, 2012). For example, Hong and Ríos-Rull (2007) examines the value of annuities and life insurance in an overlapping generations, incomplete-market setting in which preferences reflect concerns for surviving spouses. A robust finding is that reducing access to annuities (including Social Security) has a limited impact on welfare; however, reducing access to life insurance incurs significant welfare costs. Our analysis builds on this insight by quantifying how EOL motives, LI frictions, and Social Security design interact to shape portfolios, labor supply, and benefit claiming—and by evaluating reforms that expand access to guaranteed EOL resources.

Our experiments also emphasize the relief that Social Security provides to married households through survivors' benefits, which continue benefit payments to the spouse after the beneficiary's death. However, since married households tend to be richer and better insured, the SS system does a poor job of helping the most financially vulnerable, who are the very people it was designed to support. Put differently, market frictions and the design of Social Security combine to favor married, higher-wealth households, thereby reinforcing pre-existing disparities in welfare and risk exposure.

The quantitative framework uses counterfactual scenarios to evaluate policy reforms and emphasize the role of EOL motives in shaping saving, insurance, and labor supply throughout the life cycle.

The findings contribute to three research areas. First, by documenting how households allocate resources between liquid wealth and life insurance in response to EOL motives, the paper informs the literature on saving, portfolio choice, and annuity demand (Dynan et al., 2002; Gomes and Michaelides, 2005; French et al., 2006; Kopczuk and Lupton, 2007; Wachter and Yogo, 2010; Love, 2010; Cocco and Gomes, 2012; De Nardi et al., 2016; Anderson et al., 2017; Fagereng et al., 2017, 2018, 2020; Ameriks et al., 2020; Jones et al., 2020; De Nardi et al., 2025; Catherine, 2022). Second, by quantifying how private market frictions and Social Security design jointly generate heterogeneous welfare effects and portfolio distortions, it extends work on annuitization and public insurance (İmrohoroglu et al., 1995; Conesa and Krueger, 1999; De Nardi et al., 1999; Benabou, 2000; Fuster et al., 2003; Krueger and Kubler, 2006; Hong and Ríos-Rull, 2007; Kotlikoff et al., 2007; Attanasio et al., 2007; Krusell et al., 2010; Huggett and Parra, 2010; Catherine et al., 2020a; Scheuer and Slemrod, 2021; Maurer et al., 2021). Third, by evaluating a reform that redistributes resources from married to unmarried individuals through death-contingent transfers, it connects to research on household heterogeneity, inequality, and institutional effects on labor supply and retirement (Krueger and Perri, 2006; Heathcote et al., 2010b,a; Golosov et al., 2016; Daruich and Fernández, 2020; Catherine et al., 2020b; Miller and Bairoliya, 2021; Bairoliya and Miller, 2021; Bairoliya and McKiernan, 2024).

Taken together, the analysis reconciles empirical patterns in wealth, insurance holdings, and labor supply, while highlighting that expanding access to guaranteed EOL resources—particularly for singles and less-educated households—represents a promising policy direction. Four results support this conclusion. First, warm-glow bequest motives are quantitatively significant across household types. Second, tail risks in medical expenditures make liquid wealth a costly means of satisfying EOL objectives. Third, guaranteed death-contingent resources generate welfare improvements through portfolio de-risking. Fourth, while eliminating LI market frictions would require substantial reform, modest Social Security adjustments can yield meaningful gains.

2 EOL Motives: Some Evidence

To motivate our quantitative analysis, we document three facts about the late-life behavior of individuals in different familial arrangements. First, we show that households engage in activities consistent with end-of-life motives. Irrespective of marital status, most households exhibit intent to bequeath wealth and readiness to hold significant liquidity up to the end. Second, we document that many individuals hold life insurance, consistent with end-of-life motives across the whole cross-section of households, although LI holdings differ by family structure. Such differences suggest discrepancies in access to LI. Lastly, we show that, despite evidence that EOL motives are present regardless of marital status, the SS system favors married households; the extent of this bias is visible in the mismatch between the contributions and entitlements of different households.

In the model estimation, we do not use data on wills or subjective intentions to leave wealth. However, this evidence is instructive, as it highlights the prevalence and intensity of EOL motives across household types.

1. End-of-life motives: intent and preparedness.

We use data from the Health and Retirement Study (HRS) to establish facts related to intent and preparation to bequeath wealth. Our HRS sample covers the years 1996 to 2020 (Waves 3-15) and consists of 85,764 men over 50, born between 1926 and 1970, for whom marital and parental statuses are known. Details about sample selection are in Appendix A1.

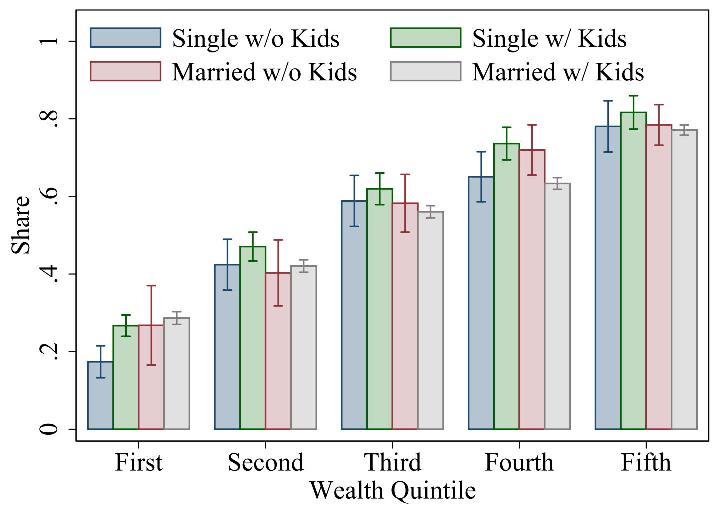
Intent to leave assets by wealth, marital and parental status. We measure intent to leave assets using a set of HRS questions on the likelihood of leaving bequests of various sizes. From these questions, we construct an indicator that equals one if a worker aged 50-70 reports at least a 95% chance of leaving a bequest of any size. This design addresses two issues. First, we limit the sample to workers aged 50-70 to focus the analysis on bequest intentions rather than on higher probabilities of reaching old age with more wealth than expected.[1] By setting a conservative 95 percent threshold, we get as close as possible to measuring the deliberate choice to leave a bequest rather than a future chance based only on how things turn out. Second, we focus on the likelihood of leaving any bequest rather than an exact amount, as we want to measure the general intention to leave some wealth behind. Therefore, a decline in the probability measure can be interpreted as a

[1]This restriction limits the sample to 60,803 observations between the ages of 50 and 70.

weaker intent to leave a bequest rather than a lower probability of ending up alive in old age with unplanned excess wealth above a specific amount.

We compute this measure by marital and parental status and wealth quintile. Figure 1 highlights that wealth is an essential indicator of the intention to leave bequests. The influence of wealth is greater than that of marital status or the presence of children. Once we condition on wealth quintile, there is relatively little variation in the intention to leave a bequest across people with different marital and parental statuses. Conditional on the quintile of the wealth distribution, we run Tukey-Kramer pairwise mean comparison tests and cannot reject that the share of individuals who intend to leave a bequest is the same across groups (see the Appendix Table A2).

Figure 1: Bequest Intentions by Family Structure and Wealth



Source: Health and Retirement Study. authors' calculations
Notes: Figure shows the share of workers aged 50-70 of a given marital-parental status and wealth quintile who report over a 95 percent probability of leaving a bequest of any amount. 95 percent confidence intervals are shown. Results of the Tukey-Kramer pairwise mean comparison test are shown in Table A2.

Prevalence and attributes of valid wills. The intention to leave a bequest suggests that the workers may have a subjective desire. However, it does not demonstrate that these individuals engage in concrete preparations to leave behind wealth. To determine whether preparations occur, we document patterns associated with a key estate-planning activity: drafting a legally binding will. Figure 2 plots the share of men, by marital-parental status and wealth quintile, who make such provisions and who they designate as beneficiaries in their will.

Figure 2a plots the share of individuals with a legally binding will to dispose of assets after death. The share increases with wealth, but after controlling for wealth, there are no significant differences by marital status or the presence of children. In the fifth quintile of the wealth distribution, around 70 percent of individuals, regardless of marital or parental status, have a written will specifying how their assets will be distributed. The share is about 55 percent in the median wealth quintile, while in the lowest wealth quintile, it is around 25 percent. Tests of pairwise differences cannot reject the null hypothesis that, in each wealth group, similar shares of individuals make a valid will whether they are married or have children (see Table A2). In the event of death without a valid will, wealth is distributed according to the law of intestacy (probate process). Rules vary by state, but spouses and biological children usually take precedence. Such defaults may reduce the share of married individuals who write a will.[2] Given this observation, the share of married individuals and those with children who present a valid will in the data may be viewed as a lower bound of those who care about the eventual destination of their wealth.

Beneficiaries. Given the intention and preparation to leave resources behind, to whom do individuals plan to leave them? First, many individuals make provisions in their wills for their immediate family, including children, grandchildren, parents, and siblings.[3] Around 90 percent of men with children make provisions for their families, compared with 60-80 percent of those without children. Second, leaving money to charities is a frequent consideration, especially among those without children. Between 30 and 40 percent of individuals without children make provisions for a charity in their wills, as opposed to less than 10 percent of those with children.

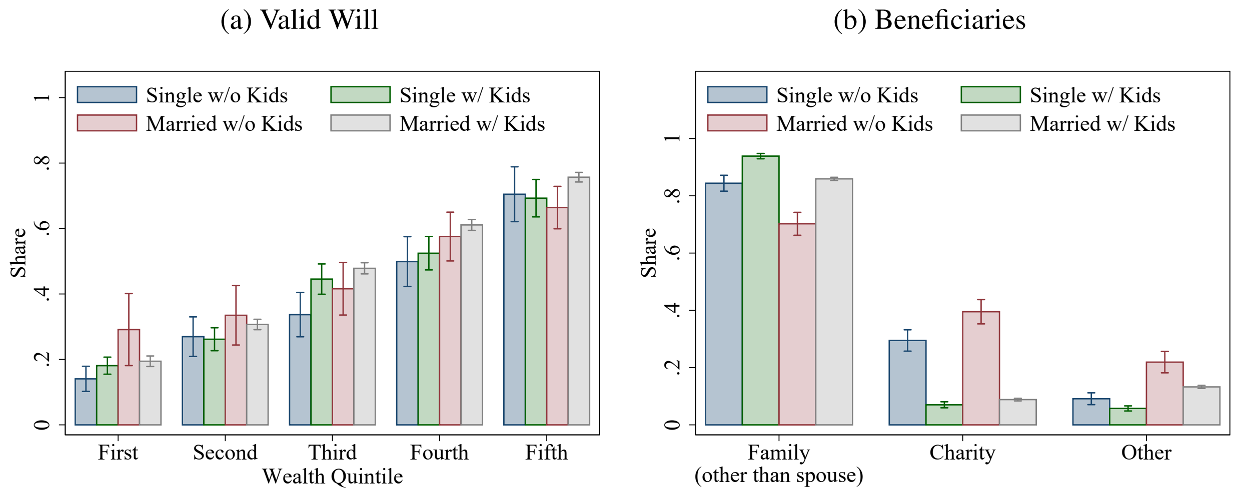
2. Life insurance markets: differences across familial groups

Private life insurance markets enable individuals to purchase contracts that pay out to a designated beneficiary upon the policyholder's death. Using HRS data, we document the prevalence of these contracts, which can transfer resources like a bequest, among individuals with heterogeneous

[2]Francesconi et al. (2023) shows that the share of individuals who die with no will has grown over time and argues that the absence of a will should not be interpreted as a preference for the default division.

[3]An individual's spouse is the default recipient of wealth if the individual dies without a will in most states. A will is only needed to deviate from the legal requirements of probate. Furthermore, in some states, spouses may have rights that limit the ability to use a will to distribute resources.

Figure 2: Will Coverage and Beneficiaries by Family Structure and Wealth



Source: Health and Retirement Study. authors' calculations

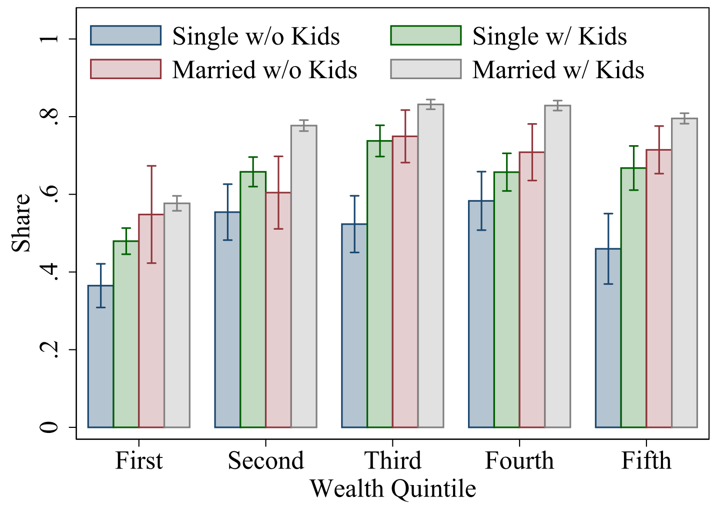
Notes: Panel (a) shows the share of individuals age 50+ of a given marital-parental status and wealth quintile who say they have a written and witnessed will or trust. Ninety-five percent confidence intervals are shown. The Tukey-Kramer pairwise mean comparison test results are shown in Table A2. Panel (b) shows the share of individuals age 50+ of a given marital-parental status and who have a valid will who report having made provisions for a given group in said will. Ninety-five percent confidence intervals are shown.

family structures.[4] The share of people who have a life insurance policy according to marital and parental status and wealth quintile is shown in Figure 3.

A significant proportion of men hold at least one life insurance policy. This is consistent with the analysis above, which shows that intention and preparation to leave wealth extend beyond those in marital relationships and those with children. The average coverage within the population is nearly 70 percent. This share ranges from roughly 40 percent among the poorest singles with no children to 80 percent for wealthy married individuals with children. Based on pairwise mean comparison tests conditional on wealth, we mostly reject the null hypothesis that coverage shares are the same between groups defined by marital and parental status (see Appendix Table A2). This suggests that, even though different households exhibit similar patterns of intent and preparation to leave bequests, their access to life insurance may differ. We revisit this finding in the quantitative analysis.

[4] Questions about life insurance start in Wave 6. Therefore, the sample for these calculations covers the years 2002-2020.

Figure 3: Life Insurance Coverage by Family Structure and Wealth



Source: Health and Retirement Study. authors' calculations

Notes: Figure shows the share of individuals aged 50+ of a given marital-parental status and wealth quintile who hold a life insurance policy. 95 percent confidence intervals shown. Results of the Tukey-Kramer pairwise mean comparison test are shown in Table A2.

3. The uneven costs and benefits of Social Security across households

Evidence indicates that the intention and readiness to leave behind resources do not apply exclusively to people with children or spouses. However, under the United States Social Security system, benefits that extend beyond the beneficiary's death are provided only to the beneficiary's spouse (or young children). To illustrate this discrepancy, we focus on two types of benefits paid by the SS system: (i) *Old-Age Benefits* which provide annuity income to retirees from the time of claiming until death. For married individuals, this may also include a spousal benefit which allows a spouse to receive payments based upon the employment history of a higher-earning beneficiary rather than their own; and (ii) *Survivors Benefits* which continue to pay a deceased beneficiary's benefits to their spouse after their death.[5] Figure 4 shows how benefits received from and contributions made to this SS system vary with the income and marital status in single-earner families.[6]

Within each marital group, both the contributions and benefits increase with income, and, as

[5]See Internet Appendix S1 for additional details on the policy.

[6]Gaps between contributions and benefits are qualitatively similar in dual-earner households if the spouse earns less than the head. The gap between contributions and benefits declines as spousal earnings grow.

expected, higher-income individuals pay more into the system and receive more in benefits than lower-income ones. When we compare households with different marital statuses after controlling for income, however, salient differences emerge. Although individuals make similar contributions, benefits vary by marital status because spousal and survivor benefits are available only to married couples. By design, the SS system pays significantly higher benefits to married couples than singles with similar incomes and contributions.

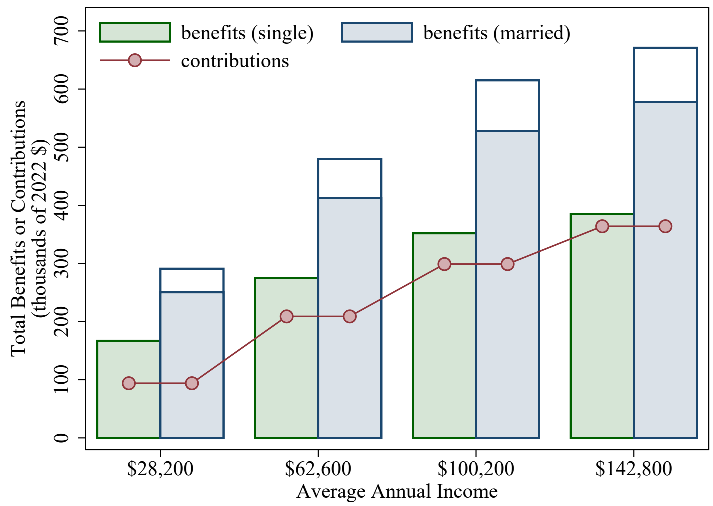
These gaps in effective entitlements depend partly on the timing of benefits. While spousal benefits are received during the beneficiary's lifetime, survivor benefits are paid to a spouse after the beneficiary's death. These payments, represented by the white portion of the benefits bar for married couples in Figure 4, may account for up to 30 percent of the gap between the benefits of singles and married. Therefore, despite similar contributions to the SS system, some entitlements are available only to individuals in a legal marital relationship, and there are no provisions to direct them to other potential beneficiaries, even if an individual (single or married) wishes to do so. Crucially, some of these differences in entitlements across marital status groups are paid after the beneficiary's death and thus help to satisfy their EOL survivors motive.

EOL motives and life insurance in the presence of a mandatory annuity. Collectively, these observations highlight the prevalence of end-of-life motives among individuals and households with very different characteristics. Despite the ubiquity of these motives, we observe an uneven uptake of life insurance, suggesting a possible mismatch between access to life insurance and households' financial vulnerabilities (Auerbach and Kotlikoff, 1985; Bernheim et al., 2003; Chambers et al., 2011). Notably, SS entitlements account for a significant share of wealth for many poorer households, thereby increasing their exposure to annuities, even though they may prefer some form of life insurance. In the next section, we use a simple analytical framework to describe the qualitative relationship between savings, end-of-life motives, and the uptake of life insurance in the presence of a mandatory annuity system.

3 An Analytical Example

This section provides a two-period illustration of the mechanism that underpins our quantitative analysis. Individuals value consumption while alive and resources available at death (an end-of-life, EOL, motive), but face a mandatory public annuity that channels part of their wealth

Figure 4: Social Security Contributions and Benefits by Marital Status



Source: Steuerle and Smith (2023) Tables 1-4, 9-12

Notes: Figure shows variation in total SS contributions and benefits by average annual income and marital status. Green bars represent the old-age benefits of a single individual of a given income, while the blue bars represent the old-age, spousal, and survivors benefits of a single earner, married household of a given income. Within the blue bars for married households, the shaded area represents old-age and spousal benefits (50% of old-age benefits), while the white portion represents survivors' benefits. The red line shows the total contributions paid for each income level. Benefits and taxes are for a cohort who turned 65 in 1995.

into an illiquid stream of old-age benefits. Life insurance (LI) allows households to de-annuitize (that is, convert annuity wealth into death-contingent liquidity that satisfies EOL motives). The example highlights how limited access to LI may generate welfare losses and shape the portfolio composition.

3.1 A two-period portfolio problem

Agents live for at most two periods and differ in their survival probability $\pi \in (\pi_{low}, \pi_{high})$. Each receives an endowment e in period 1 and derives utility from consumption while alive (the utilities are $u(c_1)$ in period 1 and $U(c_2)$ in period 2) and from leaving bequests $v(b)$ upon death. Two assets are available: (i) a risk-free bond s yielding return A; and (ii) life insurance LI, which pays $A/(1-\pi)$ at death and zero otherwise, implying an actuarially fair price.

The government levies a flat tax τ on first-period income to finance a uniform annuity transfer

T in period 2. The life-cycle problem is

$$\begin{aligned} \max_{c_1,c_2,b,s,LI} \quad & u(c_1) + \pi\beta U(c_2) + (1-\pi)\beta v(b) \\ \text{s.t.} \quad & c_1 + \frac{1-\pi}{A} LI + s \leq e(1-\tau), \\ & c_2 \leq As + T, \\ & b \leq As + LI, \\ & c_1, c_2, b, s, LI \geq 0. \end{aligned}$$

3.2 Optimal behavior

At an interior solution, optimality implies

$$\frac{u'(c_1)}{A\beta} = U'(c_2) = v'(b).$$

Because the public annuity raises guaranteed old-age income T, it lowers the marginal utility of consumption and increases the demand for death-contingent wealth LI to restore equality with $v'(b)$. Lower survival probability π raises the effective return on LI and should, under fair pricing, induce higher coverage.

Empirically, however, households with lower survival probabilities—poorer, less-educated singles—hold *less* life insurance. In Appendix Table A2, we test pairwise differences in coverage conditional on wealth for demographic groups with different survival rates and find that a higher π is associated with more widespread LI coverage. This inconsistency suggests that some individuals face effective prices above the actuarially fair rate due to frictions or market exclusion. If LI is costly or inaccessible, these agents reach a corner solution:

$$\frac{u'(c_1)}{A\beta} = U'(c_2) > v'(b),$$

That is, imperfect access to LI translates into impaired ability to meet late-life objectives and lower utility.[7]

[7] Agents would consider the corner solution $s = 0$ only if government annuities carried a higher return than the alternatives (see Hosseini, 2008), a case which we ignore as it is not empirically relevant.

3.3 Interpretation

This framework captures, in reduced form, the mechanism of our quantitative model.

1. Variation in π represents heterogeneity in health and longevity.

2. The Social Security tax τ and transfer T mirror the annuity component of retirement income.

3. Frictions that augment the effective cost of LI correspond to the *shadow prices* we estimate in Section 5.

When life-insurance markets are imperfect, mandatory annuitization makes it more costly to hold bonds to meet EOL needs. In the richer life-cycle model of Section 4, this mechanism operates alongside medical-expenditure risk, means-tested transfers, and survivor benefits, which amplifies the trade-off between longevity insurance and end-of-life liquidity. The analytical example provides an illustration of the portfolio decisions we study in Section 6.

4 Quantitative Framework

We develop and estimate a dynamic model of labor supply, life insurance, and retirement decisions, building on earlier work by Hubener et al. (2016) and Bairoliya and McKiernan (2021); Bairoliya (2019). The analysis emphasizes life cycle incentives and distortions among single and married individuals.

Life-cycle and state variables. The life cycle spans ages $t = 25, 26, ..., 99$. Individuals differ in their permanent education type (e) and marital status (q). Marital circumstances are summarized by a pair $q = (m, \iota)$ where m indicates if the agent is single or married, and ι denotes the age gap between spouses. Non-permanent (evolving) heterogeneity includes stochastic labor productivity (η_t), employment status (λ_t), health status (μ_t) and the persistence of medical expenditures (ζ_t^{μ}), assets (a_t), social security wealth (a_t^{ss}) and SS benefits' application status (b_{t-1}^{ss}).

Choices. Agents choose labor supply (h_t), consumption (c_t) and savings (a_{t+1}). We explicitly model the SS benefit application (b_t^{ss}) of couples and singles and allow them to purchase one-period LI contracts (i_t^v) with face value $v_t^{e,m}$.[8] Individuals make decisions in each period t and adjust their behavior in response to shifts in wages, employment, health, and survival. Given a vector of states $\left(e, q, \eta_t, \lambda_t, \mu_t, \zeta_t^{\mu}, a_t, a_t^{ss}, b_{t-1}^{ss}\right)$, they maximize the present discounted value of lifetime utility.

4.1 Preferences

Period Utility Agents derive utility in period t from consumption c_t and leisure l_t. The within-period utility is non-separable in these arguments. We account for the decline in expenditures at retirement through a combination of (1) unexpected health shocks causing unplanned retirement, and (2) consumption-leisure complementarities in utility (French and Jones, 2011; French, 2005; Casanova, 2010). The period utility is:

$$U(c_t, l_t) = \frac{1}{1-\rho}\left(\left(\frac{c_t}{\zeta_t}\right)^{\nu} l_t^{1-\nu}\right)^{1-\rho}. \tag{1}$$

Relative risk aversion is dictated by the parameter ρ, while ν is the weight on consumption and ζ_t is a consumption-equivalence scale. The utility of married households is multiplied by two to account for spousal utility from consumption and leisure. The leisure enjoyed in period t is

$$l_t = \bar{l} - h_t - \phi_P(t)\mathbb{I}\{h_t > 0\} - \phi_H(\mu_t, t), \tag{2}$$

where $\bar{l}$ is the endowment of leisure in each period, h_t is hours worked, the function ϕ_H represents leisure lost to bad health and ϕ_P is the cost of employment participation (positive if $h_t > 0$).[9]

End-of-Life Motive At the end of life, an individual receives utility by leaving behind liquid assets and life insurance (a bequest motive). Moreover, married individuals value the expected discounted utility of the remainder of a spouse's life (the survivor's motive). The bequest motive takes the form of De Nardi (2004). An individual values bequests, A_t, according to the exponential

[8] Agents in practice can lapse a policy at any time by stopping premium payments. Allowing the LI choice to be revised each period captures this lapse option in a simple way. We discuss these contract features in more detail in Section 5.2.2. The Social Security application is a one-time decision and cannot be reversed.

[9] We discuss the estimation of these time costs in the Internet Appendix S10.

function:

$$\Omega(A_t) = \frac{\theta}{1-\rho}\,(A_t + \kappa)^{(1-\rho)\nu}\,. \tag{3}$$

The coefficient θ measures the intensity of the end-of-life motive, while κ determines the curvature of the function. Higher θ increases the marginal utility of an extra unit of end-of-life wealth, and higher κ makes it more similar to a luxury good. The end-of-life estate, A_t, consists of a fraction, $\overline{\gamma}$, of assets at the time of death plus the face value of life insurance.

$$A_t = \overline{\gamma}\,(a_t + i_t^v \times v_t^{e,m}) \tag{4}$$

For deceased single individuals, all wealth is allocated to the bequest motive and $\overline{\gamma} = 1$. When a married individual dies, however, only a portion of wealth is allocated to the bequest motive, while the remainder is left to the surviving spouse, or $\overline{\gamma} = [0, 1]$.[10] In addition, surviving spouses receive Social Security survivors' benefits and solve a consumption-savings problem with mortality risk. Surviving spouses derive utility in period t from consumption according to the same utility function as the household head (shown in Equation 1), and the expected discounted utility of the surviving spouse, denoted by W, appears in the value function of the household head and therefore reflects the survivor's motives. Additional details on the problem faced by surviving spouses are in Section 4.8.

4.2 Health, Medical Expenditures and Mortality

Each period, individuals are subject to an exogenous health process (μ_t) that affects their age, education, and marital status, specific survival probability (π_t); their medical expenditures (ρ_{mt}); and their time endowment. Transitions across health states depend on current health status, education, and age. As in French and Jones (2011), we posit the following process for out-of-pocket medical expenditures: [11]

[10] The bequest motive is therefore similar to the side bequests described in De Nardi et al. (2025).

[11] Estimation details are in the Appendix Section S4.

$$\log \rho^{e,m}_{\mu t} = m(\mu_t, t, e, m) + \sigma(\mu_t, t, e, m) \times \varphi_t$$
$$\varphi_t = \zeta^{\mu}_t + \epsilon^{\mu}_t, \;\; \epsilon^{\mu}_t \sim N(0, \sigma^{\mu}_{\epsilon})$$
$$\zeta^{\mu}_t = \rho^{\mu}\zeta^{\mu}_{t-1} + \nu^{\mu}_t, \;\; \nu^{\mu}_t \sim N(0, \sigma^{\mu}_{\nu})$$

A key feature of this process is that state variables, including the realization of health, μ_t, age t, education e, and marital status m, impact both the level of medical expenditures and their variance (through σ). Additionally, the term φ_t captures additional volatility and persistence in individual medical expenditures; ϵ^{μ}_t is the transitory component of the shock while ζ^{μ}_t defines persistence.

4.3 Employment and Wages

Unemployment shocks are an important driver of claiming and retirement behavior among older Americans (Bairoliya and McKiernan, 2021). Individuals in the model experience unemployment shocks with probability π^{λ}. Unemployment implies lower productivity and wage-scarring effects. Hourly wages follow a deterministic education-specific age profile $\omega(e, t)$ and encompass two stochastic components: employment status (λ_t) and an auto-regressive component η_t.[12]

$$w_t = \xi(\lambda_t)\exp(\omega(e, t) + \eta_t) \tag{5}$$
$$\eta_t = \rho^{w}\eta_{t-1} + \epsilon^{w}_t$$
$$\epsilon^{w}_t \sim N(0, \sigma^2_{\epsilon^w})$$

Upon realization of a shock $\lambda_t = 1$, an individual can immediately re-enter the labor market with a wage penalty ξ. This captures the short average duration of unemployment spells.

4.4 Life Insurance

Each period, households can purchase a one-period life insurance policy for a premium $\rho\left(v^{e,m}_t\right)$. The policy pays out the face value $v^{e,m}_t$ in the event of death in the next period. We let individuals choose between two levels of insurance (high and low): $v^{e,m}_t \in \{\underline{v}^{e,m}_t, \overline{v}^{e,m}_t\}$. These levels of life insurance coverage are allowed to vary with age t, education e, and marital status m.

[12]This specification delivers realistic wage scarring effects after unemployment spells.

4.5 Social Security

We approximate old age benefits in several steps. First, the SS system relies on Average Indexed Annual Earnings (AIAE), which is computed as the average of earnings in the highest thirty-five earning years. The AIAE grows by an additional year if earnings in that year exceed the lowest earnings embedded in it; earnings are capped at a threshold, $a^{\max}$. For simplicity, Equation (6) approximates the AIAE by updating its value when it is lower than current earnings. Without this approximation, modelling the actual system would require keeping track of the entire earnings history, which is computationally unfeasible.

We let a_t^{ss} denote the Social Security wealth (the AIAE). Then, we approximate the evolution of Social Security wealth by the following rule:

$$a_{t+1}^{ss} = \max\{[a_t^{ss} + \max\{0, (w_t h_t - a_t^{ss})/35\}], a^{\max}\} \tag{6}$$

In the second step, we use a piece-wise linear function to convert the AIAE into the so-called Primary Insurance Amount (PIA) that determines the benefits:

$$\begin{aligned} pia(a_t^{ss}) = 0.90 \times \min\{a_t^{ss}, b_0\} + 0.32 \times \min\{\max\{a_t^{ss} - b_0, 0\}, b_1 - b_0\} \\ +0.15 \times \max\{a_t^{ss} - b_1, 0\} \end{aligned} \tag{7}$$

Adjustments and SS Benefit. Social Security benefits, ssb_t, depend on the PIA defined above as well as on two possible adjustments: (1) a penalty/credit for claiming early/late; and (2) a claw-back of benefits for those who continue working while claiming benefits (Υ_t).

$$ssb_t = pia(a_t^{ss}) * [1 - abs\,(t_{NRA} - t^{ss}) * \gamma_t^{ss}] - \Upsilon_t \tag{8}$$

Adjustment (1): Early/Late Claiming Penalty SS benefits can be claimed with no penalty at the normal retirement age t_{NRA}.However, individuals can claim benefits with some penalty starting from the early retirement age (t_{ERA}), which is 62. For every year before the NRA, for which these benefits are claimed, the amount received is permanently reduced by the early claiming penalty. Individuals can delay their benefit claim beyond NRA. In that case, future benefits are permanently increased by the delayed claiming credit.

In the model, penalties show up as a percentage decrease ($\gamma_t^{ss} > 0$) for each year before the normal retirement age that a worker claims; credits show up as a percentage increase ($\gamma_t^{ss} < 0$) for each year after the normal retirement age that a worker delays claiming.

Adjustment (2): Earnings Test The SS system includes an earnings test, taxing the labor income of beneficiaries above the threshold y_t^{ss} at a rate τ_t^{ss}, until the age of 70. For each additional dollar earned above the threshold, SS benefits are reduced by τ_t^{ss} until all benefits are taxed away:

$$\Upsilon_t = \min\{pia\left(a_t^{ss}\right), \max\{0, w_t h_t - y_t^{et}\}\tau_t^{et}\} \tag{9}$$

Υ_t denotes benefits lost through the earnings test. To be precise, withheld benefits do not work like a standard tax. Rather, taxed benefits are credited back through permanent increases in future benefits. In the model, we implement this mechanism by increasing the SS wealth (AIAE).[13]

4.5.1 Marriage Related Benefits

Spousal benefits. Married households receive additional income through Social Security spousal benefits. Spouses of household heads are entitled to up to 50 percent of the head's benefits, depending upon the age at which the benefits were claimed. We assume that spouses claim together, and thus the size of the spousal benefits received is a function of the head's age at SS claiming, t^{ss}, and of the age gap between spouses, ι. The total SS benefits that a household receives are $\delta_t^q ssb_t$ where $\delta_t^q \in (1.0, 1.5)$.

Singles and married individuals whose spouse is not yet eligible for benefits ($t^{ss} - \iota < t_{ERA}$) receive no additional spousal benefits. Married individuals for whom the spouse's age is above the normal retirement age receive an additional 50 percent of benefits. Married individuals whose wives are between 62 and 65 at the time of claiming receive benefits penalized by the early retirement penalty. Spousal benefits do not accrue delayed retirement credits and are maximized at the spouse's normal retirement age.

Survivors benefits. Upon death, married individuals may pass their SS entitlements on to their spouses. Widows over age 62 ($t - \iota \geq 62$) receive benefits equal to the benefits the head of

[13] This is a simplification. Benefits are typically adjusted after the NRA. The earnings test was removed for workers over the NRA starting in the year 2000.

household received during retirement.

$$surv_t = \mathbb{I}\{t - \iota \geq 65\} * ssb_t \tag{10}$$

These benefits are received from either the death of the spouse or the date when the spouse turns 62, whichever is later, until the death of the surviving spouse. Therefore, if the head of household dies before the spouse reaches retirement age, survivors' benefits are not received until the spouse becomes eligible for retirement.[14]

4.6 Budget Constraint

The household budget constraint can be summarized as:

$$c_t + i_t^v \times \rho(v_t^{e,m}) + \rho_\mu^{e,m}(\mu_t) + a_{t+1} = a_t + Y(y_t, y_{st}, ra_t, \tau) + \delta_t^q ssb_t + tr_t \tag{11}$$

Where i_t^v is an indicator that represents the decision to purchase a one-period life insurance policy. The price of this policy, $\rho(v_t^{e,m})$, varies with the face value of the chosen coverage, $v_t^{e,m}$. Labor income, y_t, is a function of the individual's hourly wage and work hours. We let spousal income for married households be a function of the head's age, health status, and labor income. There is a simple no-borrowing constraint on assets:

$$a_{t+1} \geq 0 \; \forall t \tag{12}$$

4.7 Government

The government taxes individuals with a proportional payroll tax, including Social Security duties and the Medicare tax, τ_t^{ss}, and labor income taxes, τ.

The government guarantees a minimum consumption level (Hubbard et al., 1995) $c_t \geq \bar{c}$. Government transfers, denoted as tr_t, bridge the gap between the minimum level of consumption

[14]The SS program does provide survivors benefits for minor children in the event of the death of the parent. These benefits are provided from the death of the parent until the child achieves age 18. Given the low probability of parental death during the years in which minor children may be present, we do not model these benefits.

and an individual's liquid resources, that is:

$$tr_t = \min\{0, \underline{c} - (a_t + Y_t + \delta_t^q ssb_t - \rho_m^{e,m}(\mu_t))\}, \tag{13}$$

where W_t is the total disposable household income. This approximates federal safety-net programs, such as the Supplemental Nutrition Assistance Program (SNAP), the Supplemental Security Income (SSI), and the Temporary Assistance for Needy Families (TANF), to capture differences in family size across these two groups.

4.8 Recursive Formulation

In period t, the individual state vector is $s_t = \left(e, q, \eta_t, \lambda_t, \mu_t, \zeta_t^\mu, a_t, a_t^{ss}, b_{t-1}^{ss}\right)$. Individuals solve a finite-horizon Markov problem where they choose a sequence of consumption $\{c(s_t)\}_{t=1}^T$, hours $\{h(s_t)\}_{t=1}^T$ and SS benefit application rules $\{b^{ss}(s_t)\}_{t=1}^T$ to maximize their expected discounted utility subject to the exogenous processes for health and employment transitions, survival and wage risk, a set of budget, borrowing, and time constraints, a government transfer rule, and policies for taxes and Social Security. The value function of a household can be written as:

$$V(s_t) = \max_{c_t, h_t, a_{t+1}, i_t^v, b_t^{ss}} \left\{ U(c_t, l_t) + \beta \pi_{t+1}^s EV(s_{t+1}) + \beta(1 - \pi_{t+1}^s) \left[\Omega(A_{t+1}^q) + W(s_t)\right] \right\} \quad s.t. \tag{14}$$

$$c_t + i_t^v \times \rho(v_t^{e,m}) + \rho_{mt}^{e,m}(\mu) + a_{t+1} = a_t + Y(y_t, y_{st}, ra_t, \tau) + tr_t + \mathbb{I}\{b_t^{ss} = 1\}\delta_t^q ssb_t,$$

2), (6-9), (12), and $c_t \geq \bar{c}$.

Phases of the life cycle. The life cycle of an individual between the ages of 25 and 99 consists of three phases.[15] The first is the *employment* phase from age 20 to 61, when individuals of a given education (e) and marital status (q) make decisions about consumption, savings, life insurance, and employment. The state variables during this phase are private assets (a_t), Social Security wealth (a_t^{ss}), productivity (η_t), employment status (λ_t), and health status (μ_t).[16] The second stage covers the *retirement choice* phase between ages 62 and 69 when, in addition to the state variables

[15]We report the complete value functions for each stage of life in Internet Appendix S2.

[16]We do not allow individuals to claim disability benefits and only estimate the model for individuals who claim Social Security through the non-disability route.

and choices of the employment phase, individuals make a Social Security application decision (b_t^{ss}). Social Security claims are assumed to be an absorbing state; once workers claim benefits, they continue to receive benefits until death. Finally, there is a *retirement* phase when individuals make only consumption, life insurance, and savings decisions. In this final stage, all uncertainty concerning productivity and employment has been resolved, while individuals face risks related to health, medical expenditures, and mortality.

Surviving spouse. Spouses are assumed to survive after the death of a married head of household. These widows inherit the demographic states (t, e, m) from the head of household and continue to choose consumption to maximize their expected discounted utility subject to the exogenous processes for survival, a set of budget and borrowing constraints, a government transfer rule, and policies. The value function of the surviving spouse, $W\left(s_t\right)$, is given by:

$$W(s_t) = \max_{c_t, a_{t+1}} \left\{ U(c_t) + \beta \pi_{t+1}^{s} W(s_{t+1}) \right\} \quad s.t.$$

$$c_t + a_{t+1} = a_t + Y(y_{st}, ra_t, \tau) + tr_t + surv_t,$$
$$\text{(6-8), (12), and } c_t \geq \bar{c}.$$

5 Estimation

We estimate the model on a sample of male household heads born between 1931 and 1935. Estimation proceeds in two steps. In the first step, we combine several data sets, including the Panel Study of Income Dynamics (PSID), the Health and Retirement Study (HRS), and the Household Component of the Medical Expenditure Panel Study (MEPS), to estimate processes that can be identified without imposing the restrictions of the dynamic life cycle model. These include health transitions, out-of-pocket medical expenditures, survival probabilities, family structure and spousal income, wages, unemployment risk, the tax function, and the exogenous rate of return on assets.

In the second step, we use initial conditions drawn from data for the cohort born between 1931 and 1935 alongside our structural model and the parameters from the first step to estimate the preference parameter vector $\{\beta, \rho, \nu, \theta, \kappa, \phi_P(t), \rho(v_t), \bar{l}\}$ by education and marital status. In this step, we employ the Method of Simulated Moments (MSM) and simulate the life cycle of a representative cohort of individuals; then, we find the parameter values that allow simulated moments to best match the data profiles for this cohort of male household heads (according to a GMM criterion function).[17]

The data that inform the structural estimation process consist of the following 45 moments for each education and marital status (see Internet Appendices S9 - S11 for the construction of initial conditions and data moments):

1. Labor market participation of male household heads within 5-year age bins between 25 and 69, resulting in 9 moment conditions for each education and marital group.
2. Hours worked, conditional on participation, of male household heads within 5-year age bins between 25 and 99, like above, resulting in 9 moment conditions for each education and marital group.
3. Median assets of male household heads within 5-year age bins between 25 and 99, resulting in 13 moment conditions for each education and marital group.
4. Life insurance coverage rates for male household heads within 10-year age bins between ages 25 and 99, resulting in 7 moment conditions for each education and marital group.
5. Median face value of life insurance policies held by male household heads within approximate 10-year age bins between ages 25 and 99 (like above), resulting in 7 moment conditions for each education and marital group.

5.1 First Step: Externally Estimated Parameters

Health, mortality and medical expenditures. Health can take three values in the model, $\mu_t = \{\text{excellent}, \text{good}, \text{poor}\}$. We identify these health states from the self-reported health status variable in the MEPS.[18] (Hosseini et al., 2022). As shown in Miller and Bairoliya (2021); Miller et al. (2019), self-rated health predicts mortality even after controlling for health conditions and behaviors. This suggests that people have private info about their overall state above and beyond what is reflected in the frailty index. We estimate health transitions across these states through an ordered probit of current health on the previous year's health status, education, and a quadratic function of age. Survival probabilities are similarly obtained from the MEPS. We estimate survival

[17] We use the identity matrix for weighting (see Altonji and Segal, 1996).

[18] The Medical Expenditure Panel Survey asks respondents to report their health on a 1-to-5 scale: 1 is "Excellent", 2 is "Very Good", 3 is "Good", 4 is "Fair", and 5 is "Poor". We convert the 5-point scale to a 3-point scale, grouping individuals with "Very Good" and "Good" score into the good health category and those with "Fair" and "Poor" scores into the poor health category. We could instead use a frailty index

profiles for male household heads are computed by estimating an ordered probit model for a death indicator on health status, a quadratic in age, education, and marital status. Survival profiles for widows of married household heads are also estimated from MEPS following the same approach. These probabilities vary based upon the spouse's age and the education of the household head. Finally, we estimate annual out-of-pocket medical expenditures from the Health and Retirement Study using all years from 1992-2018, following the same approach used in De Nardi et al. (2010); French and Jones (2011); Borella et al. (2019). Appendices S3 and S4 provide further details.

Family structure. Family structure determines two parameters for married men: the consumption equivalence scale, ζ_t, and the gap between spouses, ι. In addition, married men receive spousal income (see Bairoliya and McKiernan, 2021).

We construct the consumption equivalence scale by education and marital status using family statistics from the PSID. Single households have an equivalence scale of 1. The equivalence scale for married households depends on the presence of a spouse and the number of children living in the household, categorized by age and education type. Given the family size, we set the values of ζ_t using the OECD equivalence scale, which gives a weight of 1 to the household head, 0.5 to the spouse, and 0.3 to each child.

For married couples, the age gaps between the male household head and the spouse are based on the distribution of age gaps for the cohort at hand. We use four age gap states $(0, 1, 4, 8)$ to describe this distribution and assign the mass at each point using PSID data. Approximately 8.7 percent of married couples have no age gap, 26.2 percent have an age gap of one year, 46.1 percent have an age gap of four years, and 19 percent have an age gap of eight years or more.

From the PSID, we estimate spousal income y_{st} as a function of the household head's age, education, health, and labour income. Details are in the Internet Appendix S5.

Labor productivity, employment shocks and wage scarring, Wages comprise an age and education profile, and a persistent shock. The age and education function, alongside the AR(1) shock process parameters, are estimated on a PSID sample (Bairoliya and McKiernan, 2021). The probability that a worker is separated from the labor market is independent of education and marital status. We set the employment shock, λ, at 0.1 to match the separation rate in the JOLTS. The wage penalty associated with a bad employment shock, ξ, is modelled as a percentage of income. We estimate the penalty from the PSID following the literature on wage scarring and set to $\xi = 0.86$

(see, for example, Jacobson et al., 1993; Huff Stevens, 1997; Huckfeldt, 2016). To estimate the displacement penalty, we regress the log of hourly wages on dummies representing years since displacement and a vector of control variables, including a quadratic in age and a quadratic in experience. The penalty is set to match the average percentage drop in annual wages experienced by displaced workers. Internet Appendices S6 - S7 provide details about the estimation.

Taxes, consumption floor, and Social Security. Individuals in the model pay a proportional payroll tax and labor income taxes. The proportional labor income tax includes the SS payroll tax and the Medicare tax. The SS payroll tax is 6.2 percent on income up until the maximum taxable amount, a^{max}, while the Medicare tax is 1.45 percent on total labor income.[19] Following the literature, we adopt a smooth functional form for the labor income tax that allows for negative tax rates to incorporate the Earned Income Tax Credit (EITC). We allow for the tax function to differ by marital status to capture any differences in family size across these groups. The Internet Appendix S8 provides details on the estimation.

We parameterize the Social Security system, as described in Section 4.5, using the 1998 rules of the US Social Security Administration. A first set of parameters, b_0, b_1, and a^{max}, determines the value of Social Security wealth and benefits. The maximum wealth at which benefits are capped is a^{max} and is set at \$68,400. The parameters b_0 and b_1 define the bend points of the Social Security benefits formula, $g(\cdot)$. These points are set to \$5,724 and \$34,500. There is no variation in these parameters based on the claiming age.

A second set of parameters is based on the retirement earnings test. Before the normal retirement age (NRA), earnings above \$9,120 are taxed at a 50 percent. After the NRA, earnings above \$14,500 are taxed at 33 percent. The normal retirement age varies by birth cohort; it is age 65 for our benchmark birth cohort (born between 1931 and 1935). Benefits decrease by 6.7 percent for each year of claiming before the NRA. After the normal retirement age, benefits increase by 5.5 percent for each year of delay in claiming benefits.

Finally, we approximate all means-tested transfers (including Medicaid) by a simple consumption floor $\bar{c}$. Following De Nardi et al. (2025), we set this to \$2,824 for singles and \$4,236 for married individuals.[20]

[19]The system mandates a matching contribution by the firm. As we focus on the tax faced by the household in a partial equilibrium setting, estimated wages reflect the cost of the firm's contribution, which is passed through to the worker.

[20]We convert their estimates to 1998 dollars.

Asset division upon death of the head. At the death of the household head, assets are split between general bequests and transfers to the surviving spouse (if the individual was married). A fraction $\overline{\gamma}$ goes to general bequests. Consistent with evidence in De Nardi et al. (2025), we set this share to $\overline{\gamma} = 0.3$; 30 percent of assets and life insurance are bequeated while the remaining 70 percent stays with the surviving spouse. In Section 7, we check the sensitivity of our findings to alternative sharing rules. Among singles, the general bequest share is set to $\overline{\gamma} = 1$.

5.2 Second Step: Internally Estimated Parameters

The set of structural parameters is free to vary with marital and education status. This allows us to match wealth profiles, labor supplies, and life insurance holdings for individuals of different education-marital types.

5.2.1 Preference Parameters

In the benchmark specification, we fix the real interest rate at $r = 0.03$. Table 1 reports estimates of $(\rho^{e,m}, \nu^{e,m}, \beta^{e,m}, \theta^{e,m}_{beq}, \kappa^{e,m}_{beq}, \bar{l}^{e,m})$ by education and marital status. Estimates of the coefficient of relative risk aversion, ρ, range between 3.42 (college married) and 3.78 (non-college married). The consumption weight, ν, lies between 0.59 and 0.61. These values imply an intertemporal elasticity of substitution for consumption, $-1/[\nu(1-\rho)-1]$, equal to 0.39 for singles, and 0.38 and 0.42 for the non-college and college married groups, respectively. Estimates of discount factors, β, are marginally higher for married households than for singles.

Together, $\theta^{e,m}_{beq}$ and $\kappa^{e,m}_{beq}$ govern the intensity and shape of the bequest motive. Our estimates suggest that bequests are less of a luxury for non-college singles, $(\theta_{beq}, \kappa_{beq}) = (2.75,\ 0.68)$: relatively higher intensity combined with lower curvature means that singles begin to value bequests at comparatively modest wealth levels. By comparison, college singles, $(1.26,\ 2.45)$, have lower baseline intensity and higher curvature, so bequests behave more like a luxury good—there is little weight on bequests at low wealth, and the motive picks up sharply at higher wealth.

For married households, the pattern lies in between, with some strengthening at the top. Non-college married households, $(2.13,\ 1.35)$, display moderate intensity and curvature. College-married households, $(3.10,\ 2.39)$, exhibit stronger intensity and higher curvature, indicating that large bequests are concentrated among higher-wealth college-married households. The EOL motive is powerful when resources are abundant, but it binds less at lower wealth levels.

Table 1: Preference Parameters

Parameter	Description	Singles		Married	
		Non-College	College	Non-College	College
ρ	relative risk aversion	3.585	3.710	3.785	3.417
ν	consumption weight	0.607	0.577	0.589	0.582
β	discount factor	0.893	0.953	0.979	0.980
$\bar{l}$	time endowment	4965	4835	5971	6114
θ_{beq}	bequest intensity	2.749	1.260	2.125	3.096
κ_{beq} (in 000s)	bequest curvature	0.677	2.454	1.351	2.390

* The estimated β's do not include discounting due to survival risk which enters separately. The effective discount rate in the model is $\tilde{\beta} = \beta \pi_t^s$ where π_t^s represents the probability of survival to $t + 1$.

Estimates of the time endowment, $\bar{l}^{e,m}$, are larger for married individuals. This is a frequent finding in quantitative household models because married individuals enjoy economies of scale in home production. Finally, we estimate the time cost of working and the coefficients of the function described in Equation A5 for each education and marital group in the model. Appendix Figure S6 shows the implied costs for each group as a fraction of their time endowment.

Identification of EOL Motives Precautionary and bequest motives overlap to the point that they cannot be immediately distinguished. "A dollar simultaneously serves a precautionary function against future contingencies like health shocks and a bequest motive because, in the event the dollar is not spent on these contingencies, it will be available to bequeath to children or other worthy causes" (Dynan et al., 2002). Therefore, even if households have an EOL motive, that motive becomes active only in certain states of the world after uncertainty is resolved. This observation illustrates the difficulties in separately identifying these motives.

We proceed in two steps. First, we pinpoint precautionary and bequest motives over the life cycle by jointly matching asset and LI holdings by age. Second, we gauge the information content of the wealth and LI moments through a post-estimation analysis (see Andrews et al., 2017), which highlights the sensitivity of the structural parameters to local variation in the target moments. The magnitude of parameter responses to moments is small, suggesting that estimates are locally stable.

All sensitivity exercises are in Appendix Figure A6. In what follows, we provide intuition about the role that different moments play.

We model three distinct motives for holding assets and LI: the precautionary motive, the survivors motive (among the married), and the warm-glow bequest motive. One dollar of liquid assets can be used to satisfy all three motives; however, holding such assets exposes the household to risk, to the extent that medical expenditures are associated with assets spend-down. LI holdings, on the other hand, can shelter wealth from this uncertainty and provide a guaranteed payout upon death. The guaranteed payout satisfies the survivors and warm-glow motives, but makes wealth inaccessible while alive. Among married individuals, one dollar of savings or one dollar of life insurance can go towards both the survivors motive and the warm glow (a fraction $\overline{\gamma}$ is transferred to the spouse). The parameter estimates reflect the intensity of the precautionary motive and the bequest motive.

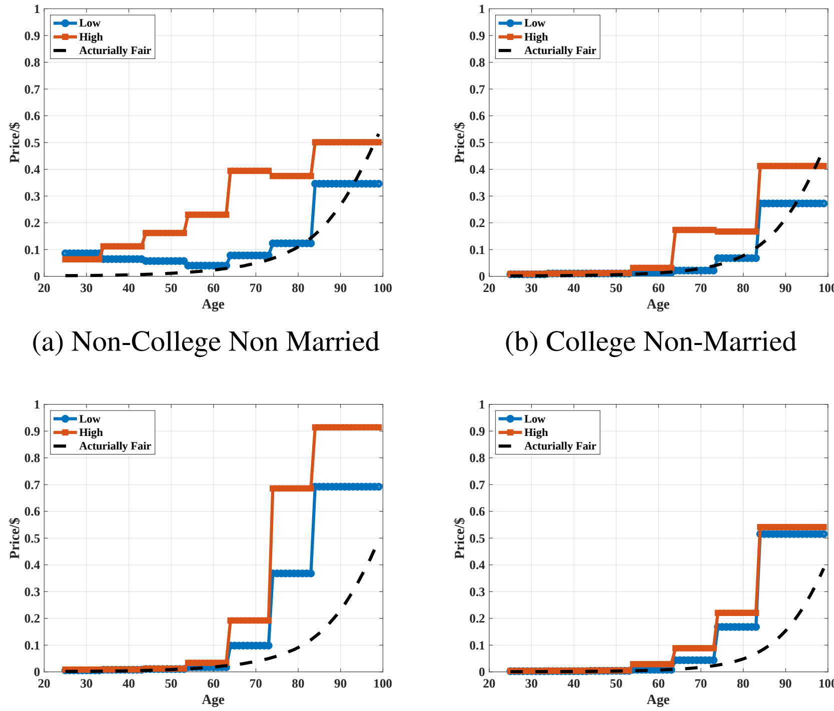
The post-estimation analysis shows that estimates of the discount factor (β) respond differently to moments of liquid wealth and LI holdings. At the margin, the discount factor is positively impacted by liquid assets and negatively affected by LI. Higher asset holdings indicate a stronger precautionary motive and, among the married, a stronger survivors motive (as the life of the surviving spouse is discounted at rate β). In contrast, higher LI coverage reduces estimates of the discount factor. This occurs because, in addition to a survivors motive, life insurance provides directly for a warm-glow motive but cannot be used to finance expenditures during life. Thus, high LI holdings reflect the intensity of EOL motives relative to standard savings. It follows that LI holdings convey more information about bequest motives than do median wealth levels.

To sum up, Uncertainty about medical expenditures means that liquid savings are not necessarily the best way to satisfy EOL motives. As discussed in the analytical example, individuals who have access to fairly priced LI contracts may prefer using those sheltered financial products to accommodate their EOL needs; thus, the joint variation of LI and liquid assets provides valuable information about the intensity of EOL motives and the costs of LI.

5.2.2 Life Insurance Prices

Figure 5 shows estimates of the shadow prices of LI by age for each education-marital group. Estimates reflect the pecuniary costs of acquiring an LI contract, as well as latent factors that influence LI take-up, such as the presence of multi-year agreements. Our modelling strategy accounts for two salient features of multi-year term policies. First, multi-year term policies allow

Figure 5: Estimated Life Insurance Price per Dollar of Coverage
by Education Marital Status



(a) Non-College Non Married

(b) College Non-Married

(c) Non-College Married

(d) College Married

Notes: price estimates for low-value (blue, lower curve) and high-value (red, upper curve) life insurance over the life cycle, by education-marital status group. The black-dashed line in each figure represents the actuarially fair price of life insurance implied by the survival probabilities.

for premium lock-in at inception — often when individuals are younger and healthier. While our single-year contracts do not allow pricing based on past states, we estimate "shadow" prices that are fixed over ten-year windows, yielding the stair-step pattern in Figure 5. This approach mimics locked-in pricing while keeping the model computationally tractable. In Section 7, we show that extending the price lock-in to twenty years delivers similar quantitative results. Second, in multi-year contracts, no agent is forced to hold a life insurance contract with a premium they can no longer afford. Policyholders can stop paying and let coverage lapse. A year-to-year contract embeds this lapse option.[21]

[21]More generally, estimates of shadow prices reflect a variety of market influences. For example, employer subsidies lead to higher LI take-up for some, whereas medical requirements and costly testing restrict access for others.

Our estimates of LI shadow prices indicate that the price per dollar of coverage rises with age and with the policy's face value. This pattern is consistent with prices reflecting expected payouts: as survival probabilities fall and the expected benefit grows, higher per-dollar premiums are expected. Moreover, when we overlay the actuarially fair price implied by life expectancies within each education–marital group (dashed lines in Figure 5), we find that shadow prices exceed actuarially fair ones at older ages in all groups. The gap is pronounced for married individuals aged 70 and older. Among singles, the gap is most apparent for high-value contracts.

These patterns help reconcile a tension between model and data. In the model, late-life medical-expenditure risk and Medicaid eligibility (captured by the guaranteed consumption floor) raise the value of death-contingent resources and push households to shift away from liquid asset accumulation toward LI holdings that are sheltered from spend-down risk. This force is stronger among married households that must ensure their surviving spouse's continued well-being throughout the surviving spouse's remaining lifetime. In the data, however, coverage — especially high-value coverage at older ages — is limited. The estimates of high shadow prices at older ages reflect the limited take-up and indicate a scarcity of affordable LI exactly when the incentive to de-risk through LI is strongest. The steep shadow prices at older ages might plausibly be due to the loss of employer-sponsored coverage upon retirement, or to severe information asymmetries about underlying health conditions. The consequence of higher prices is a reduction in LI coverage, leaving many households with less EOL insurance than they would have if prices were closer to actuarially fair.

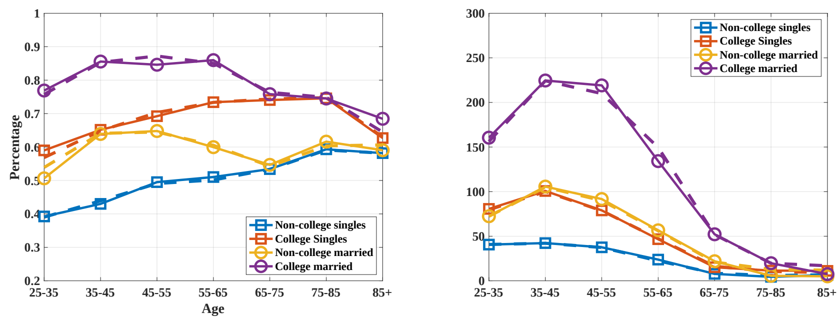
5.3 Model Fit

Figure 6 overlays observed and simulated LI coverage rates and the median face value of LI policies, conditional on having a positive value. The model has sufficient flexibility to match these moments.

Appendix Figure A3 compares observed and simulated labor force participation by age, education, and marital status. Figure 7 shows that the model reproduces the age evolution of median wealth, matching both levels and growth as well as, importantly, the lack of dis-saving at older ages. As an external validation, Appendix Figure A5 compares non-targeted Social Security claiming rates at four junctures: at the ERA, between the ERA and NRA, at the NRA, and after

These nuances are accounted for in our estimates of shadow LI prices.

Figure 6: Life Insurance Coverage and Face Value by Education Marital Status



(a) Share (b) Face Value

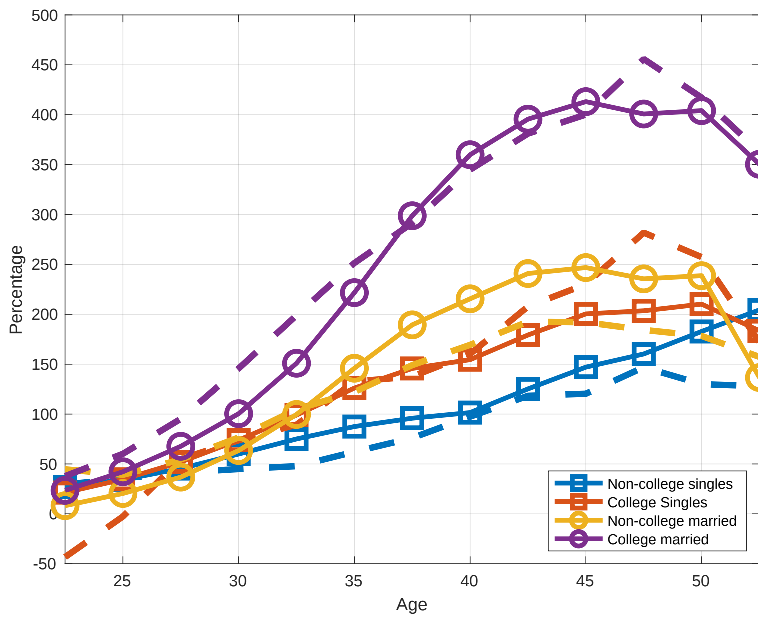
Notes: Dashed lines indicate data and solid markered lines indicate model outcomes of individuals in each marital status-education group for the share who hold some life insurance (Panel (a)) and the median face value of LI contracts conditional on holding a policy (Panel (b)).

the NRA. Consistent with the canonical literature, the model modestly overstates delays and understates early claims, but overall magnitudes align closely with the data. The main exception is an understatement of claiming at age 62. As Bairoliya and McKiernan (2021) notes, matching that spike typically requires incorporating high levels of impatience or incomplete information, and accounting for program rules of survival.

6 Counterfactual Experiments

Our estimates suggest that EOL motives are prevalent in the whole cross-section of households. Moreover, these motives cannot be exclusively satisfied through life insurance, especially in late life. The quantitative implications of these findings are not immediately apparent, as offsetting forces determine how households make choices about their lives. We examine these forces in two steps. First, we conduct a notional exercise in which LI prices are set at actuarially fair values. This counterfactual exercise provides an estimate of the welfare costs of LI market imperfections. The estimate is approximate because one cannot determine how much life insurance agents would acquire in an economy with no information frictions (our benchmark is calibrated to the frictional economy with empirically observed LI quantities). Nonetheless, the exercise is valuable as it pinpoints the magnitude of the welfare gains associated with more accessible LI. In the second step of the counterfactual analysis, we consider a more viable policy reform in which a guaranteed

Figure 7: Model Fit: Wealth



Notes: Dashed lines indicate data and solid lines indicate model outcomes of the median wealth.

lump-sum transfer at the end of life replaces a small share of the annuity entitlement.

6.1 Life insurance counterfactuals

The model suggests that households save, in part, to accommodate EOL motives. Moreover, our estimates indicate that access to LI is constrained — especially at older ages — by prices that are above actuarially fair levels. To assess the quantitative importance of imperfect LI, we study a counterfactual setting in which households can purchase LI coverage at actuarially fair prices, within each demographic group. That is, we set insurance premia equal to expected payouts implied by survival probabilities (the dashed black lines in Figure 5). All other elements of the environment are the same as in the baseline. A caveat is in order: the counterfactual exercise is notional, as it would be infeasible to implement such a policy without addressing the underlying information frictions; nonetheless, the experiment is informative about the magnitude of life insurance impacts on welfare and life-cycle dynamics.

We implement two variations of this counterfactual exercise. In the first, LI prices reflect mortality at each age over the life cycle; in the second, we keep the same prices as in the benchmark economy up to age 70, then switch to actuarially fair prices thereafter. Comparing these experiments helps isolate the importance of EOL motives in old age, rather than their influence on earlier life-cycle choices. In both experiments, more accessible life insurance is associated with households substituting liquid assets with guaranteed EOL benefits.

Table 2 shows the average welfare gain across all households, relative to baseline, after setting prices at actuarially fair values. When LI prices reflect mortality at each age, the welfare gains (Consumption Equivalent Variation) are larger, hitting almost 5%, as opposed to less than 1% in the simulation where we reduce LI prices only after age 70. This suggests that life insurance has considerable value at younger ages, as individuals lack cost-effective ways to satisfy their EOL motives. This results in significant distortions in the consumption and labor supply decisions, which add up to a considerable welfare loss over the entire life cycle. In contrast, making life insurance more affordable in later life has a positive but limited welfare impact because, up until age 70, many of the saving and labor supply distortions are still present.

The importance of life cycle distortions becomes apparent when comparing the asset accumulation and LI coverage in baseline and experiments: Appendix Figures A12 and A13) document a significant portfolio reshuffling when LI prices are lower, whereby liquid assets are substituted by LI coverage. For example, among non-college singles, asset holdings fall by roughly 30%; at the same time, LI coverage rises by about 50 percentage points at younger ages and about 15 percentage points at older ages. The same qualitative pattern holds for other groups, although the magnitudes are smaller: college-educated married households reduce liquid wealth by 5–10% and increase LI coverage by 10–20 percentage points.

In both experiments (whether LI prices are actuarially fair throughout, or only after age 70), these adjustments appear early in life, consistent with EOL motives shaping choices throughout the life cycle. However, the magnitudes are most significant in experiments where prices are low throughout the life cycle, suggesting that EOL motives play an essential role in the consumption and saving decisions of younger households, even when their mortality risk is low.

Taken together, the experiments confirm strong latent demand for a guaranteed EOL transfer, and they highlight the importance of market frictions in suppressing LI coverage in the baseline. Frictions influence choices throughout the life span.

Appendix Table A3 reports welfare (CEV) changes for each experiment disaggregated by household type. All households gain from lower LI prices, and the CEV change is proportional to the intensity of the reshuffle in the wealth-insurance portfolio.

Table 2: Average Welfare from Experiments

	Average
Actuarially fair LI prices throughout the life-cycle	4.89
Actuarially fair LI prices only after age 70	0.64
EOL Transfer Reform	3.54

Notes: % CEV (Consumption Equivalent Variation). In LI reforms, actuarially fair prices (either throughout or at the end of the life-cycle) apply to both low- and high-face value contracts.

6.2 EOL Transfer Reform

Removing information frictions is arguably infeasible; however, small changes to current policies can provide relief to individuals who struggle to fulfill their EOL goals. We examine a SS reform that introduces a small, universal EOL payment disbursed regardless of marital status. The reform replaces a small share of the annuity benefit with an EOL lump sum transfer. We are careful to hold government outlays on SS payouts at their benchmark level: after denoting the total expected present value of the EOL lump sum transfers as PV^D, we impose the following constraint,

$$\sum_{i=1}^{N}\sum_{t=62}^{100}\left[(1-d_{it})\alpha^{ss}ssb^*_{it}\right] + PV^D = \sum_{i=1}^{N}\sum_{t=62}^{100}\left[(1-d_{it})ssb^*_{it}\right] + SVB \tag{15}$$

$$\text{Where: } PV^D = \sum_{i=1}^{N} PV_i^D; \quad SVB = \sum_{i=1}^{N} \mathbb{I}_{\{m_i=1\}} SVB_i$$

In the expression above, d_{it} are death indicators based on simulated health and survival transitions, ssb^*_{it} is the benchmark value of the annuity benefits paid to individual i at age t, SVB_i is the survivor benefit paid to the surviving spouse of an individual upon death (if they have already claimed their benefits), α^{ss} is the factor that scales down the value of the annuity benefits in the experiment, and PV_i^D is the lump sum paid out to the original SS program recipient at the end of life. The constraint guarantees that aggregate Social Security disbursements are the same as in the baseline. Under the reform, survivors benefits that were exclusively available to married couples are replaced by an EOL transfer paid to all individuals, married or not, at the end of life. This introduces a redistribution of resources between different household types.

The lump-sum payment varies across individuals because it is set as a multiple of their primary insurance amount (PIA). In the experiment, all individuals receive, upon death, the equivalent of 5.5 years' worth of their PIA entitlement in exchange for a 4 percent decrease in annuity payments.

Table 3 shows the average welfare change in the cross-section of households. Moreover, it reports changes in labor supply, asset holdings, average consumption, and welfare across subsets of the population (by education and marital status). Even a small departure from the baseline SS regime generates economically significant impacts.

Table 3: EOL Transfer Reform
(percentage change relative to the benchmark SS regime)

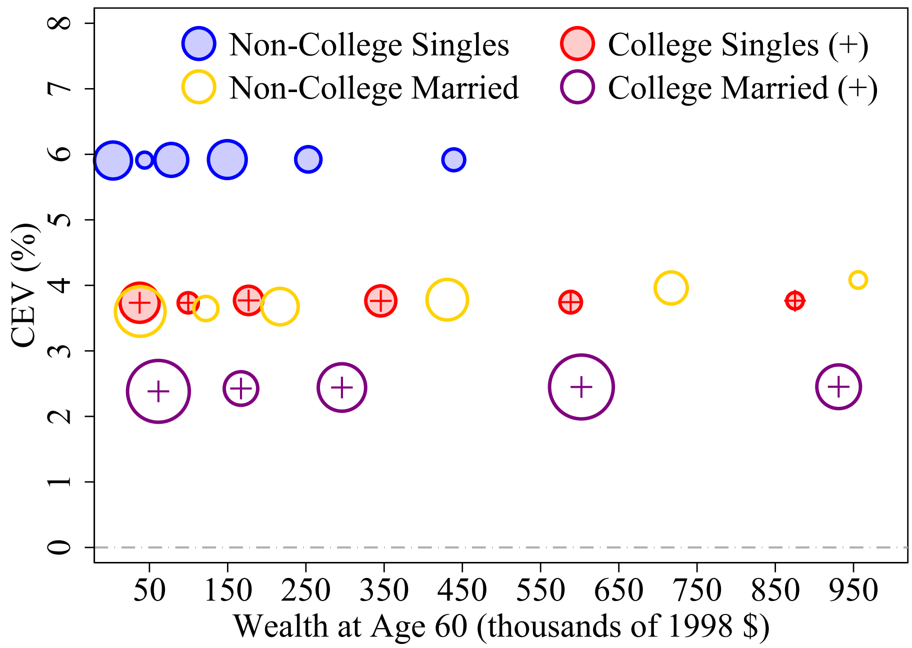
	Singles		Married	
	Non-College	College	Non-College	College
Welfare	5.91	3.75	3.73	2.43
Consumption	14.62	4.89	4.09	0.83
Assets	-63.47	-32.59	-18.33	-5.98
LI coverage	20.18	5.01	2.83	1.02
Participation	-1.89	-0.81	-0.18	1.56
Hours	-1.17	0.07	1.93	2.26

Notes: % changes following an experiment that entails a lump sum payment to every individual. The payment is worth 5.5 years of the PIA at the time of death. The transfer is financed through a 4% reduction in the annual flow of SS annuity payments. This guarantees that the aggregate lifetime SS outlays remain at their benchmark level.

6.2.1 What drives welfare changes?

Welfare changes are significant, even though they are on average lower than in the experiment where the LI price is actuarially fair at all ages (see Table 2). The largest gains accrue to singles: under the reform, they are guaranteed a portion of their Social Security benefits even if they die before claiming them. Among non-college singles, the average CEV increase is 5.9%; college-educated singles gain 3.8% on average, with most individuals experiencing gains above three percent (Figure 8). Married households also benefit, though to a lesser extent: average CEV gains are 3.7% for non-college married and 2.4% for college married. As we show below, one reason for the considerable welfare gains is the increase in consumption, which rises over the entire

Figure 8: Welfare: EOL Transfer Reform



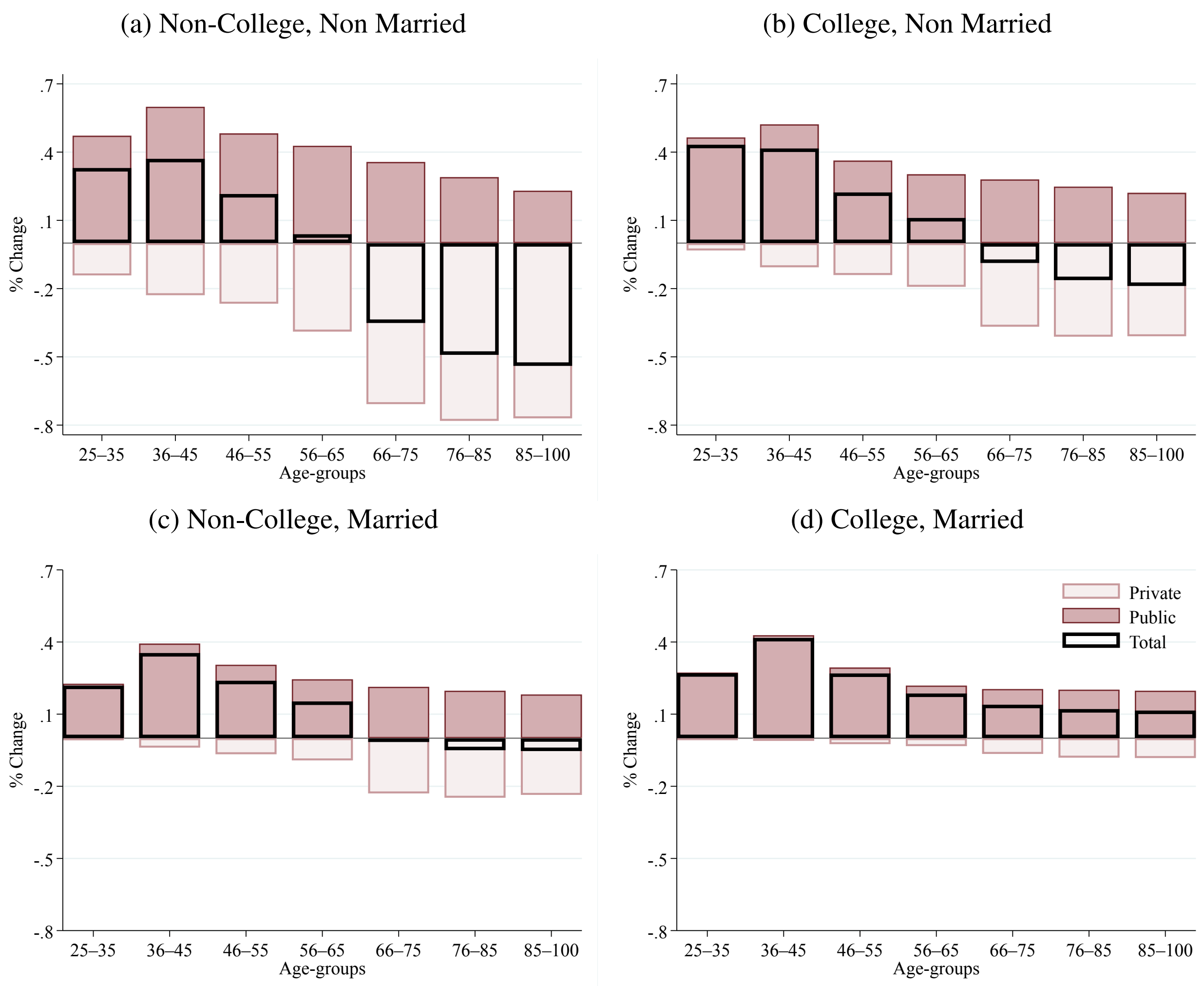
Notes: Shows the consumption-equivalent variation (CEV %) impact of the EOL transfer reform on individuals who vary based on education-marital status group and age 60 wealth. The size of the bubble corresponds to the size of the population within that group; larger bubbles indicate an education-marital status group and wealth level that represent a larger share of the population.

life cycle for all groups, especially the less educated and unmarried.

Figure 8 summarizes the distribution of CEV changes by education, marital status, and age 60 wealth; bubble sizes indicate group size. All subgroups gain, although the magnitudes differ.

Reduced risk exposure, increased welfare. The guaranteed EOL transfer allows households to reduce their exposure to health and wealth risk by substituting away from late-life asset accumulation. As concerns about EOL motives dissipate, the need to accumulate liquid assets diminishes: the reduced saving is associated with earlier retirement and higher late-life consumption. Among married households, a countervailing force dampens the gains: the reform replaces a generous survivors' annuity with a smaller lump sum payment, prompting additional saving to support the surviving spouse in old age. Even so, reduced exposure to the risk of asset depletion due to late-life medical expenditures yields welfare gains.

Figure 9: End-of-Life Resources: EOL Transfer Reform



Notes: Figures show the percentage change in end-of-life resources (total, public and private), conditional on dying at a given age, between the baseline and the EOL transfer reform experiment for each marital status-education group: non-college singles (Panel (a)), college singles (Panel (b)), non-college married (Panel (c)), and college married (Panel (d)).

6.2.2 Portfolio reallocation: life insurance versus assets

The reform induces a reshuffling of lifetime wealth portfolios: asset holdings shrink while LI rises. For non-college singles, the third and fourth rows of Table 3 show that life-cycle asset holdings decline by more than 60% while LI coverage increases by 20%. Patterns are similar for married households, though magnitudes are smaller.

The mechanism behind the welfare gains is the rebalancing away from costly self-insurance. In the baseline, households can (i) accumulate assets or (ii) purchase LI to accommodate EOL motives. Self-insurance through asset accumulation is especially costly at older ages because of the risk of large medical expenses that can rapidly deplete wealth. If late-life "tail" shocks exhaust assets (upon transition to Medicaid, approximated by the consumption floor in our model), households are left with negligible residual wealth. Hence, conditional on death tomorrow, only a small fraction of assets may remain to meet EOL motives. In addition, LI market frictions reduce access to high-face value policies at older ages.

The substantial impact of the reform stems from its direct effect on this key margin, through the introduction of a guaranteed EOL benefit equivalent to 5.5 years' worth of annuity. To illustrate the impact of the EOL transfers, we define total EOL resources, R_a, as the sum of all assets available to satisfy the warm glow motive (Equation 16):

$$R_a \;=\; A_a^d \;+\; L_a \;+\; B_a, \tag{16}$$

B_a represents the publicly provided lump-sum benefit received at age a ($B_a = 5.5 \times \text{PIA}_a$ in the experiment, but it is zero in the baseline). L_a represents the payout from private LI, and A_a^d are the assets which remain after medical expenses. Because B_a is not subject to medical expenditure risk, the reform guarantees EOL resources that are independent of health risk. This allows individuals to optimally substitute away from risk-exposed asset holdings — i.e., a portfolio "de-risking."

Figure 9 plots the percentage change, relative to baseline, in total EOL resources by age (the black outlined transparent bars). The plots also show the composition of EOL resources: guaranteed public EOL (B_a, darker bars) versus private assets and LI ($A_a^d + L_a$, lighter bars). Under the reform, the public EOL transfer rises mechanically (B_a); at the same time, private EOL resources decline as households re-adjust their asset and LI holdings. This reallocation is the proximate channel through which the reform reduces exposure to medical-expenditure tail risks, changing lifetime behaviors and raising welfare.

Heterogeneous reallocation: singles. Non-college single men enjoy the most significant welfare gains from the reform. This group exhibits pronounced portfolio rebalancing; public EOL transfers crowd out private assets and LI holdings. As individuals near retirement (ages 56–65), the public EOL component, as a share of baseline total EOL resources, is about 42% higher under the reform. In contrast, private EOL resources are 38% lower. On net, total EOL resources R_a are almost unchanged. The portfolio rebalancing is consistent with sizable substitution away from private self-insurance.

The picture differs at different life stages. At ages 25–35, total EOL resources are about 33% higher relative to baseline, whereas at ages 85–100 they are 54% lower. This pattern reflects age-varying crowd-out: the public EOL transfer displaces private saving only modestly in early adulthood, but displaces it strongly at older ages, when households would otherwise hold precautionary wealth, which is exposed to more medical expenditure risk.

For non-college single men, the average crowd-out is about 31 cents of lower private wealth for each additional dollar of public EOL transfer at ages 25–35. The crowd out rises to 2.7 dollars lower private wealth per 1 dollar of public EOL transfer at ages 85–100. The increase from 31 cents to 2.7 dollars reflects the strong late-life substitution away from private EOL resources. This explains why the reform raises total EOL provisions among the young but reduces them at older ages.

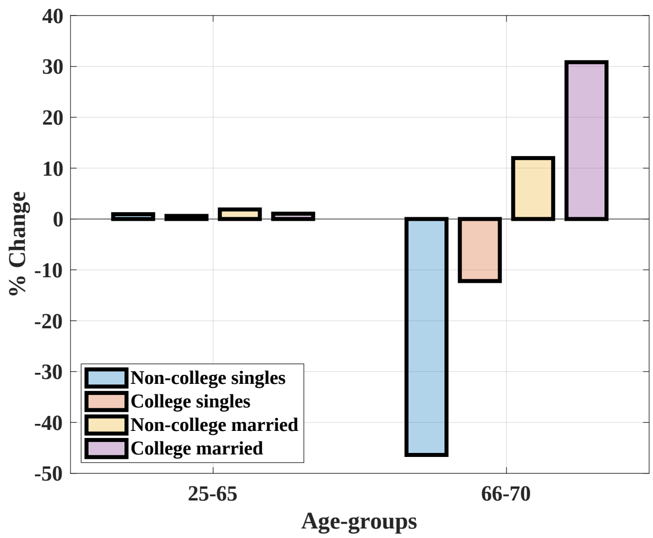
More educated single men exhibit similar responses to the reform, albeit with smaller magnitudes than their less educated counterparts. Total end-of-life resources are about 19% lower at late ages (ages 85-100). This is primarily driven by almost a 41% reduction in private assets in response to a 22% increase in public EOL transfers (refer to the second panel of Figure 9). Overall, this shows that every dollar of public EOL transfer crowds out roughly \$1.5 at older ages.

Heterogeneous reallocation: Married individuals. The changes among married men are less pronounced. At ages 85–100, each dollar of public transfer crowds out a little more than a dollar of private EOL resources among the less educated men, and less than a dollar (37 cents) among the college-educated. In the latter group, individuals experience a net gain in overall resources over their lifetimes. As shown in Figure 9, their total EOL resources under the reform $(A_a^d + L_a + B_a)$ are 11.5% higher at older ages relative to the baseline. This stands in contrast to singles, for whom late-life crowd-out exceeds a one-for-one replacement.

The more muted responses among married households are primarily due to changes in survivors benefits under the reform. In the baseline economy, the surviving spouse is insured by a generous public annuity (The SS survivors benefit), which the reform replaces with a less generous lump sum transfer upon the death of the primary beneficiary. Anticipating lower survivors benefits, married households respond by holding additional private assets. This offsets the original portfolio rebalancing. The result is a smaller crowd-out and, for college married men, a modest increase in total EOL resources at older ages.

6.2.3 Labor supply responses over the life cycle

Figure 10: Life Cycle Hours: EOL Transfer Reform



The reform generates heterogeneous labor supply responses over the life-cycle and across groups. Table 3 shows that average labor force participation (LFP) falls by almost 2% among non-college singles, while it rises by 1.6% among college married men. These responses are better understood by examining the life-cycle profiles of hours and participation. Figure 10 reports the percentage change in total hours for two age groups (25–65 and 66–70), capturing both extensive and intensive responses. Across all groups, the most significant adjustments occur at ages 66–70. Appendix Figures A10 and A11 show that these adjustments occur mainly on the extensive margin: while labor-force participation shifts, hours conditional on working are little changed. Because dropping out of work (or entering employment) implies moving between zero and positive hours in the presence of fixed participation costs, even modest participation responses translate into large changes in total hours, as seen in Figure 10.

Among singles, the reform leads to earlier retirement. Between ages 66 and 70, LFP declines by 20 percentage points among non-college singles and 10 percentage points among college singles, with negligible changes in hours conditional on working. In the baseline economy, singles finance EOL motives by accumulating assets and, if feasible, by purchasing LI. Because late-life assets are exposed to medical-expenditure tail risk and LI is costly, working until later in life becomes an effective way to build up precautionary wealth. The reform provides a guaranteed public EOL benefit, thereby reducing the marginal value of additional late-life asset accumulation. Singles, therefore, exit earlier and enjoy higher leisure and consumption (Appendix Figure A8). The intuition is that single individuals are no longer forced to work and save to satisfy their EOL motives.

Married households face similar incentives. However, the reform replaces a generous survivors annuity (Social Security Survivors benefits) with a less generous transfer upon death of the primary beneficiary. Anticipating lower survivors income, married men delay labor market exit and modestly increase hours to offset the decline in resources left to the surviving spouse. Among college-educated married men, LFP between ages 66 and 70 rises by about 10 percentage points, with a slight increase in hours. As discussed above, their liquid asset holdings fall less than those of singles, and the crowd-out of private EOL resources by public transfers is much smaller.

To summarize, the guaranteed EOL transfer allows households to reduce their exposure to tail expenditure risks in late life and pulls forward retirement for singles. However, the loss of generous survivors benefits pushes married men, especially the college-educated, to delay retirement. These labor supply patterns align with the heterogeneous welfare changes documented above.[22]

7 Robustness

The terminal asset-splitting rule. In the baseline, we set the terminal asset–splitting rule for married households at 70–30: 70% of terminal assets are left to the surviving spouse and 30% go to general EOL bequests. Although the data and recent evidence guide this choice, one might worry that welfare results hinge on this assumption.

To assess robustness, we study two alternative baselines in which married households follow different terminal splits: (1) a 50–50 rule (even split), and (2) a 90–10 rule (90% to the spouse, 10% bequeathed). For each scenario, we keep all first-step parameters fixed and re-estimate the

[22]The discussion of the impact of the reform on Social Security claiming behavior is in Appendix Section B.

Table 4: Robustness: Welfare from EOL Transfer Reform

	Singles		Married	
	Non-College	College	Non-College	College
Benchmark	5.91	3.75	3.73	2.43
50-50 Splitting Rule	5.91	3.75	4.77	2.72
90-10 Splitting Rule	5.91	3.75	2.09	1.50
LI Term Contract	5.90	3.92	3.56	2.50

Notes: % CEV following an experiment that entails a lump sum payment to every individual. The payment is worth 5.5 years of the PIA at the time of death. The transfer is financed through a 4% reduction in the annual flow of SS annuity payments. This guarantees that the aggregate lifetime SS outlays remain at their benchmark level.

group-specific preference parameters by matching the same set of moments described in Section 5. Then, we evaluate the policy experiment under the alternative split.

The key findings are effectively unchanged. The second and third rows of Table 4 report welfare gains from the reform under the 50–50 and 90–10 splits, relative to the benchmark (in the first row). Results for singles are, mechanically, the same. For married households, shifting a larger share to warm glow (50–50) yields somewhat larger gains from the universal transfer reform, while allocating only 10% to warm glow (90–10) yields somewhat smaller gains. Intuitively, a dollar allocated to warm-glow bequests delivers utility at the time of death. In contrast, resources for the surviving spouse are realized as a discounted stream over the remaining lifespan—warm-glow dollars carry more weight in present-value utility; consequently, when a larger share of terminal resources is earmarked for warm glow, the portfolio reshuffling induced by the reform yields larger welfare gains.

Notably, the mechanism and the ranking of welfare gains remain similar across splits: households reallocate portfolios away from risk-exposed liquid assets, and the heterogeneity by education and marital status is preserved (see Appendix Table A4 for more details). The main results are robust to alternative assumptions about the terminal asset–splitting rule.

LI contracts: terms and price lock-ins. Our baseline model allows households to revise LI choices in each period while facing premia that are fixed over a 10-year window. We relax the 10-year assumption by lengthening the premium guarantee to 20 years. In this experiment, we hold LI premia constant over four age bands—25–45, 46–65, 66–85, and 85+—and recalibrate to the same wealth, LI, and labor-supply moments as in Section 5. The quantitative findings for the policy reform are essentially unchanged (see Appendix Table A5 for results). Portfolio responses continue to display sizable substitution away from liquid asset accumulation, and the welfare rankings and magnitudes remain close to the original experiment, as shown in the last row of Table 4. This highlights that the portfolio de-risking mechanism does not hinge on the precise duration of the premium lock-in within the empirically relevant 10–20 year range.[23]

8 Conclusion

Late-life financial decisions are shaped by multiple, often overlapping motives, including precautionary concerns about uncertain medical expenses, the desire to support surviving spouses, and end-of-life (EOL) warm-glow bequest preferences. The presence of multiple motives makes it difficult to identify genuine EOL preferences empirically, as they can be easily confounded with precautionary or survivor motives. Moreover, all these considerations can influence behavior well before old age, shaping saving and labor supply throughout the entire life cycle in distinct ways. Using evidence on wills, beneficiaries, and life insurance (LI), we document that warm-glow bequest motives are pervasive across household types.

We develop and estimate a quantitative life-cycle model of consumption, labor supply, saving, and LI that explicitly nests these three motives. A key contribution is our identification strategy, which exploits a fundamental asymmetry: LI pays only at death, while liquid wealth finances consumption while alive and pays residually at death. This state-contingency asymmetry allows us—together with age-specific wealth moments and the post-estimation sensitivity analysis of Andrews et al. (2017)—to separate time discounting from the intensity and curvature of EOL preferences. The model matches targeted and non-targeted moments on wealth, LI, participation, and claiming behavior.

Our findings highlight a portfolio de-risking channel. Because assets near the end of life are exposed to medical-expenditure tail shocks, residual wealth at death is highly stochastic. Death-contingent resources (private LI or a guaranteed EOL transfer) are state-contingent and guaranteed.

[23] We have also experimented with a computationally intensive version of the model in which households are contractually locked into a term policy for an average of 10 years (with an exogenous lapse probability). They can revise LI only upon a lapse. While this set-up mechanically forces continued premium payments until lapse (whereas, in practice, policyholders can and do stop paying at will), the aggregate portfolio and welfare results are remarkably similar. Results for this extended version of the model are available from the authors.

When households value EOL provision, this asymmetry tilts portfolios away from risk-exposed assets and toward instruments that pay at death, with first-order implications for welfare, labor supply, and Social Security claiming.

To isolate how EOL motives shape labor supply and portfolio allocation, we conduct two counterfactual experiments. First, we study a hypothetical scenario in which LI prices are set at actuarially fair levels—effectively removing information frictions that are difficult to eliminate in practice. This benchmark reveals strong latent demand for EOL insurance: households shift dramatically from liquid assets to LI coverage across all demographic groups, including at younger ages. This experiment provides a metric against which to evaluate more realistic reforms. Second, we examine a modest Social Security redesign that swaps a small share of the mandatory annuity for a guaranteed lump-sum payable at death, regardless of marital status. This policy generates substantial welfare gains, particularly for financially vulnerable singles with limited access to fairly priced LI, by enabling households to reduce exposure to late-life expenditure risk without sacrificing EOL objectives. Both experiments operate through the same de-risking mechanism: the availability of guaranteed EOL resources allows households to reduce their costly accumulation of risk-exposed liquid wealth and adjust their labor supply accordingly. Singles retire earlier, while married households—who lose generous survivor annuities under the SS reform—partially compensate by increasing saving and delaying retirement.

Taken together, the analysis shows that (i) EOL motives are quantitatively important across household types; (ii) tail medical-expenditure risks transform late-life saving into a risky vehicle for EOL provision; (iii) guaranteed death-contingent resources deliver welfare gains by de-risking portfolios; and (iv) while achieving actuarially fair LI prices would require major market redesign that is difficult to implement, a modest adjustment to Social Security can deliver substantial welfare improvements. These results help reconcile observed saving, insurance, and retirement patterns, and they suggest that policies aimed at expanding access to guaranteed EOL resources can meaningfully improve welfare, especially for singles and the less educated who face the greatest frictions in private LI markets.

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Appendix

A Motivation

A1 Sample Selection

As discussed in the main text, the empirical facts use data from the Health and Retirement Study (HRS). The Health and Retirement Study is a longitudinal study of Americans aged 50 and above. We use Waves 3-15 of the 2020 version 1 in this work; these waves cover the years 1992 through 2020. Our final sample focuses on a cohort of men born between 1926 and 1970 who are over the age of 50 and for whom marital status and parental status are known. We will also be using two sub-samples when computing the statistics in Section 2: the bequest intention sub-sample and the life insurance and will sub-sample. The bequest intention sub-sample adds the additional restriction of limiting the age to be between 50 and 70; the life insurance and will sub-sample limits the Waves used to 6-15, covering years 2002-2020. Table A1 details this sample selection.

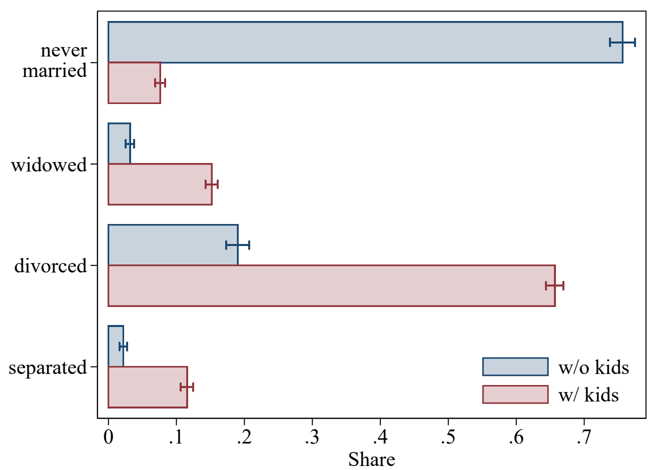
Table A1: Stylized Facts Sample Selection

Main Sample	Observations
HRS 2020 version 1	636,180
Waves 3-15	551,356
Born 1926-1970	430,404
Men	193,206
Age 50+	87,400
Marital, parental status known	85,764
Bequest Intention Sub-Sample	85,764
Age 50-70	60,803
Life Insurance and Will Sub-Sample	85,764
Waves 6-15	68,927

We separate this sample into four groups based upon marital and parental status: single with no children, single with children, married with no children, and married with children. Married individuals are those who are currently legally married (spouse present or absent) and those who are partnered; singles individuals are separated, widowed, divorced, or never married; an individual is classified as having children is he has at least one living child with whom he is currently in touch. Using current marital status means that individuals who we classify as single may have been previously married. Figure A1 shows how singles are distributed across more detailed marital status groups based upon whether they have children. We see that nearly 80 percent of singles without children have never been married, while over 80 percent of singles with children are either divorced or widowed. Additionally, using a measure of children based upon living children who are currently in touch may mean we classify an individual as not having children if a child is deceased or not in communication. We prefer this measure as it allows us to include step-children who would not be captured in a measure of biological children. Even so, our results are robust to using a measure of children that counts whether an individual has ever has a biological child born to them.

Within the main sample, 6.4% are single with no children, 15.9% are single with children, 3.1% are married with no children, and 74.6% are married with children.

Figure A1: Distributions of Detailed Marital Status Among Singles



Notes: Figure shows the distribution of detailed marital statuses among those who are classified as single, conditioned on either having children or not having children.

To construct our indicator of the intention to leave a bequest we use the following sequence of questions: Workers are first asked, “What is the probability that you will leave a bequest of \$10,000 or more?” Follow-up questions are determined based on the response. If the individual reports a probability strictly above zero, he or she is asked “What is the probability that you will leave a bequest of \$100,000 or more?”[24] If an individual, on the other hand, reports a zero probability of leaving a bequest of at least \$10,000, that individual is asked for the probability of leaving any

[24]Beginning in Wave 6, those who report a positive probability of leaving a bequest of \$100,000 or more are asked the probability they will leave a bequest of \$500,000 or more. We will not use this question in our analysis.

bequest.[25]

A2 Additional Results and Figures

In the main text, we present Figures 1 and 2, which show how the share of individuals with bequest intentions and those who make choices to prepare. We also perform a Tukey pairwise mean comparison test to determine whether there is a statistically significant difference between the means of each marital-parental status group. These results are shown in Table A2. The table presents the point estimate for the difference in the mean of the outcome variable (bequest intention, presence of a valid will) for a given pair of marital-parental status groups within a specific wealth quintile. A significant result for this point estimate means that we can reject the null hypothesis that the means are the same across groups; an insignificant result means that we can reject the null hypothesis that these means are the same.

B EOL Transfer Reform: Social Security Claiming

We also examine how the reform alters Social Security claiming by household heads. Figure A2 reports percentage-point changes in claiming shares at four ages: the earliest eligibility age (ERA, 62), the pre-normal-retirement window (62–64), the normal retirement age (NRA, 65), and the post-NRA window (66–70). We find that singles substantially delay claiming. At age 62, claims fall by 60 percentage points for non-college singles and by 12 percentage points for college singles, while claims after age 65 rise by 70 and 65 percentage points, respectively. Under the reform, singles need not "cash out" early to fund end-of-life motives because a guaranteed lump-sum is paid upon death even if they hadn't claimed benefits.[26] In addition, delaying claims helps recover part of the reform's annuity reduction (4%) through delayed retirement credits, further strengthening the incentive to postpone.

For married households, these forces also operate, but a countervailing incentive helps mitigate delays. In the baseline, postponing claims raises the surviving spouse's annuity through accumulated delayed retirement credits, providing a strong reason to delay. The reform removes that survivor annuity and replaces it with a lump sum at death, weakening the benefit of waiting. Consistent with this, we observe an uptick in early claiming among some married groups; for example, college married households exhibit a 20 percentage-point increase in claims at age 62. In short,

[25] In Wave 3, the order of questions is different. Workers are asked the probability of leaving any bequest before being asked about a bequest of $10,000 or more.

[26] See Bairoliya and McKiernan (2021) and Pashchenko and Porapakkarm (2018) on the link between bequest motives and claiming behavior.

Table A2: Results of Tukey-Kramer Pairwise Mean Comparison Test

	Wealth Quintile				
	Q1	Q2	Q3	Q4	Q5
Bequest Intentions					
single w/ kids – single w/o kids	0.074***	0.026	0.063	0.103***	0.029
	(0.022)	(0.030)	(0.033)	(0.033)	(0.033)
married w/o kids – single w/o kids	0.029	−0.054	−0.023	0.041	−0.044
	(0.040)	(0.043)	(0.042)	(0.039)	(0.035)
married w/ kids – single w/o kids	0.101***	−0.031	0.010	0.014	−0.012
	(0.020)	(0.028)	(0.028)	(0.028)	(0.028)
married w/o kids – single w/ kids	−0.045	−0.080	−0.085*	−0.061	−0.073*
	(0.037)	(0.037)	(0.036)	(0.034)	(0.029)
married w/ kids – single w/ kids	0.027	−0.057***	−0.052**	−0.089***	−0.041
	(0.012)	(0.016)	(0.018)	(0.019)	(0.020)
married w/ kids – married w/o kids	0.072	0.023	0.033	−0.028	0.032
	(0.036)	(0.035)	(0.032)	(0.029)	(0.023)
Valid Will					
single w/ kids – single w/o kids	0.023	−0.025	0.066	0.030	0.009
	(0.019)	(0.030)	(0.036)	(0.037)	(0.040)
married w/o kids – single w/o kids	0.089*	0.023	0.035	0.028	−0.033
	(0.036)	(0.043)	(0.045)	(0.043)	(0.041)
married w/ kids – single w/o kids	0.018	0.004	0.093**	0.138***	0.080*
	(0.018)	(0.027)	(0.031)	(0.032)	(0.033)
married w/o kids – single w/ kids	0.066	0.049	−0.031	−0.002	−0.041
	(0.033)	(0.037)	(0.038)	(0.037)	(0.033)
married w/ kids – single w/ kids	−0.004	0.029	0.027	0.108***	0.072**
	(0.011)	(0.016)	(0.020)	(0.022)	(0.023)
married w/ kids – married w/o kids	−0.070	−0.020	0.058	0.110***	0.113***
	(0.032)	(0.035)	(0.034)	(0.031)	(0.025)
Life Insurance					
single w/ kids – single w/o kids	0.117***	0.110***	0.162***	0.092**	0.192***
	(0.026)	(0.030)	(0.029)	(0.030)	(0.039)
married w/o kids – single w/o kids	0.190***	0.065	0.178***	0.132***	0.226***
	(0.049)	(0.043)	(0.036)	(0.035)	(0.039)
married w/ kids – single w/o kids	0.187***	0.189***	0.267***	0.262***	0.331***
	(0.024)	(0.027)	(0.025)	(0.026)	(0.032)
married w/o kids – single w/ kids	0.073	−0.045	0.015	0.040	0.034
	(0.045)	(0.037)	(0.031)	(0.030)	(0.032)
married w/ kids – single w/ kids	0.069***	0.079***	0.105***	0.170***	0.139***
	(0.015)	(0.016)	(0.016)	(0.018)	(0.023)
married w/ kids – married w/o kids	−0.004	0.125***	0.090***	0.130***	0.105***
	(0.044)	(0.034)	(0.027)	(0.025)	(0.024)

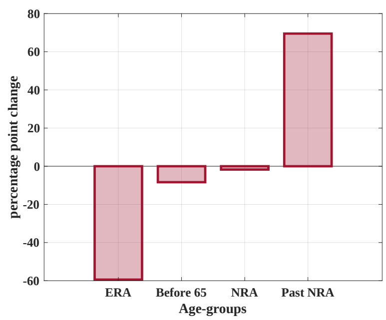
Notes: Table shows the difference in the means of the outcome variable (bequest intention, presence of a valid will) for each pair of marital-parental status groups and each wealth quintile. The null hypothesis of the Tukey-Kramer test is that the means are equivalent, $H_0 = \mu_1 - \mu_2 = 0$, for any two groups 1 and 2. Standard errors in parentheses.

*p< 0.1, **p< 0.05, ***p< 0.01

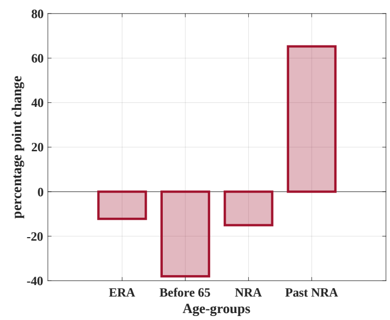
the reform shifts singles toward later claiming, while married households display more muted—or even earlier—claiming due to the loss of survivors benefits.

Figure A2: Social Security Claiming Behavior: EOL Transfer Reform

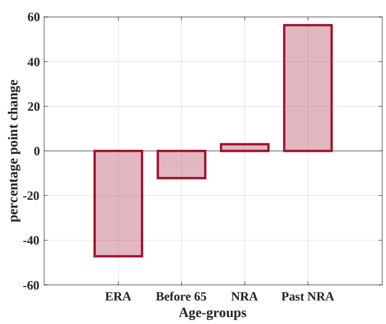
(a) Non-College, Non Married



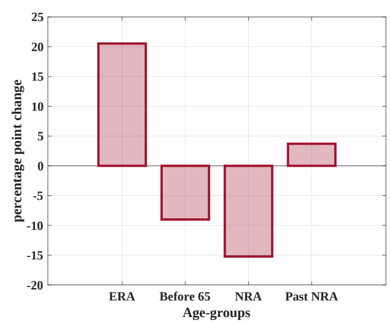
(b) College, Non Married



(c) Non-College, Married



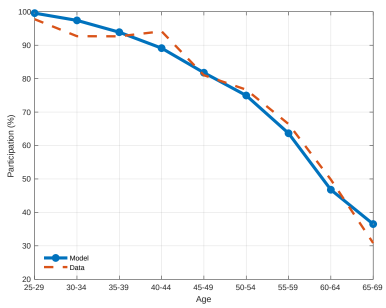
(d) College, Married



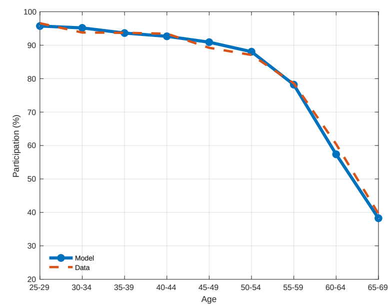
C Additional Figures and Tables

Figure A3: Model Fit: Labor force participation rates

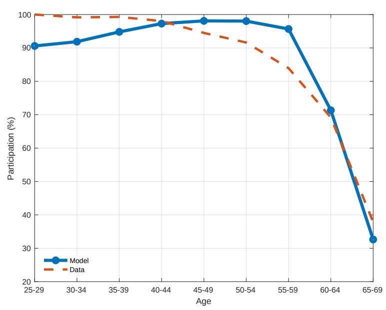
(a) Non-College, Non Married



(b) College, Non Married



(c) Non-College, Married



(d) College, Married

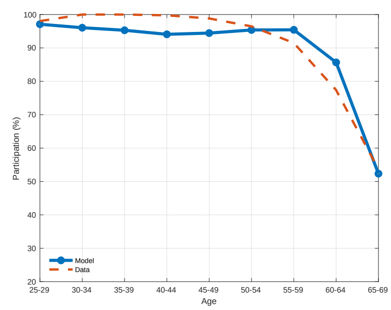
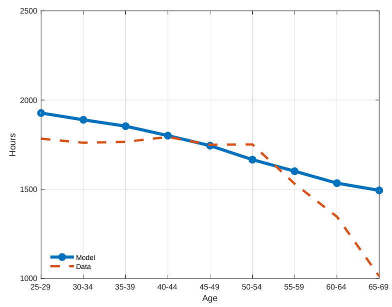
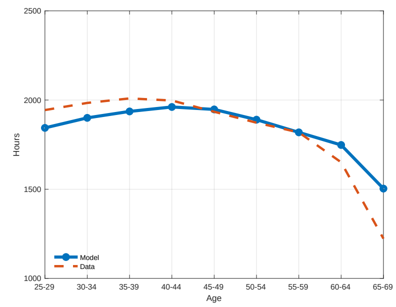


Figure A4: Model Fit: Hours Worked

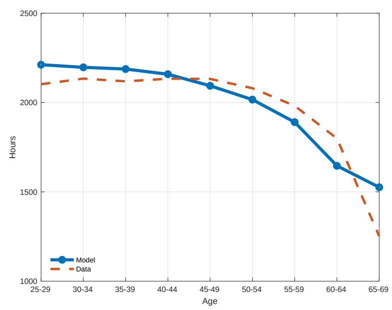
(a) Non-College, Non Married



(b) College, Non Married



(c) Non-College, Married



(d) College, Married

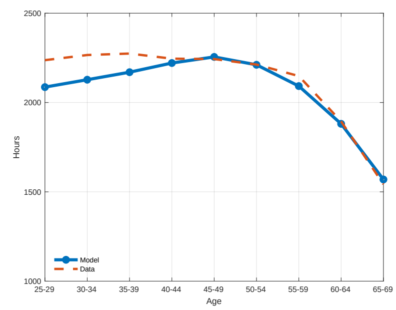


Figure A5: Model Fit: SS Claiming Behavior

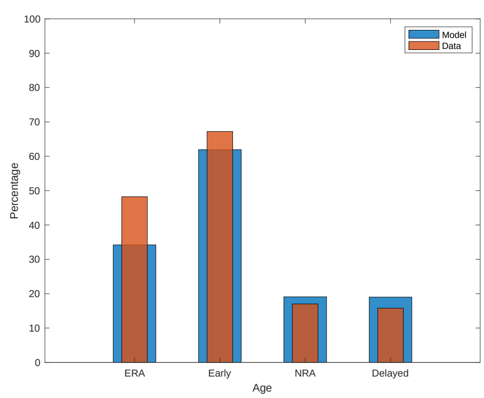
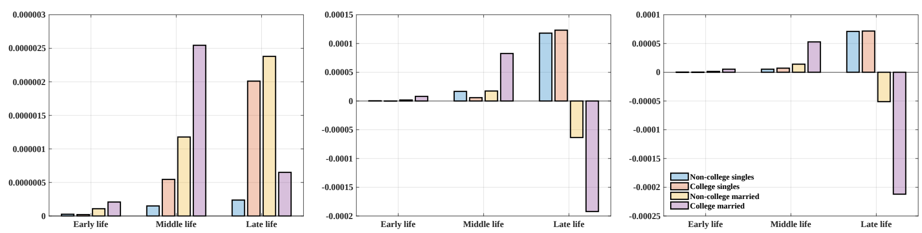


Figure A6: Sensitivity of Select Parameters to Wealth and Life Insurance Moments

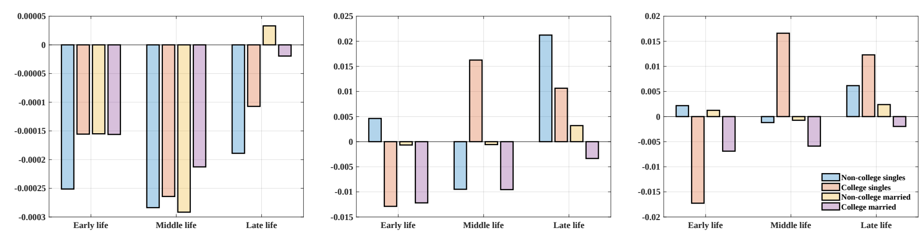
Wealth Moments

(a) Discount factor (β) (b) Bequest intensity (θ) (c) Bequest curvature (κ)



Life Insurance Moments

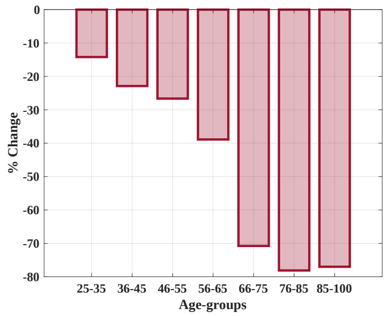
(d) Discount factor (β) (e) Bequest intensity (θ) (f) Bequest curvature (κ)



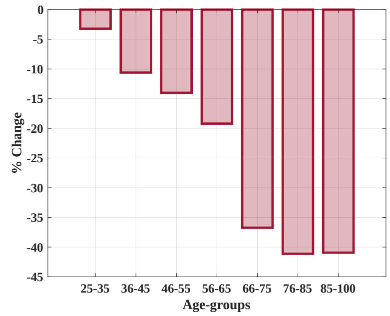
Notes: Each plot shows the plug-in sensitivity of the parameter named in the plot title with respect to select estimation moments: average median wealth (Panels (a)-(c)) or life insurance coverage (Panels (d)-(f)) between ages 25-40 (Early life), 40-60 (Middle life) and >60 (late life). The y-axis can be interpreted as the sensitivity of the estimated parameter (in parameter units) to a misspecification of the data moment corresponding to a 10% increase in wealth or a unit increase in LI coverage for each marital-education-age group.

Figure A7: Life cycle Assets: EOL Transfer Reform

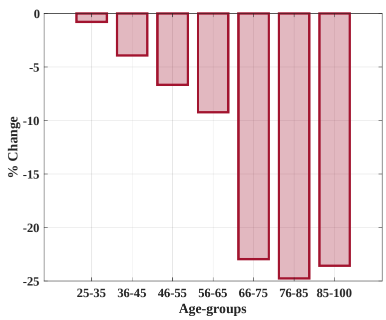
(a) Non-College, Non Married



(b) College, Non Married



(c) Non-College, Married



(d) College, Married

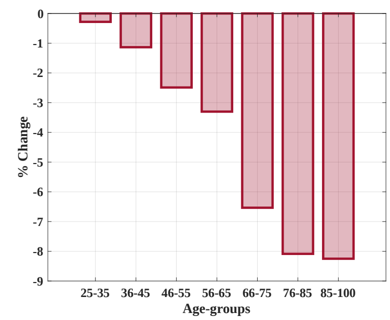
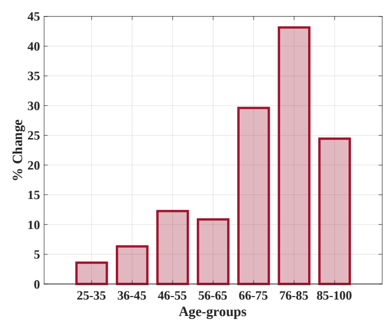
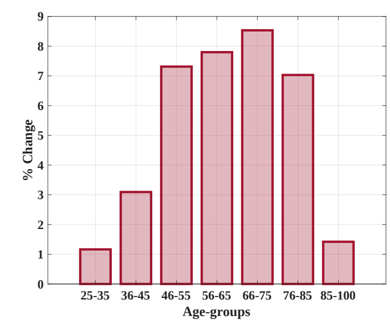


Figure A8: life cycle Consumption: EOL Transfer Reform

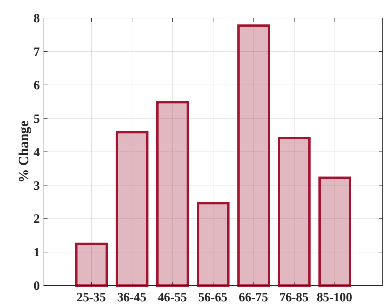
(a) Non-College, Non Married



(b) College, Non Married



(c) Non-College, Married



(d) College, Married

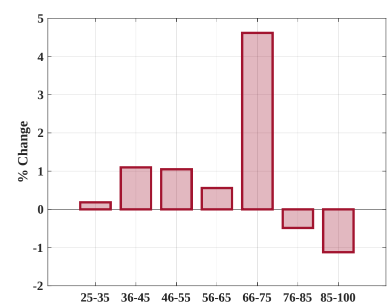
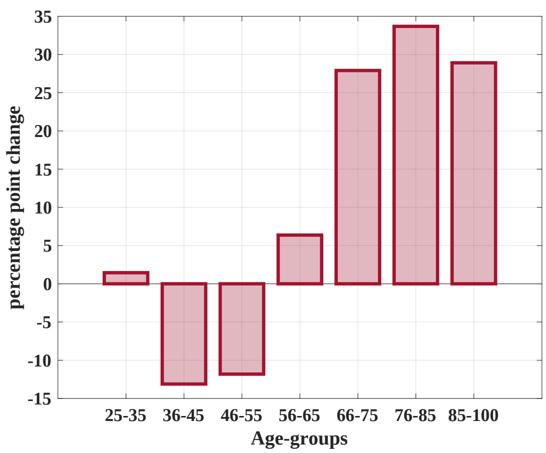
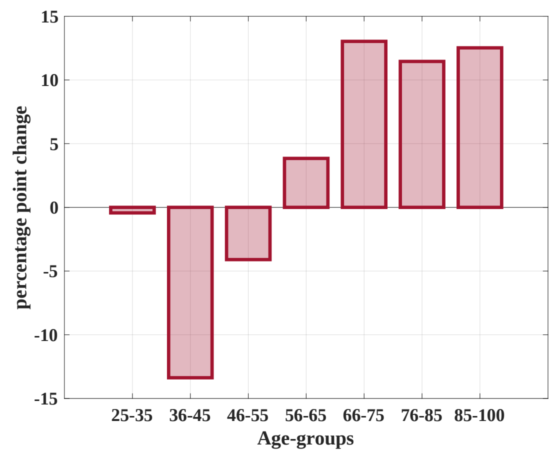


Figure A9: life cycle LI Holdings: EOL Transfer Reform

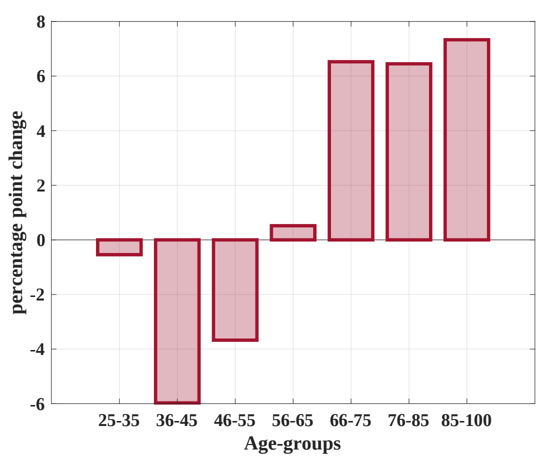
(a) Non-College, Non Married



(b) College, Non Married



(c) Non-College, Married



(d) College, Married

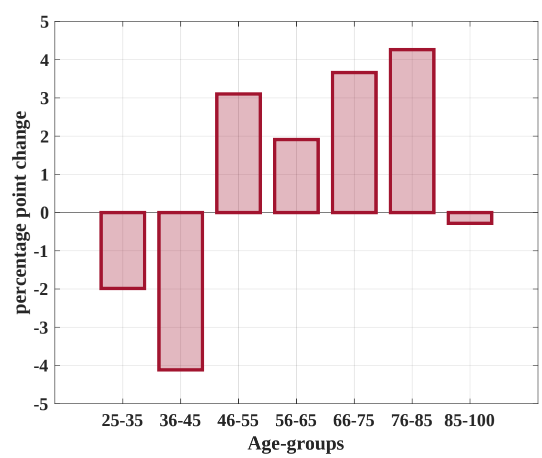
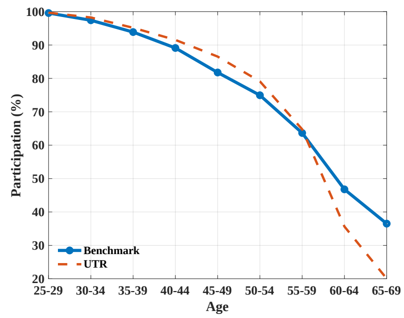
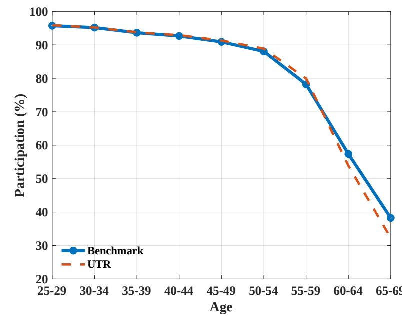


Figure A10: Labor force participation rates: EOL Transfer Reform

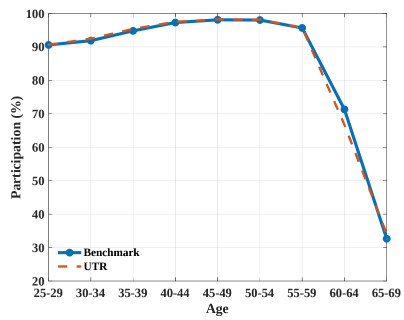
(a) Non-College, Non-Married



(b) College, Non-Married



(c) Non-College, Married



(d) College, Married

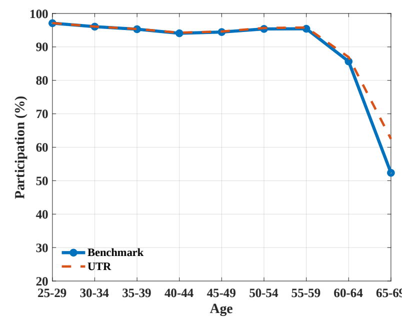
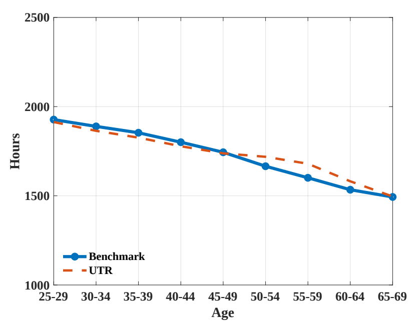
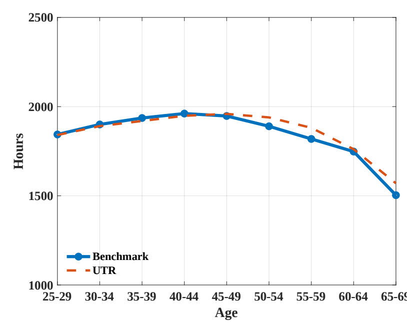


Figure A11: Hours conditional on participation: EOL Transfer Reform

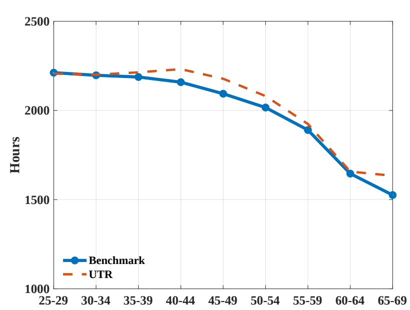
(a) Non-College, Non-Married



(b) College, Non-Married



(c) Non-College, Married



(d) College, Married

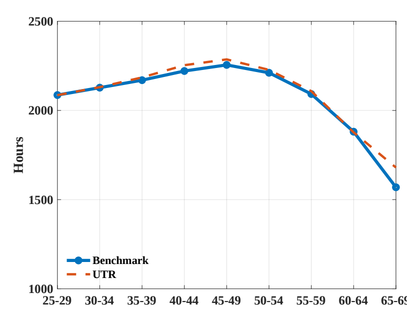


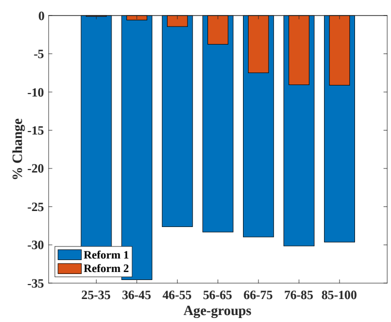
Table A3: LI Price Experiments: Welfare Changes by Household Type

	Singles		Married	
	Non-College	College	Non-College	College
Actuarially fair LI prices throughout the life-cycle	18.01	2.45	1.66	2.27
Actuarially fair LI prices only after age 70	0.16	0.32	0.72	0.88

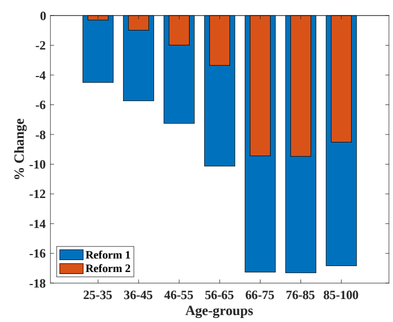
Notes: % CEV relative to the baseline for each LI reform is reported. n both reform, actuarially fair prices (either throughout or at the end of the life-cycle) apply to both low- and high-face value contracts.

Figure A12: LI Price Experiments: Changes in Life Cycle Assets

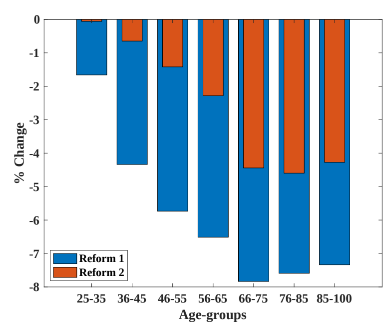
(a) Non-College Singles



(b) College Singles



(c) Non-College Married



(d) College Married

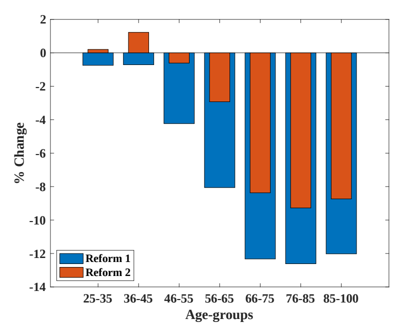
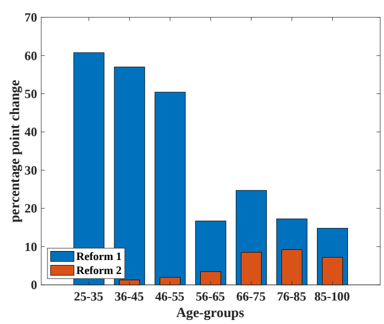
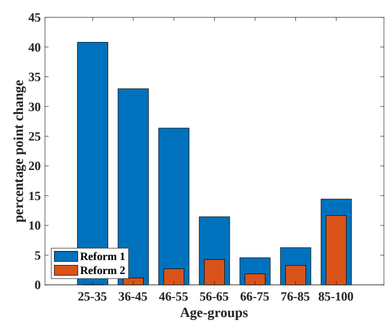


Figure A13: LI Price Experiments: Changes in Life Cycle LI Holdings

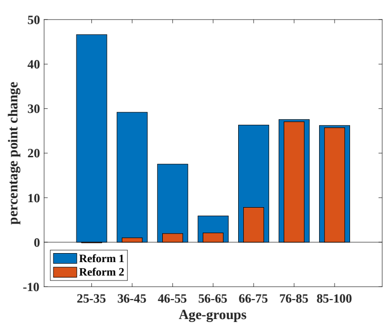
(a) Non-College Singles



(b) College Singles



(c) Non-College Married



(d) College Married

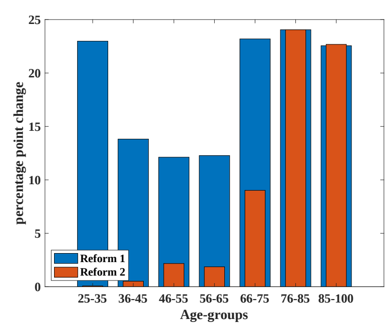


Table A4: Terminal Split Robustness: EOL Transfer Reform
(percentage change relative to the benchmark SS regime)

	Singles		Married	
	Non-College	College	Non-College	College
50-50 Rule				
Welfare	5.91	3.75	4.77	2.72
Consumption	14.62	4.89	4.96	1.37
Assets	-63.47	-32.59	-27.81	-13.11
LI coverage	20.18	5.01	4.93	1.62
Participation	-1.89	-0.81	-0.24	0.53
Hours	-1.17	0.07	1.66	1.41
90-10 Rule				
Welfare	5.91	3.75	2.09	1.50
Consumption	14.62	4.89	2.97	0.76
Assets	-63.47	-32.59	-7.69	0.03
LI coverage	20.18	5.01	0.65	1.34
Participation	-1.89	-0.81	0.56	1.68
Hours	-1.17	0.07	2.52	2.70

Notes: % changes following an experiment that entails a lump sum payment to every individual. The payment is worth 5.5 years of the PIA at the time of death. The transfer is financed through a 4% reduction in the annual flow of SS annuity payments. This guarantees that the aggregate lifetime SS outlays remain at their benchmark level.

Table A5: LI Price Robustness: EOL Transfer Reform
(percentage change relative to the benchmark SS regime)

	Singles		Married	
	Non-College	College	Non-College	College
Welfare	5.90	3.92	3.56	2.50
Consumption	12.80	4.95	4.06	0.71
Assets	-65.18	-31.55	-17.74	-5.56
LI coverage	18.78	4.90	2.99	-0.56
Participation	-2.49	-1.08	-0.04	1.17
Hours	-1.92	-0.09	2.03	1.93

Notes: % changes following an experiment that entails a lump sum payment to every individual. The payment is worth 5.5 years of the PIA at the time of death. The transfer is financed through a 4% reduction in the annual flow of SS annuity payments. This guarantees that the aggregate lifetime SS outlays remain at their benchmark level.

D Internet Appendix

S1 Policy Details

We focus on two types of benefits paid by the US Social Security System: (i) *Old-Age Benefits* which provide annuity income to retirees from the time of claiming until death; and (ii) *Survivors Benefits* which continue to pay a deceased beneficiary's benefits to their spouse after their death.

Old-Age Benefits are an increasing and concave function of the average indexed monthly earnings. Up to a maximum taxable amount, higher income in working life translates to higher benefits in retirement. The progressive nature of the system implies that high-income individuals receive lower replacement rates on their earnings. Spouses of primary earners can claim spousal benefits on the earnings record of the primary earner.[27] These benefits are up to 50 percent of the benefits of the primary earner and are contingent on the primary earner having claimed SS benefits. Individuals first become eligible for benefits at the age of 62 and become eligible for full benefits at the normal retirement age (NRA). Claiming Social Security benefits before the NRA entails lower pension payments for a longer period. Delaying pension claims until beyond the NRA (up until age 70) entitles workers to larger payments, albeit for a shorter period. These penalties/credits for early/delayed claiming also apply to spousal benefits. Spouses who claim before the NRA incur a penalty, while spouses who delay their claims up to age 70 receive a credit.

Widows and widowers of eligible workers[28] can receive *Survivors Benefits* of 77.5 percent of the beneficiary's basic SS benefits as early as age 60 or full benefits at the normal retirement age.[29][30] [31] They will continue to receive these benefits until their death. Moreover, spouses who were living with the deceased are eligible for a small, one-time lump-sum payment in the month when the death occurs.[32]

[27]Spouses elect whether to claim benefits on their own earnings record or that of the primary earner.

[28]Whether a worker's record is eligible to pay out survivors benefits depends on the work history of the deceased beneficiary: the number of credits needed for survivor benefit eligibility varies by age, with younger workers requiring fewer credits. No worker is required to have more than 40 credits–roughly 10 years of work.

[29]While widows and widowers are the largest group claiming SS Survivors Benefits, children and dependent parents of the deceased beneficiary are also eligible for benefits. Divorced spouses are eligible as long as their marriage to the beneficiary lasted at least ten years, and they do not remarry before the age of 60.

[30]There are ways to "game" the system here. For example, a surviving spouse may claim these scaled-down benefits at age 60 and switch to benefits on their record later.

[31]Details:https://www.ssa.gov/benefits/survivors/onyourown.html#h4;https://www.ssa.gov/pubs/EN-05-10084.pdf

[32]This payment is $255. If there is no living spouse, this benefit is given to children who are eligible for the benefits of the deceased worker's record.

S2 Recursive Formulation

The life cycle of an individual between ages 25 and 99 consists of three phases. The first is the *employment* phase between ages 20 and 61 when individuals make consumption, savings, life insurance holdings, and employment decisions. The second stage is the *retirement choice* phase between ages 62 and 69, when individuals additionally can make Social Security application decisions (b_t^{ss}). Finally, there is a *retirement* phase when individuals make only consumption, life insurance, and savings decisions.

Employment phase. The problem of a household head in the initial phase is:

$$
\begin{aligned}
V(a_t, a_t^{ss}, \eta_t, \lambda_t, \mu_t) = \max_{c_t, h_t, a_{t+1}, i_t^v} \Bigg\{ & U(c_t, l_t) \\
& + \beta\pi_{t+1}^s \Big[EV(a_{t+1}, a_{t+1}^{ss}, \eta_{t+1}, \lambda_{t+1}, \mu_{t+1}) \Big] \\
& + \beta(1 - \pi_{t+1}^s)\Omega(A_{t+1}^q) \Bigg\} \quad s.t.
\end{aligned}
$$

$$
c_t + i_t^v \times \rho(v_t^{e,m}) + \rho_{mt}^{e,m}(\mu) + a_{t+1} = a_t + W\left(y_t, y_{st}, ra_t, \tau\right) + tr_t
$$

2), (6-9), (12), and $c_t \geq \bar{c}$.

where $y_t + y_{st} + ra_t$ is the total pre-tax income and $W(., \tau)$ is the level of post-tax income, given tax rate τ. The expectation is taken for wages, employment, and health uncertainty.

Claiming phase. Starting at age 62, individuals can make a benefit claim. The claim is a one-time decision, and benefits are based on the age at which the individuals claim for the first time. If an individual enters a period as a non-claimer, they must choose whether or not to claim benefits during this period, as shown below:

$$
V(a_t, a_t^{ss}, \eta_t, \lambda_t, \mu_t, b_{t-1}^{ss} = 0) = \max\left\{V^{b_t^{ss}=0}, V^{b_t^{ss}=1}\right\}
$$

where the value of postponing the claim, $V^{b_t^{ss}=0}$, is

$$V^{b_t^{ss}=0}(a_t, a_t^{ss}, \eta_t, \lambda_t, \mu_t, b_{t-1}^{ss}=0) = \max_{c_t, h_t, a_{t+1}, i_t^v, b_t^{ss}} \Bigg\{ U(c_t, l_t) + \beta\pi_{t+1}^s \Big[EV(a_{t+1}, a_{t+1}^{ss}, \eta_{t+1}, \lambda_{t+1}, \mu_{t+1}, b_t^{ss}=0) \Big] + \beta(1-\pi_{t+1}^s)\Omega(A_{t+1}^q) \Bigg\} \quad s.t.$$

$$c_t + i_t^v \times \rho(v_t^{e,m}) + \rho_{mt}^{e,m}(\mu) + a_{t+1} = a_t + W(y_t, y_{st}, ra_t, \tau) + tr_t,$$

2), (6-9), (12), and $c_t \geq \bar{c}$.

The value of filing the claim in the current period is:

$$V^{b_t^{ss}=1}(a_t, a_t^{ss}, \eta_t, \lambda_t, \mu_t, b_{t-1}^{ss}=0) = \max_{c_t, h_t, a_{t+1}, i_t^v, b_t^{ss}} \Bigg\{ U(c_t, l_t) + \beta\pi_{t+1}^s \Big[EV(a_{t+1}, a_{t+1}^{ss}, \eta_{t+1}, \lambda_{t+1}, \mu_{t+1}, b_t^{ss}=1) \Big] + \beta(1-\pi_{t+1}^s)\Omega(A_{t+1}^q) \Bigg\} \quad s.t.$$

$$c_t + i_t^v \times \rho_{it}^{e,m}(v) + \rho_{mt}^{e,m}(\mu) + a_{t+1} = a_t + W(y_t, y_{st}, ra_t, \tau) + tr_t + \delta_t^q ssb_t,$$

2), (6-9), (12), and $c_t \geq \bar{c}$.

Retirement phase. At age 70, if an individual has still not claimed, they automatically start receiving their benefits and (if applicable) spousal benefits. Their value function is:

$$V(a_t, a_t^{ss}, \mu_t) = \max_{c_t, a_{t+1}, i_t^v} \Bigg\{ U(c_t, l_t) + \beta\pi_{t+1}^s EV(a_{t+1}, a_{t+1}^{ss}, \mu_{t+1}) + \beta(1-\pi_{t+1}^s)\Omega(A_{t+1}^q) \Bigg\} \quad s.t.$$

$$c_t + i_t^v \times \rho(v_t^{e,m}) + \rho_{mt}^{e,m}(\mu) + a_{t+1} = a_t + W(y_{st}, ra_t, \tau) + \delta_t^q ssb_t + tr_t,$$

(2), (7), (12) and $c_t \geq \bar{c}$.

S3 Health Transitions and Survival Probabilities

We estimate health transitions using the Household Component of Medical Expenditure Panel Survey on a population between the ages of 20 and 90. The coefficient estimates are provided in Table S1. We estimate the survival probabilities from MEPS by running an ordered probit regression of death indicator on self-rated health interacted with a third-order age polynomial as well as interactions of college and married indicators on the same population. Figure S1 provides the estimated survival probabilities.

Table S1: Ordered Probit Estimates of Health Transitions

	Coefficient Estimates
Health Lag=2	0.924***
Health Lag=3	2.118***
Age	0.0200***
Age^2/10^2	-0.00939
Age^3/10^3	-0.000500
College=1	-0.329***
cut1	0.635***
cut2	2.613***
Observations	188,226
Pseudo R^2	0.1622

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S4 Medical Expenditures

Out-of-pocket (OOP) medical expenditures are measured from years 1992-2018 of the Health and Retirement Study (HRS) and include spending on hospital and nursing costs; doctor, dentist, and outpatient surgery costs; average monthly prescription drug costs; and health health care and special facilities costs plus any expenses incurred in the final year of life. Expenses covered by insurance (public or private) are not included in this measure. As HRS is collected every two years, medical expenditure variables are divided by 2 to obtain an average annual cost.[33]

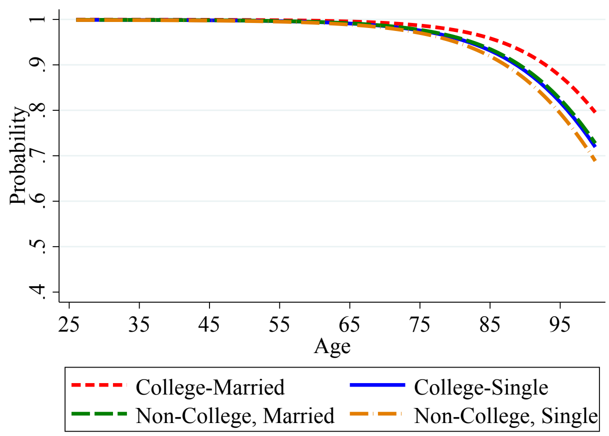
To estimate these OOP medical expenditures, we follow the two-stage procedure in De Nardi et al. (2010); French and Jones (2011); Borella et al. (2019). We first run the following fixed-effect regression on a sample of men aged 70 and above:

$$\ln\left(m_{it}\right) = f_i + X_{it}^{'}\beta_{it} + u_{it} \tag{A1}$$

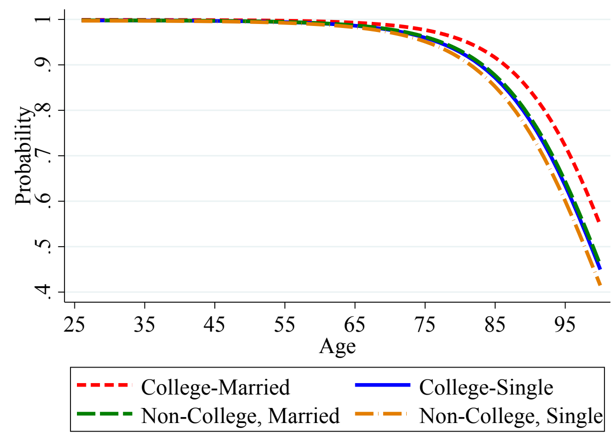
[33] In Wave 2A, the reference period for medical spending questions was the previous 12 months. Therefore, in this wave, we do not divide by two.

Figure S1: Survival Probabilities by Health, Education and Marital Status

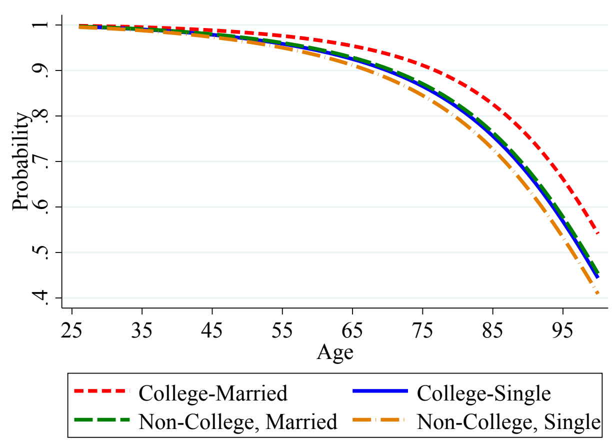
(a) Excellent Health



(b) Good Health



(c) Fair Health



Where m_{it} is the measure of these out-of-pocket medical expenditures, f_i is the individual-specific fixed effect, and X_{it} is a set of explanatory variables including a fourth-order polynomial in age, a dummy variable indicating an individual is in poor health. This indicator interacted with a quadratic polynomial in age, and a dummy variable, which takes a value of 1, interacted with a quadratic polynomial in age. Interactions were only included when they were statistically significant. Notably, we investigated the inclusion of education variables and their interaction with marital status and age; however, these were not statistically different from 0 in this initial stage. In the second stage, the residuals and fixed effects from this equation are regressed on dummies for marital status, education level (and their interaction, and birth-year cohort. Table S2 shows these first and second stage regression results.

In the final step, the squared residuals are regressed on a quadratic polynomial in age, a third-order polynomial in age interacted with bad health, a third-order polynomial in age interacted with

Table S2: Estimated Coefficients from Logarithm of Out-of-Pocket Medical Expenditures

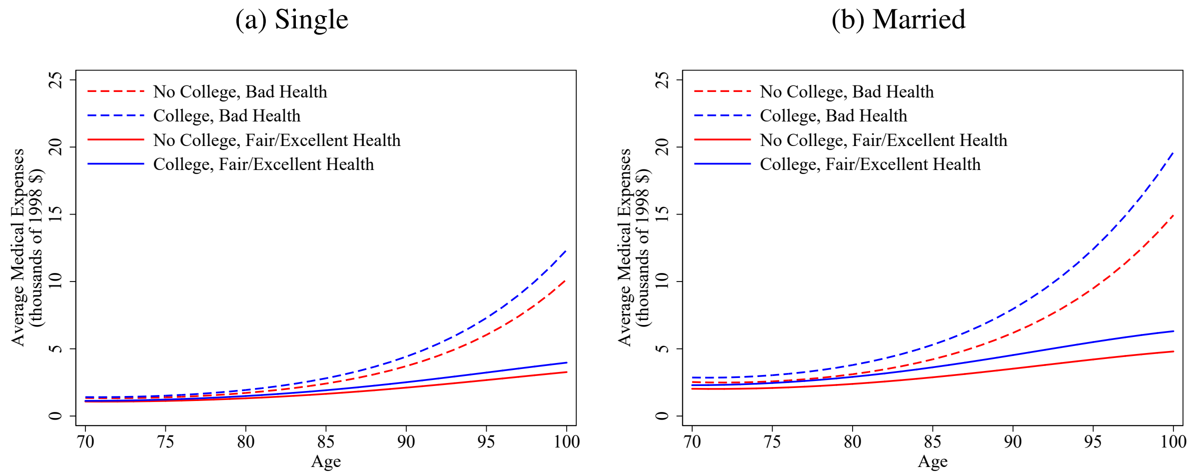
First Stage	Coefficient	(std. err.)
Age	-2.438	(7.328)
$Age^2/10^2$	3.793	(13.56)
$Age^3/10^3$	-2.491	(11.11)
$Age^4/10^4$	0.585	(3.405)
bad health	5.681**	(2.836)
bad health*Age	-0.152**	(0.0714)
bad health*$Age^2/10^2$	0.104**	(0.0448)
married*$Age^3/10^3$	0.0288***	(0.00478)
married*$Age^4/10^4$	-0.0218***	(0.00579)
constant	62.15	(148.1)
Second Stage		
married	-0.113***	(0.0324)
college	0.197***	(0.0503)
married*college	0.0254	(0.0543)
born 1941-1945	-0.0452	(0.0423)
born 1936-1940	0.00842	(0.0347)
born 1926-1930	0.0153	(0.0351)
born 1921-1925	-0.204***	(0.0359)
born 1916-1920	-0.321***	(0.0405)
born 1900-1915	-0.571***	(0.0406)
constant	0.125***	(0.0372)
N	36680	
R^2 first stage	0.051	
R^2 second stage	0.027	

Source: Health and Retirement Study, authors' calculation
Notes: First Stage is fixed effects, Second Stage is OLS
Standard errors in parentheses, clustered at the individual level
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

education, a dummy for being married, an interaction between marital status and education, and cohort dummies to compute the variance. The expected medical expenditures by age, education, marital status, and health are calculated using the deterministic profiles from the first two stages plus half of the variance from this final step. These expected expenditures are shown in Figure S2.

We use age, health, and group-specific estimates of mean and standard deviation of log medical expenditures from above to use in our process as described below:

Figure S2: Expected Out-of-Pocket Medical Expenditures



Source: Health and Retirement Study, authors' calculations.

$$\log \rho_{\mu t}^{e,m} = m(\mu_t, t, e, m) + \sigma(\mu_t, t, e, m) \times \varphi_t$$
$$\varphi_t = \zeta_t^{\mu} + \epsilon_t^{\mu}, \quad \epsilon_t^{\mu} \sim N(0, \sigma_{\epsilon}^{\mu})$$
$$\zeta_t^{\mu} = \rho^{\mu}\zeta_{t-1}^{\mu} + \nu_t^{\mu}, \quad \nu_t^{\mu} \sim N(0, \sigma_{\nu}^{\mu})$$

Following French and Jones (2011), we set the value of ρ^m to 0.925, σ_{ν}^{m} to 0.219 and σ_{ϵ}^{m} to 0.816. While we keep all other first-step parameters the same, we recalibrate the preference parameters of the model to match the same benchmark moments as listed in Section 5.

S5 Family Structure

Family structure in the model varies by education. For men born between 1931 and 1935, the share who are married or cohabiting remains roughly stable over the life cycle. Accordingly, we model marriage as a fixed state determined at age 25, based on initial conditions drawn from the data. The married share is set to approximately 56 percent for non-college-educated individuals and about 74 percent for college-educated men.

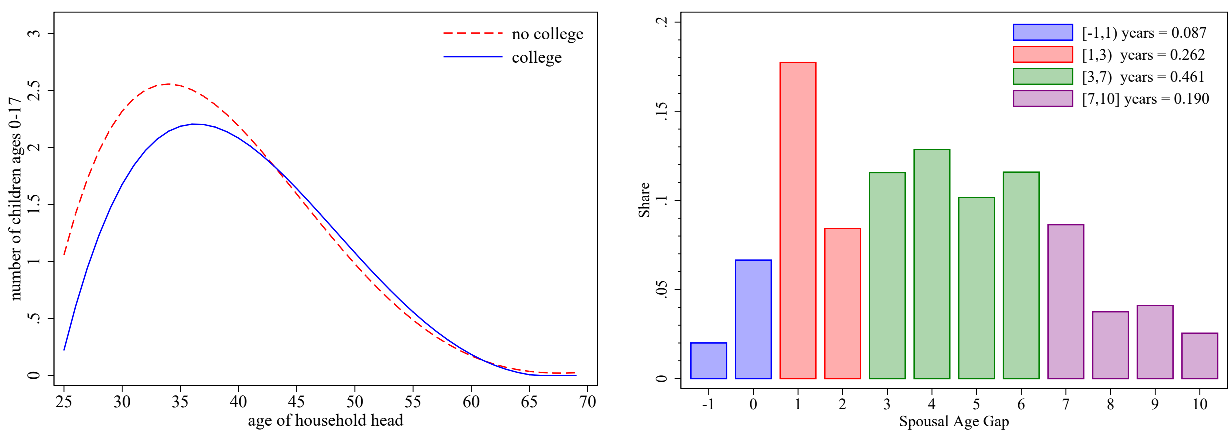
Figure S3a displays the number of children in the household over the life cycle by education of the household head. This measure includes all children age 17 and under living in the household at any point in time. The number of children follows a hump-shaped profile, peaking around age 35 (slightly earlier for non-college-educated heads) and declining to zero by age 65. Non-college-educated men reach a peak of about 2.5 children, while college-educated men peak slightly above two children.

Married couples are eligible for Social Security spousal benefits, which depend on both the worker's age and the spouse's age. Consequently, the spousal age gap is an important determinant. Figure S3b shows the distribution of this gap for married couples in the cohort. The average gap is approximately 4 years.

To focus on the central part of the distribution, we restrict attention to couples with an age gap between –1 (wife one year older) and +10 years, excluding the bottom 5 percent and top 10 percent. Even within this range, considerable variation remains. For computational tractability, we partition the distribution into four groups and assign each group the median gap within it. This approach captures both the prevalence of small gaps and the presence of larger ones. Estimated shares are as follows: 8.7 percent of couples have gaps of –1 to 0 years (median = 0), 26.2 percent have gaps of 1–2 years (median = 1), 46.1 percent have gaps of 3–6 years (median = 4), and 19 percent have gaps of 7–10 years (median = 8).

Figure S3: Family statistics

(a) Number of children (b) Spousal age gap



Source: Panel Study of Income Dynamics, authors' calculations

Notes: Panel (a) shows the number of children ages 0–17 in the household by education and age of the household head. Panel (b) displays the distribution of spousal age gaps. The color shading indicates the four groups used in the quantitative model.

S6 Spousal Income

We include spousal income in the budget constraint of the married worker since we model only male household heads. Due to the high proportion of married household heads, estimating spousal income is crucial for understanding the budget constraints faced by individuals. We first estimate how spousal income varies based on characteristics of the head of household:

Table S3: Coefficients of Spousal Income Regression

	coefficient	standard error
age	-1.581	(1.369)
age*age/(10^2)	8.024	(5.730)
age*age*age/(10^4)	-12.265	(7.859)
age*age*age*age/(10^6)	5.900	(3.540)
college	17.071**	(7.951)
college*age/(10^2)	-19.268**	(9.199)
poor health	4.842	(23.379)
poor health*age/(10^2)	-2.369	(28.361)
labor income (thousands)/(10^2)	9.842*	(5.211)
N	59,491	
R^2	0.165	

Source: Panel Study of Income Dynamics, authors' calculations
Notes: Dependent variable is labor income received by spouse (thousands). Standard errors are in parentheses.
*p<0.10, **p<0.0.5, ***p<0.01

$$y_{it}^s = X_{it}'\beta + \varepsilon_{it} \tag{A2}$$

where X_{it}' is a vector of control variables including a fourth order polynomial in the age of the household head, and indicator for whether the head of household is in poor health (both in levels and interacted with age), an indicator for whether the head of household attended college (both in levels and interacted with age), and the labor income of the head of household (in thousands). This regression is run for a sample of married individuals born between 1926 and 1940. We then use the estimated coefficients to impute spousal income in the model.

$$\hat{y}_{it}^s = X_{it}'\hat{\beta} \tag{A3}$$

By estimating how spousal income varies based on characteristics of the household head, we capture the impact of assortative matching and differing probabilities of marriage across education levels and health status. The estimated coefficients are included in Table S3.

S7 Wages

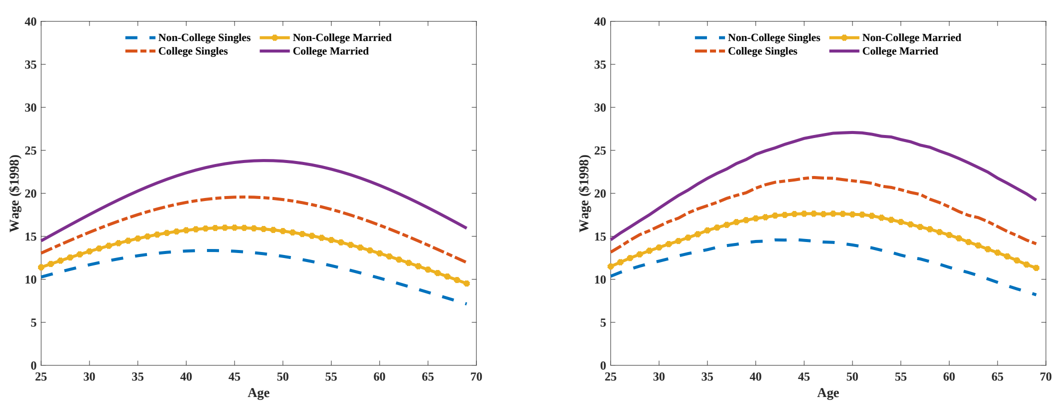
Data on wages is drawn from the PSID. Hourly wages are calculated as annual earnings divided by the total number of hours worked. To address outliers and minimum wage distortions, we exclude observations with hourly wages below $3.50 or above $75 (in 1998 dollars), which trims approximately the bottom 1% and top 2% of the wage distribution. To ensure sufficient life-cycle coverage, the sample includes all workers aged 20 to 74 born between 1901 and 2000. Because wages are only observed for individuals who participate in the labor market, we estimate hourly wage profiles using a Heckman selection model.

In the first step, a probit regression estimates the probability of labor market participation and generates the inverse Mills ratio. This ratio is then included as a regressor in the second-stage wage regression. Labour market participation is modelled as a function of a quadratic in age, interacted with a college education indicator, as well as dummies for being married, having children, and being in good health—all interacted with age. We also control for cohort fixed effects. Table S4 confirms the significance of the inverse Mills ratio, indicating that selection bias is present in the simple OLS estimates of wages.

In the second stage, we estimate wage profiles by regressing the natural logarithm of hourly wages on a second-order polynomial in age, its interaction with a college education indicator, and an interaction between age and a marital status indicator. The regression also includes cohort fixed effects. Table S4 reports the estimated coefficients, and panel (a) of Figure S4 displays the resulting wage profiles by age, education, and marital status.

Figure S4: Wage profiles by education and marital status

(a) Unadjusted for unemployment effects (b) Adjusted for unemployment effects



These estimated wage profiles exhibit several interesting patterns. First, wages generally increase over the life cycle, with the rate of growth slowing as individuals age. Consistent with Rutledge et al. (2017), we find that these profiles remain relatively flat as workers approach retirement rather than declining during these years. Second, in addition to a clear skill premium associated with higher education levels, our results (aligned with Borella et al. (2019)) also reveal a marriage premium: married men earn higher wages than their non-married counterparts across both education groups.

Table S4: Estimated coefficients from logarithm of hourly wages

	Wage Equation	
age	0.0743***	(0.00249)
$age^2/10^2$	-0.0879***	(0.00375)
college*age	0.0108***	(0.000358)
college*$age^2/10^2$	-0.00475***	(0.000755)
married*age	0.00417***	(0.000201)
born 1946-2000	-0.0665***	(0.0102)
born 1941-1945	-0.00117	(0.0113)
born 1936-1940	-0.0229*	(0.0124)
born 1926-1930	0.0326**	(0.0129)
born 1921-1925	0.0801***	(0.0144)
born 1916-1920	0.0228	(0.0175)
born 1900-1915	-0.0257	(0.0183)
constant	1.020***	(0.0501)
	Selection Equation	
age	0.0939***	(0.00292)
$age^2/10^2$	-0.156***	(0.00327)
college*age	0.0106***	(0.000988)
college*$age^2/10^2$	-0.00780***	(0.00176)
married*age	0.00895***	(0.000314)
kids*age	-0.000401	(0.000293)
born 1946-2000	-0.132***	(0.0256)
born 1941-1945	-0.00424	(0.0296)
born 1936-1940	-0.0191	(0.0319)
born 1926-1930	0.0765**	(0.0312)
born 1921-1925	0.0733**	(0.0327)
born 1916-1920	-0.0143	(0.0361)
born 1900-1915	0.185***	(0.0355)
constant	-0.115*	(0.0670)
Inverse Mills Ratio	0.202***	(0.0464)
N	96768	

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Panel Study of Income Dynamics, authors' calculation

Notes: dependent variable of the wage equation: natural logarithm of the real hourly wage (1998 dollars); dependent variable of the selection equation: labor force participation. Standard errors in parentheses.

*p< 0.1, **p< 0.05, ***p< 0.01

These estimated profiles are then used to compute predicted wages for individuals in the sample. The residuals—defined as the difference between observed and predicted hourly wages—are used to estimate the stochastic component of the wage process. Specifically, the parameters of the

AR(1) income process are estimated using the Method of Simulated Moments, with the identity matrix as the weighting matrix. This procedure yields an estimate of $\rho = 0.968$ for persistence and $\sigma^2 = 0.022$ for the variance of the wage innovation.

Unemployment shock and wage scarring

Two parameters govern employment shocks in the model: the probability of receiving a shock, λ, and the wage penalty associated with it, ξ.

We set λ equal to the annual involuntary separation rate. Since our model explicitly captures wage scarring from unemployment, we focus solely on separations due to involuntary job loss, excluding voluntary exits and job-to-job transitions.

The separation rate is computed in two steps. First, using CPS data from 1995 to 2005 for men aged 25–69, we estimate the monthly separation rate among employed workers and annualize it, yielding a total separation rate of 19.9%. This rate ranges from 17.5% to 24.5% across education-marital groups and from 16.4% to 28.0% over the life cycle. Second, we adjust this figure to exclude voluntary separations. Based on Simmons (2023), who use SIPP data to classify separations, only 28.6% of separations are involuntary.[34] Applying this share yields an annual involuntary separation rate of 5.6%.

To construct the wage penalty from an unemployment shock, $\xi(\lambda)$, we follow the literature estimating the effect of job displacement on re-employment earnings. Specifically, we estimate the following regression:

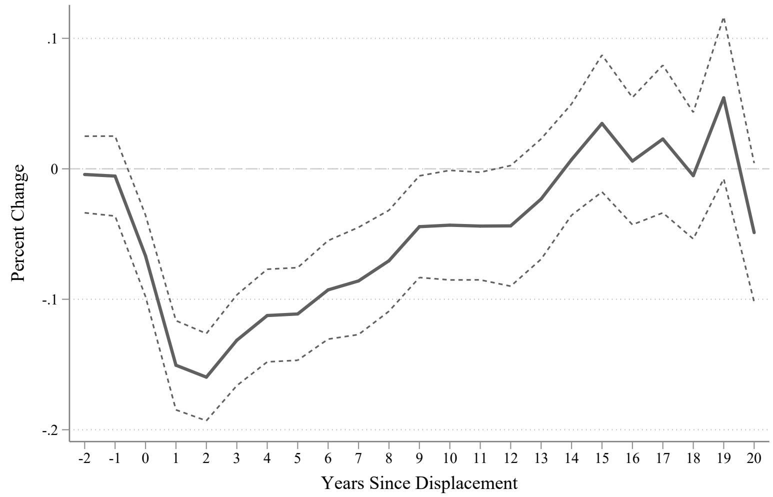
$$y_{it} = x'_{it}\beta + \sum_{k\geq -2}^{20} \delta^k D_{it}^k + \alpha_i + \gamma_t + \varepsilon_{it} \tag{A4}$$

Here, y_{it} is the log wage of individual i at time t; x_{it} includes controls such as education and a quadratic in experience; D_{it}^k is a set of dummies indicating the k-th year relative to a displacement event; and α_i and γ_t are individual and time fixed effects.

The estimated coefficients δ^k are plotted in Figure S5. Consistent with previous work, we find that displaced workers earn roughly 14–20 percent less than non-displaced workers, with these losses persisting for 5 to 10 years post-displacement. Based on these estimates, we set the wage penalty from an unemployment shock at 14 percent, i.e., $\xi(\lambda) = 0.86$. Additional analysis by education level reveals similar displacement effects across educational groups.

[34] Simmons (2023) uses the Survey of Income and Program Participation to classify separations as involuntary (due to lay-off, discharge/firing, employer bankruptcy or sale, or temporary employment ending) or voluntary (due to employer-to-employer transitions, dissatisfaction with the job, personal circumstances, or other reasons).

Figure S5: Wage scarring due to unemployment



Source: Panel Study of Income Dynamics, authors' calculations

Notes: figure is the graphical presentation of the estimated β coefficients from Equation A4. The solid line illustrates the impact of an unemployment spell on hourly wages (relative to those of an employed individual) for 2 years preceding and 12 years following such a spell. 90 percent confidence intervals shown.

S8 Taxes

The Social Security payroll duty is 6.2 percent on income up until the maximum taxable amount, a^{max}, while the Medicare tax is 1.45 percent on total labor income.

We adopt a smooth functional form for the labor income tax, τ, that allows for negative tax rates to account for Earned Income Tax Credit (EITC). Details of the estimation We let the function vary with education and estimate it from PSID data as:

$$\tau = 1 - \lambda y^{-\xi}.$$

PSID includes information on taxes paid up until 1991 and cover tax years up through 1990. To have individuals throughout the life cycle, we extend the sample to those workers between the ages of 1916 and 1945. To estimate the parameters of the taxation function, we regress the natural log of total family income net of income taxes on a constant and the natural log of family pre-tax income for each education level and marital status. Total taxable income of the family is measured as the sum of labor and Social Security income of the household head and the spouse and other family members (if present). The federal tax liability is constructed based on the taxable income of the family, as well as exemptions, and the tax table used.

To maximize the sample size for measurement at each education level, we focus on estimating these parameters independently from age. The estimated parameters are shown in Table S5.

Table S5: Parameters of the Tax Function

	λ	ξ
Single	1.333	0.042
Married	1.370	0.043

Table S6: Summary Statistics for Initial Conditions

	overall	no college, single	college, single	no college, married	college, married
share	1.00	0.18	0.15	0.23	0.43
assets (thousands of 1998 $)					
mean	48.966	24.724	63.105	37.326	60.276
std. dev	91.224	50.408	118.925	64.495	104.31
hourly wage (1998 $)					
mean	15.28	12.65	15.12	13.78	17.06
std. dev	10.24	5.95	13.67	10.55	9.80

S9 Initial Distribution

The initial distribution across states is calculated by taking random draws of the empirical distribution for men between the ages of 25 and 30. Summary statistics for the initial conditions are shown in Table S6.

S10 Time Costs for Poor Health, Participation

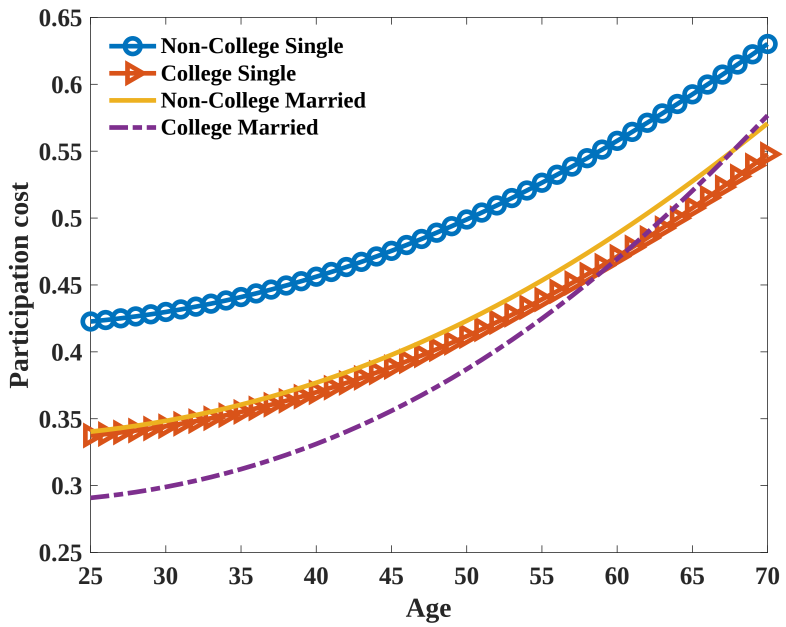
We estimate the time cost of poor health using data from Jones and Li (2023). The best health state in Jones and Li (2023) corresponds to our first two health states, while our worst state maps into their fair/poor group. Health costs vary by education. The age-education time cost of poor health for our worst health group, at age 25, is approximately 15% of the time endowment for non-college graduates and 40% for college graduates.

We estimate the time cost of participation internally using our structural model and assume the following functional form for the time costs of working:

$$\phi_P(t) = \frac{\exp(\phi_0 + \phi_1 t + \phi_2 t^2)}{1 + \exp(\phi_0 + \phi_1 t + \phi_2 t^2)} \tag{A5}$$

The estimated costs, as a fraction of the endowment of time, are shown in Figure S6.

Figure S6: Time cost of working: by age, education and marital groups



S11 Target Profiles

The target life cycle profiles of participation, hours, and assets used are estimated from the Panel Study of Income Dynamics (PSID) covering years 1968 - 2016 (annually 1968-1995; biannually 1996-2016) using the method from French (2005).

In each year t, PSID respondents are asked to report their labor market variables for year $t-1$. Participation is measured as a dummy variable taking a value of 1 if the respondent worked at least 300 hours (25 hours per month) in the previous year. Hours is measured as a continuous, self-reported variable of total hours worked during the last year.

We use wealth observed in the 1984, 1989, 1994, 1999, 2001, 2003, 2005, and 2007 PSID wealth surveys, as well as the 2010-2016 PSID family files. Household assets are measured as the value of farm and business, vehicles, checking and savings accounts, real estate, stocks, mutual funds, IRAs, Keoghs, and investment trusts, net of debts. We drop observations with either negative household wealth or household wealth above $1 million (1998 dollars).

To measure mean life cycle profiles, we run the following fixed effect regression:

$$
\begin{aligned}
Y_{it} = f_i + \sum_{c\in\{0,1\}}\sum_{m\in\{0,1\}} \left(\sum_{k=1}^{J} \beta_c^m \mathbb{I}\left[age_{it}=k\right] \times \mathbb{I}\left[married_i = m\right] \times \mathbb{I}\left[college_i = c\right]\right) \\
+ \sum_{f=1}^{F} \beta_f \mathbb{I}\left[family\ \ size_{it} = f\right] + \beta_u u_t + \varepsilon_{it}
\end{aligned}
$$

where Y_{it} represents a data observation of the variation in the outcomes (participation of the labor force, hours, assets) of the individual i in the period t; f_i is a fixed individual effect, $\mathbb{I}\left[age = k\right] \times \mathbb{I}\left[married_i = m\right] \times \mathbb{I}\left[college_i = c\right]$ are dummies of specific age groups in education and marital status specific age-group dummies; $\mathbb{I}\left[family\ \ size_{it} = f\right]$ are family size dummies; u_t is the unemployment rate in period t. The estimated parameters are $\{\beta_{nc}^{nm}, \beta_c^{nm}, \beta_{nc}^{m}, \beta_c^m, \beta_f, \beta_u\}$.

The education-marital status specific age effects from this estimate regression are shown in Figures A3, A4, and **??** of the main text. In these profiles, we make three adjustments to control for year, family size, and cohort effects: (1) the unemployment rate is set to 6.5%, (2) family size is fixed at 1 for single individuals and 4 for married individuals, and (3) for each education-marital status group, we use the individual specific effect of the same group who are born in 1930 and between the ages of 45 and 49.

For the wealth moments, we report distributional (25th percentile, median, and 75th) moments in addition to the mean (Figure 7). These are computed by running a quartile regression on the set of education and marital status-specific age dummies.

The life insurance moments used in the estimation are computed from 1989 through 2019 of the Survey of Consumer Finances (SCF). Coverage is constructed as a dummy variable which takes a value of 1 if the respondent reports holding at least one term or whole life insurance policy. The face value is a continuous variable representing the total insurance value of all policies. For policies that build cash value, we subtract the cash value from the total face value. We then compute the share of individuals in a given age group, education, and marital status group who hold policies, as well as the median face value of policies within these groups.

We cannot distinguish between privately purchased life insurance policies and those provided by employers. Therefore, the coverage of life insurance, as well as the face values, may include plans that are included as employer benefits rather than optimally purchased.

S12 CEV Calculation

Let $\{c_t^*, l_t^*\}_{t=1}^T$ denote benchmark optimal choices of consumption and leisure respectively and $\{c_t^p, l_t^p\}_{t=1}^T$ denote optimal choices in the policy world.

Then preferences with end-of-life motives can be mapped to preferences without them using a simple scaling factor for each individual, in both benchmark and policy worlds, in the following way:

$$\sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu} \right)^{1-\rho}}{1-\rho} + (1-s_t)\Omega(a_{t+1}^p) \right] = \sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu} \right)^{1-\rho}}{1-\rho} \right] \times \kappa_1 \tag{A6}$$

$$\sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{*\nu}(1-l_t^*)^{1-\nu} \right)^{1-\rho}}{1-\rho} + (1-s_t)\Omega(a_{t+1}^*) \right] = \sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{*\nu}(1-l_t^*)^{1-\nu} \right)^{1-\rho}}{1-\rho} \right] \times \kappa_2 \tag{A7}$$

Given that we can write lifetime utility including an additive end-of-life liquidity motive as the product of lifetime utility without the end-of-life flow utility and a multiplicative constant, CEV (τ) in our framework is computed as follows:

$$\sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu} \right)^{1-\rho}}{1-\rho} \right] \times \kappa_1 = \sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(\left[(1+\tau)\, c_t^*\right]^{\nu} (1-l_t^*)^{1-\nu} \right)^{1-\rho}}{1-\rho} \right] \times \kappa_2$$

$$\sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu} \right)^{1-\rho}}{1-\rho} \right] \times \kappa_1 = (1+\tau)^{\nu(1-\rho)} \sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{*\nu}(1-l_t^*)^{1-\nu} \right)^{1-\rho}}{1-\rho} \right] \times \kappa_2$$

$$\sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu} \right)^{1-\rho}}{1-\rho} + (1-s_t)\Omega(a_{t+1}^p) \right] = (1+\tau)^{\nu(1-\rho)} \sum_{t=1}^{T} E\beta^t \left[s_t \frac{\left(c_t^{*\nu}(1-l_t^*)^{1-\nu} \right)^{1-\rho}}{1-\rho} + (1-s_t)\Omega(a_{t+1}^*) \right]$$

$$V^P = (1+\tau)^{\nu(1-\rho)}\, V^*$$

$$\implies \tau = \left(\frac{V^p}{V^*} \right)^{1/\nu(1-\rho)} - 1$$

Where V^* is the optimal lifetime utility of an agent in the benchmark world and V^p denotes the lifetime utility of an agent in the policy experiment.