# End-of-Life Liquidity*

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**Abstract**

Uncertainty about one's lifespan induces a preference for end-of-life liquidity (Yaari, 1965). Such preference, which can be characterized as a warm-glow motive but need not be interpreted that way, interacts with institutional constraints to shape life-cycle behaviors. We illustrate its quantitative importance using a model of consumption, labor supply, and retirement decisions and document a little-known set of distortions that the U.S. social security imposes on life-cycle decisions through the illiquid and uncertain nature of its entitlements. A minor policy change that reduces the value of retirement annuities in exchange for a guaranteed amount upon death induces large effects on life-cycle allocations and raises welfare, especially among unmarried individuals with low education.

**Keywords:** liquidity, consumption, life-cycle, labor supply, self-insurance, annuity, health, marriage, social security, entitlements, survivor benefits, retirement.

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# 1 Introduction

Consumption plans are made under uncertainty about the length of one's life. In these circumstances, a consumer may value liquidity at the time of death and derive utility from it. Such end-of-life motive is not unlike a warm-glow; however, it need not be interpreted that way as it generally arises from the objectives and constraints of expected utility maximization over an uncertain lifespan and may apply to individuals with no spouses or dependants (Yaari, 1965). Several studies have examined the empirical content of end-of-life motives and have shown that they account for a variety of life-cycle observations (Dynan et al., 2002; French et al., 2006; De Nardi et al., 2016; Jones et al., 2020; De Nardi et al., 2021; Lockwood, 2012, 2018).

In this study, we examine a set of little-recognized distortions introduced by the US Social Security system. We do so in an environment where all households (couples or singles) are allowed to have an end-of-life liquidity preference that is consistent with their life-cycle behavior. The role of Social Security in providing annuitized consumption to poorer households has been studied before in settings 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 multiperson households (Hong and Ríos-Rull, 2007; Hong and Rios-Rull, 2012). It is well-known that social security distorts savings and induces under-accumulation of capital. By allowing for end-of-life motives across the whole range of households, our analysis brings to the fore little studied but severe distortions resulting from a lack of end-of-life provisions. The large costs of these distortions accrue mostly to unmarried individuals with little wealth. Unlike previous studies, we estimate how much these individuals value access to liquidity at the end of life and show that they suffer disproportionately from the current design of the system. Counterfactual experiments illustrate how these distortions could be mitigated through a minor departure from the existing program that reduces the annuity value of social security in exchange for a small end-of-life payment.

The interest in end-of-life motives is related to a lively debate about the value of annuitizing lifetime wealth. To understand the nature of this debate it is useful to follow Yaari's original arguments and define an "actuarial note" that can be bought or sold by a consumer. Such a contract remains enforceable as long as the buyer is alive and becomes null and void thereafter. The buyer of the contract acquires a promise to receive a regular allowance while alive (that is, an annuity). The allowance is determined by a rate of interest higher than the market interest on one-period debt contracts (the higher interest compensates the consumer for the possibility they will not survive to the next period, at which point the insurance company that sells the annuity is held free of any obligation). A consumer can go short and sell the actuarial note: in this case, the consumer acquires life insurance and commits to paying a rate of interest higher than the market as long as they live, in exchange for a lump-sum payment that becomes part of their estate when they pass away (the lump-sum payment is left behind with the rest of their wealth upon death, with no further obligations on anyone).

Having defined the actuarial contract, it is straightforward to show that all wealth should be annuitized unless preferences feature an end-of-life motive. If an end-of-life motive is present, the life-cycle consumption problem entails a portfolio choice where the agent has to decide how much to consume and how much to leave behind upon death (as Yaari puts it, the consumer can use the actuarial note to separate the consumption decision from the end-of-life decision).

This preamble helps clarify why the literature on household consumption is preoccupied with the observation that wealth is rarely annuitized while many people hold life insurance (LI). This stylized fact holds true also among single individuals with no dependants (see data analysis in Appendix as well as Hong and Rios-Rull, 2012), which is hard to reconcile with explanations based exclusively on within-family linkages and bequest motives. Theoretical work (e.g. Davidoff et al., 2005) shows that less than full annuitization may be optimal when markets are incomplete even in the absence of end-of-life liquidity motive. However, in this case, large shares of wealth should still be annuitized. In reality, over half of unattached individuals, including many with no offspring, hold sizable amounts of LI and little annuitized wealth: the lack of voluntary annuitization among people with different marital arrangements and fertility suggests that end-of-life motives may be more prevalent than previously thought.

Since theory alone is insufficient for answering practical policy questions, a large body of work has developed computational models of consumption behaviors under different assumptions about family structure and institutional constraints. For example, within an incomplete market setting, Hong and Ríos-Rull (2007) study an overlapping generations model and assess the relative value of annuities and life insurance. Allowing for multiperson households and family linkages, they show that the absence of life insurance contracts has non-trivial welfare costs whereas access to annuities has little or no effect. This explains why the value of social security as a surrogate for missing markets is small: its focus on annuities limits its value.

As we document, a majority of people do hold life insurance (LI), including singles with no dependants, and research suggests that LI holdings are the outcome of voluntary choices (Hong and Rios-Rull, 2012). Moreover, there is reason to believe that LI holdings might be even larger in the absence of financial constraints (Chambers et al., 2011) and that a mismatch exists between access to life insurance and the financial vulnerabilities of households (Auerbach and Kotlikoff, 1985, 1991; Bernheim et al., 2003). In this respect, Social Security does provide a modicum of life insurance to married households through survivor benefits. However, since married households tend to be richer and better insured already, we show that the current system does a poor job of helping the most financially vulnerable (for example, singles with low assets), who are the very people it was designed to support.

We show that one way to extract value from the existing program is through a small incremental reform that unlocks liquidity at the end of life. We consider a policy that allows all individuals to claim the equivalent of five and one-half years' worth of social security annuity benefits upon death; this comes at the cost of lower per-year benefits so that aggregate government outlays are constant (4 percent decrease in yearly payments). For singles, the policy provides access to a guaranteed minimum claim in exchange for a small drop in the annuity; this claim is valid upon death even if it occurs early. Married individuals value the flexibility of the benefit, that can be claimed at any time.

Our preliminary analysis yields several insights. (1) Poor single households benefit the most from the introduction of end-of-life entitlements; this comes with a large change in their life-cycle labor supply behavior. (2) The small policy departure equalizes the value of the program across participants. Under the current US Social Security system, FICA taxes are levied on all workers and used to finance survivor benefits, which are available only to married individuals. Unmarried workers pay for benefits they will never receive unless they enter formal marital relationships. To the extent that all individuals have some end-of-life motive, the reform guarantees a more even treatment of beneficiaries. (3) The life-cycle behavior of married households also responds strongly to the reform but they experience small welfare changes. More generally, the labor supply of all agents is sufficiently strong to pay for the reform in a revenue-neutral setting. (4) The consumption equivalent gains of the reform are maximized when the end-of-life entitlement is between five and six years' worth of the annuity; anything larger still results in positive but less sizeable gains. (5) A reform that only applies to single households (that is, an even smaller departure from the *status quo* with no changes for the married) can still generate welfare gains and large behavioral changes among the targeted households.

Through these findings, we make three contributions. First, we show that end-of-life motives induce different responses in the life-cycle labor supply and consumption behaviors of households; liquidity needs that extend up to the time of death can shape behaviors much earlier in the life cycle (Dynan et al., 2002; French et al., 2006; Kopczuk and Lupton, 2007; De Nardi et al., 2016; Jones et al., 2020; De Nardi et al., 2021). Second, we provide new insights into the welfare implications of reforming large-scale programs (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; Scheuer and Slemrod, 2021) with a focus on liquidity considerations. In particular, we show how the interaction of end-of-life motives and social security incentives results in little-discussed labor supply distortions and welfare losses. Third, by examining a policy that redistributes resources from the married to the singles, we emphasize some of the incentives built into the existing system and advance the understanding of the institutional drivers of observed gaps in the earnings and labor supply of diverse subsets of the population (Krueger and Perri, 2006; Heathcote et al., 2010b,a; Golosov et al., 2016; Stantcheva, 2017; Daruich and Fernández, 2020; Miller and Bairoliya, 2021).

# 2 Background: United States Social Security

The United States Social Security system provides an annuity payment to older workers and survivor benefits that allow married workers to pass on benefits to their spouses in the event of death.

## 2.1 Old-Age Benefits

The Social Security system provides a flow of retirement income that starts at the time of claiming and continues until the death of the beneficiary. Benefits are a progressive function of the average indexed monthly earnings. Up to a maximum taxable amount, higher income during working life translates to higher benefits during retirement. The progressivity of the formula means that high-income individuals receive lower replacement rates on their earnings than lower-income workers. Spouses of primary earners can claim *spousal benefits* on the earnings record of the primary earner.[1] These benefits may be up to 50 percent of the benefits of the primary earner and are contingent on the primary earner having claimed Social Security 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 of time. Delaying pension claims until beyond the NRA (up until age 70) entitles workers to larger payments, albeit for a shorter period of time. These penalties/credits for early/delayed claiming also apply to spousal benefits. Spouses who claim prior to the NRA incur a penalty while spouses who delay their claims up to age 70 receive a credit. The structure of the U.S. Social Security system, therefore, creates a trade-off between the number of years pension payments are received and their size.

## 2.2 Survivors Benefits

A key objective of the United States Social Security system is providing survivor benefits to family members in the case of the death of a beneficiary. These benefits are available to spouses– and, potentially, past spouses–, children, and parents of an eligible deceased beneficiary. However,

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

the size of benefits received varies with their relationship to the covered individual and limits the ability to make late-life transfers.

Social Security benefits are based upon the number of work credits accumulated[2], whether a worker's record is eligible to pay out survivor benefits depends upon 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.

Spouses are the largest group receiving SS survivor benefits with roughly 4 million spouses receiving benefits through this channel.[3] Widows and widowers of eligible workers can receive reduced benefits of 77.5 percent of the beneficiaries basic SS benefits[4] as early as age 60 or full benefits at the normal retirement age.[5] Moreover, spouses who were living with the deceased are eligible for a one-time lump-sum payment in the month when the death occurs.[6] Benefits are also available to divorced spouses provided that the marriage lasted at least ten years.[7]

In addition to survivor benefits for spouses, benefits may be paid out to children and dependent parents of a beneficiary. Children under age 18 may receive benefits equivalent to 75 percent of the beneficiary's primary insurance amount. These benefits expire once the child is no longer a minor. Additionally, if the deceased beneficiary provided at least 50 percent of the parents' support, surviving parents over the age of 62 may receive survivor's benefits. These benefits are 82.5 percent for a single surviving parent or 75 percent each for two surviving parents.

There is a maximum family benefit amount[8] that can be paid out on a beneficiary's earnings record.[9] This maximum amount ranges from 150 percent to 180 percent of the primary insurance amount. If the total survivor's benefits are greater than this limit, payouts to all recipients are reduced proportionally.

[2]Workers can accumulate up to 4 credits annually based upon their wages and self-employment income. For example, in 2023, workers can earn 1 credit for each $1,640 earned or the maximum of 4 credits per year if they earn at least $6,560.

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

[4]Basic Social Security benefits = Primary Insurance Amount

[5]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 own record later.

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

[7]Divorced spouses lose eligibility for these spousal benefits if they remarry before the age of 60.

[8]Details: https://www.ssa.gov/OACT/COLA/familymax.html

[9]This amount excludes any benefits paid out to divorced spouses.

# 3 Model

We develop and estimate a dynamic model of labor supply and retirement. To capture the nature of life cycle incentives under different policy regimes, we carefully model retirement benefits from Social Security to match key outcomes of the current U.S. system.

We study the choice of labor supply $(h_t)$, consumption $(c_t)$, savings $(a_{t+1})$ and the SS benefit application $(b_t^{ss})$ of couples and singles. Individuals make decisions in each time period $t$ and adjust their behavior in response to changes in wages, employment, health, and survival.

The life-cycle spans ages $t = 25, 26, ..., 99$. Individuals are heterogeneous with respect to both permanent and evolving states. They are permanently different in their 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 $\iota$ denotes the age gap between spouses if married.

Evolving states include stochastic labor productivity $(\eta_t)$, employment status $(\lambda_t)$, health status $(\mu_t)$, assets $(a_t)$, social security wealth $(a_t^{ss})$ and application status $(b_{t-1}^{ss})$. Given this vector of states $\left(e, q, \eta_t, \lambda_t, \mu_t, a_t, a_t^{ss}, b_{t-1}^{ss}\right)$, individuals choose consumption, labor supply, and Social Security benefit application decisions (if eligible) to maximize the present discounted value of lifetime utility.[10] Below we describe different elements of the model in detail.

## 3.1 Preferences

Agents derive utility in period $t$ from consumption $c_t$ and leisure $l_t$. The within-period utility is non-separable in these arguments[11] and is defined as

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

The parameter $\rho$ dictates relative risk aversion; $\nu$ is the weight on consumption; $\zeta_t$ is a consumption equivalence scale. The utility of married households is multiplied by two to account for spousal utility from consumption and leisure. The amount of leisure enjoyed in period $t$ is

$$l_t = \bar{l} - h_t - \phi_P(t)\mathbb{I}\{h_t > 0\} - \phi_H(\mu_t, t), \tag{1}$$

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

[10] Social Security application is a one-time decision and cannot be reversed.

[11] 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, see, for example,).

set the time cost of poor health using estimates in Jones and Li (2023) and assume the following functional form for the time costs of working:[12]

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

At the end of life, an individual values wealth $A_t^q$, as in De Nardi (2004):

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

End-of-life wealth $A_t^q$ amounts to any remaining assets, $a_t$, plus Social Security survivor benefits, if eligible. Eligibility for survivor benefits depends on marital status and the age gap between spouses, $q$.[13]. The coefficient $\theta$ measures the intensity of the end-of-life motive, and $\kappa$ changes the curvature of the function. Higher $\theta$ increases the marginal utility of an extra unit of end-of-life resources and higher $\kappa$ makes them more similar to a luxury good.

## 3.2 Health and Mortality

Each period, individuals are subject to an exogenous process that affects their survival probability as well as their time endowment. The transition rule across health states depends on current health, education, and age. The probability to transition between two health states $i$ and $j$ is:

$$\pi_{t+1}^{\mu_{ij}} = prob(\mu_{t+1} = j | \mu_t = i, e, t+1)$$

Individuals are also subject to mortality shocks. The probability of survival depends on age and current health, as shown below:

$$\pi_{t+1}^{s} = prob(s_{t+1} = 1 | \mu_t, m, t+1)$$

## 3.3 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 $\pi^{\lambda}$. Unemployment implies lower productivity and wage-scarring

[12]The best health state in Jones and Li (2023) corresponds to our first two health states; 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 roughly 15% of the time endowment for non-college graduates and 40% for college graduates.

[13]Details on survivor benefits are discussed in Section 3.4.1

effects.

$$\pi_{t+1}^{\lambda} = prob(\lambda_{t+1} = 1)$$

Hourly wages follow a deterministic education-specific age profile $\omega(e,t)$ and depend on two stochastic components: employment status $(\lambda_t)$ and an auto-regressive component $\eta_t$.[14]

$$\begin{aligned} w_t &= \xi(\lambda_t)\exp(\omega(e,t)+\eta_t) \\ \eta_t &= \rho^w \eta_{t-1} + \epsilon_t^w \\ \epsilon_t^w &\sim N(0, \sigma_{\epsilon^w}^2) \end{aligned} \tag{4}$$

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

## 3.4 Social Security

The Social Security system in the U.S. provides retirement incentives at the time when these benefits become available. Benefits are computed in several steps. First, the earnings of the 35 highest earning years are averaged into an index – Average Indexed Monthly Earnings (AIME). The AIME increases by working an additional year if earnings in that year are higher than the lowest earnings embedded in it and are also capped at a threshold. We let $a_t^{ss}$ be the Social Security wealth (an annualized measure of AIME). Then, the Social Security wealth evolution is approximated in the model by the following rule:

$$a_{t+1}^{ss} = \max\{[a_t^{ss} + \max\{0, (w_t h_t - a_t^{ss})/35\}], a^{\max}\} \tag{5}$$

In equation (5), $a^{\max}$ is the threshold at which the Social Security wealth is capped and $w_t h_t$ denotes annual earnings in period $t$. In (5) we assume that the high earnings year replaces an average earnings year. Modeling the actual system would require keeping track of the entire earnings history which is computationally infeasible. In the second step, we use a piece-wise linear function to convert the AIMEinto the Primary Insurance Amount (PIA), which determines the Social Security benefits:

$$\begin{aligned} pia(a_t^{ss}) = 0.90 \times \min\{a_t^{ss}, b_0\} + 0.32 \times \min\{\max\{a_t^{ss} - b_0, 0\}, b_1 - b_0\} \\ +0.15 \times \max\{a_t^{ss} - b_1, 0\} \end{aligned} \tag{6}$$

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

The Social Security system in the model provides several work disincentives at older ages. For instance, the Social Security wealth $a_t^{ss}$ is revised upwards only if current earnings are greater than average past earnings (as shown in 5). Therefore, staying in the labor market for longer by working fewer hours may not increase the benefits for the individuals in the model.[15] Additional work disincentives are due to the penalty/reward system associated with the timing of the SS application and earnings test, as we discuss below.

**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 ($\Gamma_t$); and (2) a claw-back of benefits for those who continue working while claiming benefits ($\Upsilon_t$).

$$ssb_t = pia(a_t^{ss}) * \Gamma_t - \Upsilon_t \tag{7}$$

**Adjustment (1): Early/Late Claiming Penalty.** SS benefits can be claimed without penalty at the normal retirement age ($t_{NRA}$).[16] However, individuals can claim benefits with some penalty starting from the Early Retirement Age ($t_{ERA}$) of 62. For every year before the NRA that 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.

It's been argued in the literature (Heiland and Yin, 2014; Gruber and Wise, 2005) that while the benefit reductions due to early claim are actuarially fair, the delayed claim benefit increase does not fully compensate the beneficiary for the loss of benefits in previous periods. This structure of the Social Security system provides strong incentives to not delay benefit claims. The actual incentives may depend on a variety of other factors such as an individual's subjective mortality expectations, heterogeneous discount factors, and more. In the model, penalties show up as a percentage decrease, $\gamma_t^{ss}$, for each year prior to the normal retirement age that a worker claims; credits show up as a percentage increase for each year after the normal retirement age that a worker delays claiming.

[15] In practice, the highest 35 years of covered earnings are used to compute AIME. If the individual has not yet worked for 35 years, some zeros are included in the average, and any positive earnings, including part-time work, will increase the AIME.

[16] The NRA differs slightly across birth cohorts. For the sample used in this analysis, the average NRA is 65. Later cohorts have NRA of 66 or 67.

$$\Gamma_t = \begin{cases} 1 - (t_{NRA} - t^{ss}) * \gamma_t^{ss} & \text{if } t^{ss} < t_{NRA} \\ 0 & \text{if } t^{ss} = t_{NRA} \\ 1 + (t^{ss} - t_{NRA}) * \gamma_t^{ss} & \text{if } t^{ss} > t_{NRA} \end{cases} \tag{8}$$

**Adjustment (2): Earnings Test.** The SS system has an earnings test that taxes the labor income of beneficiaries above a certain threshold $y_t^{\text{ss}}$ at a rate $\tau_t^{\text{ss}}$, until the age of 70. For each additional dollar earned above the threshold, SS benefits are reduced by $\tau_t^{\text{ss}}$, until all benefits are taxed away:

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

$\Upsilon_t$ denotes benefits lost through the earnings test. Taxed benefits are credited back through permanent increases in future benefits, which is implemented in the model through increases in the Social Security wealth as shown below:[17]

$$ssb_{t+1} = pia(a_{t+1}^{ss}) * \left[1 + \left(\frac{\Upsilon_t}{ssb_t}\right)\gamma_t^{ss}\right]$$
$$a_{t+1}^{ss*} = pia^{-1}(ssb_{t+1}) \tag{9}$$

where $\gamma_t^{ss}$ is the same reduction/increment factor that is used for determining penalty/credit for early/late benefit applications as discussed earlier. The work incentives introduced by the earnings test crucially depend on $\gamma_t^{ss}$. In combination with the application age requirements, the earnings test may reinforce the incentives to retire upon reaching the claiming age.

### 3.4.1 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 benefits are claimed. We assume that all 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, $\iota$. The total SS benefits received by a household are $\delta_t^q ssb_t$, where $\delta_t^q$ is determined as:

[17] This is a simplification. The benefits are typically adjusted upon reaching the NRA. The earnings test was removed for workers over the NRA starting in the year 2000. Since SS rules have been changing over time, the restrictions pertaining to the sample used in this analysis are based on the SSA.

$$\delta_t^q = \begin{cases} 1.0 & \text{if } m = \text{single or } m = \text{married}, t^{ss} - \iota < t_{ERA} \\ 1.5 * [1 - (t_{NRA} - (t^{ss} - \iota)) * \gamma_t^{ss})] & \text{if } m = \text{married}, \ t_{ERA} \leq t^{ss} - \iota < t_{NRA} \\ 1.5 & \text{if } m = \text{married}, \ t^{ss} - \iota \geq t_{NRA} \end{cases} \tag{10}$$

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 the 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.

**Survivor Benefits**

Upon death, married individuals may also pass part of their SS entitlements on to their spouses. These survivors benefits enter into the end-of-life wealth of individuals, $A_t^q$, which takes the form:

$$A_t^q = \begin{cases} a_t + \sum_{j=t-\iota}^{T} \frac{1}{1+r} \pi_{j+1}^s ssb_t & \text{if } m = \text{married}, t - \iota \geq 62 \\ a_t & \text{otherwise} \end{cases} \tag{11}$$

In addition to any leftover assets, $a_t$, end-of-life wealth is a function of Social Security wealth if the individual is married and the spouse is over the age of 62. Survivors benefits are calculated as the present value of the stream of benefits a spouse would receive from the time of the death of the household head until the end of her own life. Therefore, the present value is a function of the household head's age $t$ and the spousal age gap, $\iota$ (see Bairoliya and McKiernan, 2021).

## 3.5 Budget Constraint

The household budget constraint can be summarized as:

$$c_t + a_{t+1} = a_t + W\left(y_t, y_{st}, \bar{r}a_t, \tau\right) + \delta_t^q ssb_t + tr_t \tag{12}$$

Labor income, $y_t$, is a function of the hourly wage and work hours chosen by the individual. We let spousal income for married households be a function of the head's age, health status, and labor income, as follows:

$$y_{st} = f\left(t, \mu_t, w_t h_t\right) \tag{13}$$

There is a simple no-borrowing constraint on assets:

$$a_{t+1} \geq 0 \; \forall t \tag{14}$$

## 3.6 Government

The government taxes individuals with a proportional payroll tax, $\tau_t^{ss}$, and labor in come taxes, $\tau$. The payroll tax $\tau_t^{ss}$ includes both the Social Security duties and the Medicare tax. 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 that allows for negative tax rates to account for Earned Income Tax Credit (EITC). We let the function vary with education and estimate the following function from PSID data:

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

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 and an individual's liquid resources, that is:

$$tr_t = \min\{0, \underline{c} - (a_t + W_t + \delta_t^q ssb_t)\}, \tag{15}$$

where $W_t$ is the total disposable household income defined in equation (12). This approximates federal safety-net programs such as the Supplemental Nutritional Assistance Program (SNAP), the Supplemental Security Income (SSI), and the Temporary Assistance for Needy Families (TANF).

## 3.7 Recursive Formulation

The period $t$ individual state vector is $z_t = \left(e, q, \eta_t, \lambda_t, \mu_t, a_t, a_t^{ss}, b_{t-1}^{ss}\right)$. Individuals solve a finite-horizon Markov problem where they choose a sequence of consumption $\{c(z_t)\}_{t=1}^T$, hours $\{h(z_t)\}_{t=1}^T$ and SS benefit application rules $\{b^{ss}(z_t)\}_{t=1}^T$ 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.

### 3.7.1 Stages of the life cycle

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, and employment decisions.[18] The second stage is the *retirement choice* phase between ages 62 and 69 when individuals can make Social Security application decisions $(b_t^{ss})$. Finally, there is a *retirement* phase when individuals make only consumption and savings decisions.

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

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

$$a_{t+1} = a_t + W(y_t, y_{st}, ra_t, \tau) + tr_t - c_t,$$

1), (5-9), (14), 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 $\tau$. The expectation is taken with respect to 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:

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

[18]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.

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

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

$$
a_{t+1} = a_t + W(y_t, y_{st}, ra_t, \tau) + tr_t - c_t,
$$
1), (5-9), (14), and $c_t \geq \bar{c}$.

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

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

$$
a_{t+1} = a_t + W(y_t, y_{st}, ra_t, \tau) + tr_t + \delta_t^{q} ssb_t - c_t,
$$
1), (5-9), (14), 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:

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

$$
a_{t+1} = a_t + W(y_{st}, ra_t, \tau) + \delta_t^{q} ssb_t + tr_t - c_t,
$$
(1), (6), (14) and $c_t \geq \bar{c}$.

# 4 Estimation

We estimate the model on a sample of male household heads born between 1931 and 1935. Estimation proceeds in two-steps (Gourinchas and Parker, 2002). 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 programming model. We call this vector of estimates $\Phi$: it includes health transitions, survival probabilities, family structure and spousal income, wages, unemployment probabilities, the tax function, and the exogenous rate of return on assets. In the second step, we use initial conditions drawn from data for the relevant cohort, our structural model, and the parameters from the first step to estimate the preference parameter vector $\Theta = \{\beta, \rho, \nu, \theta, \kappa, \phi_H(t, \mu_t), \phi_P(t)\}$ by education and marital status. In this step, we employ the Method of Simulated Moments (MSM).

## 4.1 Estimation First Step

**Health and Mortality.** 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, .[19] 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 also obtained from the MEPS. We estimate the age-, education-, marital status-, and health-specific profiles by running an ordered probit model of a death indicator on health status, a quadratic in age, education, and marital status. Since the MEPS does not sample the institutionalized population, we adjust these profiles to match life expectancy at age 65 for both education groups in our benchmark birth cohort (born between 1931 and 1935).[20]

**Family structure.** Family structure determines two parameters for married men: the consumption equivalence scale, $\zeta_t$, and the gap between spouses, $\iota$. 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 of married households depends on the presence of

[19] 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 (see Hosseini et al., 2022). As discussed in Miller and Bairoliya (2021), self-rated health is predictive of mortality even after controlling for other health conditions and behaviors, which suggests that people may have private info about their overall state above and beyond what is recorded in the frailty index.

[20] Data on LE: https://www.ssa.gov/policy/docs/workingpapers/wp108.html

a spouse and the average number of children living in the household for each age-education type. Given family size, values of $\zeta_t$ are set 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 their 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 from PSID data. About 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 between spouses of eight years. Spousal income $y_{st}$ is estimated from the PSID as a function of the age, education, health, and labor income of the household head.

**Labor productivity.** Wages are comprised of an age and education profile and a persistent shock. The age and education function, as well as parameters of the AR(1) shock process, are estimated on a PSID sample (Bairoliya and McKiernan, 2021).

**Employment shocks and wage scarring.** The probability that a worker is separated from the labor market is independent of education and marital status. We set the employment shock, $\lambda$, at $0.1$ to match the separation rate in the JOLTS. The wage penalty associated with a bad employment shock, $\xi$, is modeled as a percentage of income. The penalty is estimated 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, the log of hourly wages is regressed on dummies representing years since displacement as well as a vector of control variables including a quadratic in age and a quadratic in experience. The penalty is set to the percentage drop in annual wages that displaced workers experience on average.

**Social security.** Modeling the rich detail of the U.S. Social Security System, described in Section 3.4, requires a set of parameters. Table 1 shows these parameters based on the 1998 rules from the U.S. Social Security Administration. A first subset of parameters, $b_0$, $b_1$, and $a^{max}$, determine 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 subset of parameters is based on the earnings test. Before the normal retirement age, earnings above \$9,120 are taxed at a rate of 50 percent. After the NRA, earnings above \$14,500 are taxed at 33 percent. The normal retirement age varies with birth cohort and is age 65 for our benchmark birth cohort (born in 1931-1935). The last parameter in Table 1 defines the penalty for early claiming (or the benefit for delayed claiming). Benefits decrease by 6.7 percent for each year prior to the NRA the worker claims. After the normal retirement age, benefits increase by 5.5 percent for each year of delays in claiming benefits.

Table 1: Social Security Benefit Formula

| Parameter | Value* | |
|---|---|---|
| | before the NRA | after the NRA |
| $a^{max}$ | 68,400 | 68,400 |
| $b_0$ | 5,724 | 5,724 |
| $b_1$ | 34,500 | 34,500 |
| | | |
| Earnings Test | | |
| $y^{et}$ | 9,120 | 14,500 |
| $\tau^{et}$ | 0.50 | 0.33 |
| $\gamma_t^{ss}$ | 0.067 | 0.055 |

*1998 rules from the SSA and those pertaining to the 1931-1935 birth cohort.

## 4.2 Estimation Second Step

Having recovered the vector of exogenous data generating processes $\Phi$ and the vector of preference parameters $\Theta$, we numerically solve for the decision rules $c(z_t, \Phi, \Theta)$, $h(z_t, \Phi, \Theta)$, and $b^{ss}(z_t, \Phi, \Theta)$ using backward induction. Then, we use estimates of $\Phi$ and of initial conditions $z_0$ to simulate the life-cycle profiles for a large set of individuals. Lastly, we employ an MSM criterion function to find the $\hat{\Theta}$ that minimizes the distance between simulated profiles and data observations. We match the following moments to estimate of $\Theta$ by education (college or no college) and marital status groups (single or married):

1. Labor market participation of male household heads between ages 25 and 69, resulting in 180 moment conditions.

2. Log of hours worked, conditional on participation, of male household heads between age 25 and 69, resulting in 180 moment conditions.

3. Mean assets of male household heads between ages 25 and 69, resulting in 180 moment conditions.

These moments add up to a total of 540 conditions.[21] The MSM estimate of $\hat{\Theta}_{MSM}$ solves:

$$\hat{\Theta}_{MSM} = \text{argmin } \tilde{g}(\Theta, \Phi) W_T \tilde{g}(\Theta, \Phi)$$

[21] Life-cycle profiles are estimated by fitting a fourth-order polynomial in age and controls for education and marital status (in levels plus interaction with each other and age) for the 1931-1935 cohort. We estimate such polynomials for participation, hours, and wealth profiles. See Bairoliya and McKiernan (2021) for a discussion of wealth measures.

where

$$\tilde{g}(\Theta,\Phi) = \begin{bmatrix} \frac{1}{N}\sum_{i=1}^{N}\{p_{it} - \tilde{p}_t^{e,m}(z_{it},\Theta,\Phi)\} \\ \frac{1}{N}\sum_{i=1}^{N}\{\log h_{it|p_{it}>0} - \log \tilde{h}_{t|p_t>0}^{e,m}(z_{it},\Theta,\Phi)\} \\ \frac{1}{N}\sum_{i=1}^{N}\{a_{it} - \tilde{a}_t^{e,m}(z_{it},\Theta,\Phi)\} \end{bmatrix}$$

$$t = \{1, ..., T\};\ e \in \{\text{non-college, college}\};\ m \in \{\text{single,married}\}.$$

$W_T$ allows for an optimal weighting matrix given by the inverse of a consistent estimate of the covariance matrix of data moments. However, efficient choice of weighting matrix may introduce finite sample biases. Therefore we adopt the following non-optimal weighting matrix in the structural estimation:

$$W_T = \left[diag\Big(var\big(\frac{1}{\sqrt{N}}\sum_{i=1}^{N} m_{it}\big)\Big)\right]^{-1}$$

where $m_{it}$ is a vector of data moments.

### 4.3 Model fit

Figure D.1 plots observed and simulated participation rates (%) by age, education, and marital status and documents labor market fit. Model values are within the $95\%$ confidence intervals and exhibit realistic patterns of decline over the life cycle. This is true also around the retirement phase when incentives change significantly and models do not always fit empirical observations. Figure D.2 describes asset holdings over the life cycle, by education and marital status. The model closely matches variation in levels and growth, including the key observation of no dis-saving in old age. Finally, Figure D.3 compares observed and simulated claiming rates at four junctures: at the ERA, between ERA and NRA, at the NRA, and after the NRA. The canonical model that we use is known to marginally overstate delay and understate early claims; however, magnitudes are accurate and provide a good approximation of empirical observations.

## 5 Counterfactual Experiments

In the numerical experiments, we hold government outlays on SS lifetime payouts at the benchmark level. Denoting the total present expected value of the end-of-life lump sum transfers as

$PV^D$, we impose the following constraint in each experiment:

$$\sum_{i=1}^{N}\sum_{t=62}^{100}\left[(1-d_{it})\alpha^{ss}ssb^*_{it}\right]+PV^D=\sum_{i=1}^{N}\sum_{t=62}^{100}\left[(1-d_{it})ssb^*_{it}\right]+SVB \tag{16}$$

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

In the expression above, the $d_{it}$ are death indicators based on simulated health transitions and survival probabilities, $ssb^*_{it}$ is the benchmark value of the annuity benefits paid to individual $i$ at age $t$, $SVB_i$ is the survivor benefits paid to the surviving spouse of a married individual upon death (if they have already claimed their benefits), $\alpha^{ss}$ is the scaling factor that scales down the value of the annuity benefits in the experiment, and $PV^D_i$ is the lump sum paid out to the original SS program recipient at the end of life (regardless of their claiming status). The constraint guarantees that Social Security disbursements are the same as in the baseline.

The lump sum amount varies in the cross-section of individuals because it is set to a multiple of their primary insurance amount (PIA). The multiple is such that the expected payout, in the form of annuity and lump sum, is the same as the expected entitlement upon initial receipt of benefits in the benchmark economy. Surviving spouses receive a marginally smaller annuity in the experiments, which is proportional to the annuity received by the main beneficiary before death.

## 5.1 Universal transfer reform

We begin by examining a reform that introduces a universal end-of-life payment, disbursed regardless of marital status. Specifically, we study a system that replaces part of the annuity benefit with an end-of-life lump sum transfer. In this experiment, all individuals are guaranteed, upon death, the equivalent of five and a half years' worth of their PIA entitlement; the transfer is financed through a smaller per-year benefit, and the percentage drop in the annuity is such that the total expected benefits remain unchanged. In practice, the introduction of the transfer requires a marginal cut of roughly $4\%$ in the annuity payments. The cut is similar to what individuals would give up if they brought forward retirement by around 7 months relative to the normal retirement age. The utility value of the end-of-life transfer is derived from the function described in (3). We do not model intergenerational linkages and the transfer does not add to the consumption of surviving beneficiaries. For this reason, the estimates of welfare changes may be viewed as a lower bound. Table 2 shows the effects of the reform on labor supply, asset holdings, average consumption, and welfare (in consumption equivalent values, CEV). We report results by education and marital status. Despite the small departure from the baseline SS system, the impacts are sizable.

Table 2: Universal Transfer Reform

| | Singles | | Married | |
|---|---|---|---|---|
| | Non-College | College | Non-College | College |
| Participation | 2.56 | 0.82 | 2.71 | 0.29 |
| Hours | 2.60 | 0.61 | 2.48 | 0.20 |
| Assets | -29.30 | -21.86 | 1.33 | 0.16 |
| Consumption | 2.31 | 0.66 | 0.71 | -0.55 |
| Welfare | 2.58 | 1.70 | 0.27 | -0.08 |

*Notes*: Experiment entails a lump sum payment to every individual. The payment is 5.5-year's worth of their PIA at the time of death. The transfer is introduced in conjunction with a $4\%$ reduction in the annual flow of SS benefits. This guarantees that the lifetime SS outlay of each individual remains at its benchmark level.

**Singles.** Welfare grows significantly among non-married individuals, who now have guaranteed access to part of their entitlement even if they die before claiming SS annuity income. The average CEV change is positive and a little over two and a half percentage points for the relatively poor non-college singles. The reform induces them to delay retirement as these individuals no longer need to claim their annuities in order to avoid losing everything in case of premature death. College-educated singles experience a smaller CEV gain of $1.7\%$ on average with most individuals exhibiting gains slightly over 1.5 percent (see Figure 1). Both college and non-college singles experience an increase in labor force participation and hours worked at older ages. This effect is somewhat stronger for the non-college group. The strong labor supply response of both groups is partly due to the novel ability, under the reform, to circumvent the earnings-test claw-back that applies after claiming SS benefits. Delaying SS claims allows these earners to supply more hours at older ages without being subject to the implicit earnings tax of the claw-back of the original system.

Regardless of education, non-married singles reduce their savings significantly under the reform. This is especially true after retirement (Figure D.5). The drop in asset holdings can exceed $1/3$ of the baseline values at old ages, reflecting a diminished need for end-of-life hoarding of resources. This finding is related to the ongoing debate on the origins of the high saving rates among the elderly and suggests that a non-trivial share of their wealth might be due to end-of-life considerations that extend beyond their own death. A policy that liquidates some of their entitlements upon death appears effective in reducing the asset holdings of older non-married individuals.

**Married individuals.** Welfare changes are not as large among married individuals. The change is slightly positive ($0.27\%$ CEV) for non-college households, while it is small and negative ($-0.08\%$ CEV) among the college-educated. Since married individuals tend to live longer than the unmarried, the ability to plan their retirement in a less constrained way carries positive returns in terms of welfare.

Non-college workers tend to be less wealthy and, by delaying SS claims, are able to participate in the labor market at older ages and with more hours. This group has the strongest labor supply response in the experiment : this suggests that the design of the current SS system generates large distortions in their behavior.

The reform induces married individuals to decrease savings during their working lives but increase them later in life (Figure D.5). Under the baseline Social Security model, surviving spouses receive marital benefits only if the surviving spouse is of retirement age; therefore, any end-of-life transfer motive would introduce an incentive to save during middle life and insure against death during their working years. The reform, however, makes everyone eligible for a transfer that is not conditional on being of retirement age: this significantly reduces the need to stash away resources earlier in life.

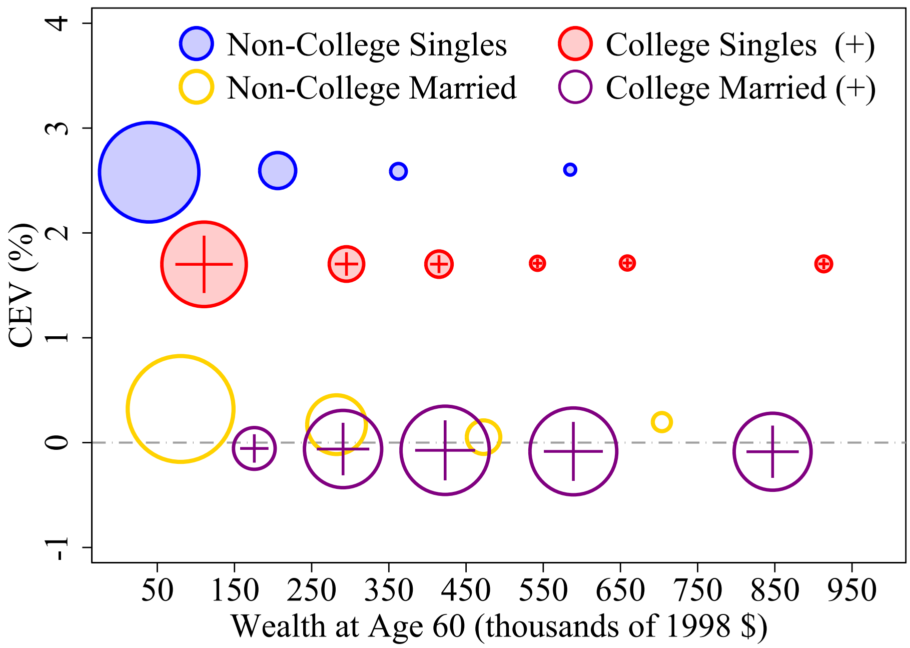
Conditional on surviving to older ages, married individuals receive marginally lower survivor benefits under the new regime, which may lead to the accumulation of additional resources for precautionary motives after retirement. We do find evidence for this offsetting force, but mostly among the less educated workers (Figure D.5). The changes in saving behavior are smaller in magnitude among married individuals, who tend to be richer. This is most apparent for college-educated couples, whose dynamic choices are not overly dependent on SS benefits and therefore exhibit smaller responses to the reform.

Figure 1 provides an overview of the distribution of welfare changes from the Universal Transfer Reform across different worker groups. The size of the bubbles conveys information about the relative size of workers of different marital status and wealth. The key takeaway from this plot is that the vast majority of workers has higher welfare under the reform: for some groups, like the non-college single workers, the gains are extremely large. As expected, the married workers are the one who earn less, or marginally lose, from the reform since they have to give up the survivor benefits of the status quo SS policy. However, even among married individuals, the majority exhibits positive welfare changes after the reform. Among those who exhibit a marginally lower welfare (college married) the changes are fairly small and indicate that the flexibility of the reform does not fully make up for the loss of the survivor benefits in the status quo SS system. Nonetheless, their losses are not large and confirm that the reform induces positive welfare changes on average.

## 5.2 The value of the reform over the life-cycle

To shed light on the mechanics of the reform and convey information on its value at different stages of the life cycle, we compute measures of the benefits' worth (in dollar terms) at different

Figure 1: Welfare: Universal Transfer Reform




ages. Figure D.8 plots the flow value of accruable benefits in the benchmark (legacy) economy and under the universal transfer reform at each age between 25 and 99 for workers of different education and marital states. Accruable means that the benefit would be payable upon death at a specific age.

The first striking difference is that the value of benefits starts growing from the beginning of the working life in the reform experiment. Unlike the legacy system, in which all benefits are conditional on claiming (or reaching age 62 in the case of married individuals for access to survivors benefits), the reform guarantees an end-of-life transfer to every worker regardless of their age at death. Moreover, the transfer grows with a worker's PIA, which explains the positive slope of the benefits flow measure between ages 25 and 60. In contrast, the flow value of the benchmark SS policy is stuck at zero until claiming occurs after 60.

The claiming patterns across groups are themselves very different. Each panel of D.7 shows a jump in benefit flows at the average age at which the annuity is claimed. It is apparent that in all groups the claiming ages change in response to the reform, sometimes by several years. However, while single individuals delay their claims, married workers move their claims earlier. These strong responses capture the relationship between claiming and liquidity preferences. While singles have reduced incentive to start claiming in order to preserve entitlements and save for transfers, married individuals have higher incentives to do so due to the removal of the more generous survivor's benefits.

The flatness of benefit flows after retirement reflects the constant annuity income and the fact that the PIA no longer changes after retirement, so the final transfer is also fixed. The gaps between benchmark and experiment accruable benefits at each age are large and can reach almost ten thousand dollars after retirement. However, note that while the flow benefits under the reform always remain higher than the benchmark for singles, it is not the case for married individuals. There are three distinct regions in this case as evident from figures D.8c and D.8d. Up until age 62, the reform clearly dominates as flow value of benefits under the reform remains higher. However, starting age 62, the legacy system favors the married individuals more given the higher level of spousal benefits. Finally, conditional on surviving to older ages, the reform dominates again as the value of survivors benefits (which is based on the remaining life-span of the surviving spouse), under the legacy system, is much lower at older ages. This is in stark contrast with the reform where the size of end-of-life transfers remains fixed after retirement.

The large welfare gains under the reform, especially for singles, follow from the fact that benefits can be accrued at young ages and before reaching retirement age, as shown in Figure D.8. For many people, this means that entitlements are not fully lost due to premature death. This difference explains why the reform is so valuable even though the total government outlays are unchanged. Figure D.9 shows the present value at age 25 (discounted at a rate of $2\%$) of total SS benefits received conditional on death at a specific age between 25 and 99. In this Figure, we plot the PDV of Total benefits by marital status and set the claiming age to 65 for both. The calculation is done for a fixed AIME of $52,000$ dollars to keep things simple. Under the benchmark SS policy, singles are assumed to claim at 62 (the modal age in the benchmark simulation). In the universal transfer experiment, singles are assumed to adjust their claiming to age 65 (the new modal claiming age in the experiment). The married are assumed to claim at 65 in both cases.

For singles, the reform results in a much higher PDV at every age. Under the benchmark SS policy, the PDV of benefits is stuck at zero until claiming. While for singles the PDV in the legacy system never catches up to the experiment's PDV, for married individuals this occurs after retirement since the reform does imply a marginal redistribution of resources from the married to the unmarried.

In Figure D.11 we refine the present value analysis by considering three scenarios for the delay in the first age of benefits claiming under the universal reform (from 62 to 65, from 62 to 70, and from 65 to 70). This analysis is meant to convey information about the present value of the reform for households that change their claiming patterns differently. The main lesson is that the present value of the reform, relative to the benchmark, becomes large with the delay in claims. That is, households that delay claiming more tend to extract more value from the policy reform. This observation is instructive to make sense of the key forces triggered by the simple policy we consider: bundling a transfer that is paid at any age and an annuity that starts after retirement, the system assuages concerns about loss of entitlements while preserving the approximate value of old-age income. In fact, the plots show that conditional on living very long lives (say, age 80 and beyond) the presence of the transfer becomes very valuable again since people don't have to worry about depleting their assets to satisfy the warm glow constraint. In this sense, the transfer appears to be most valuable for the very young and the very old.

## 5.3 The Value of Larger EOL transfers?

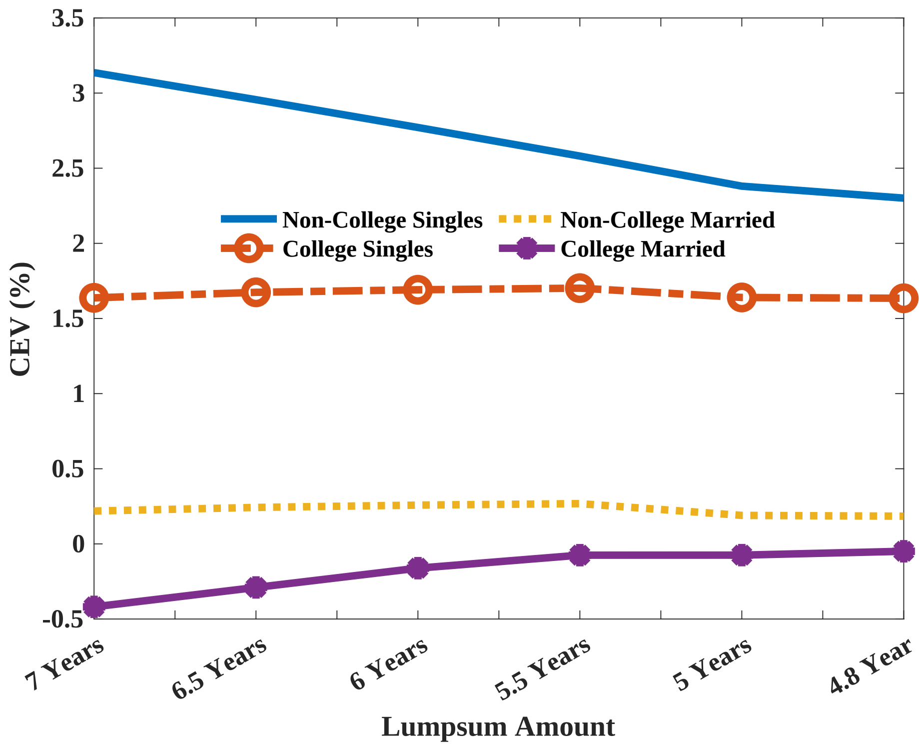
Different subsets of workers will associate different values to alternative combinations of annuity and EOL transfer. In particular, the value of EOL transfers varies with their size and the necessary adjustment in annuities. To examine who likes larger EOL transfers, Figure 2 plots changes in welfare (CEV) for different amounts of the end-of-life lump-sum transfer. Experiments for each EOL transfer size are done in an expenditure neutral way where the size of the annuity received is decreased in order to finance the lump-sum payment. The penalty ranges from nothing at all (to provide an EOL payment of 4.8 years of benefits for all workers, financed in whole by the baseline survivors benefits of the married workers) up to 16 percent of the annuity value in order to finance an EOL transfer of 7 years of benefits for all workers.

Across all values for the end-of-life transfer, we observe a consistent pattern. While married individuals are nearly indifferent or experience small welfare losses due to the experiment, singles–particularly those without college education–experience large gains. The gains for the singles increase with the size of lump-sum payment while the CEV for married workers decreases for higher levels of EOL transfers. This finding highlights the role that redistribution from married to single individuals plays in the reform.

We highlight this redistribution by performing an experiment that focuses only on single individuals. This experiment is more expensive as the decrease in the annuity required to keep the the reform expenditure-neutral must be larger when the baseline survivors benefits of married individuals are not used to finance the reform. For example, to finance an end-of-life transfer of one year of benefits to single workers, their annuity payments must decrease by 18 percentage points.

Figure 3 shows results for this experiment featuring only single workers. In panel (b) we show how CEV varies for EOL transfers valued between 2 and 0.05 years. Unlike the positive relationship between the EOL transfer and welfare we highlighted for singles in the universal transfer reform of section 5.1, considering only singles makes the CEV decreasing in higher levels of the lump-sum — a result driven by the drop in the annuity needed to finance the larger lump-sum payments. Panel (a) demonstrates this point; when the end-of-life is debt-financed rather than financed through a drop in the annuity, we find a monotonic positive relationship between CEV and the size of the transfer established previously. However, when the reforms are required to be

Figure 2: Welfare: Variation Across EOL Transfers




*Notes*: Figure reports average CEV of each education-marital status group across different EOL transfer sizes. Each EOL size is associated with a decrease in annuity payments ranging from 0 (for a lump-sum of 4.8 years of benefits) to 16 percent (for a lump-sum of 7 years of benefits)

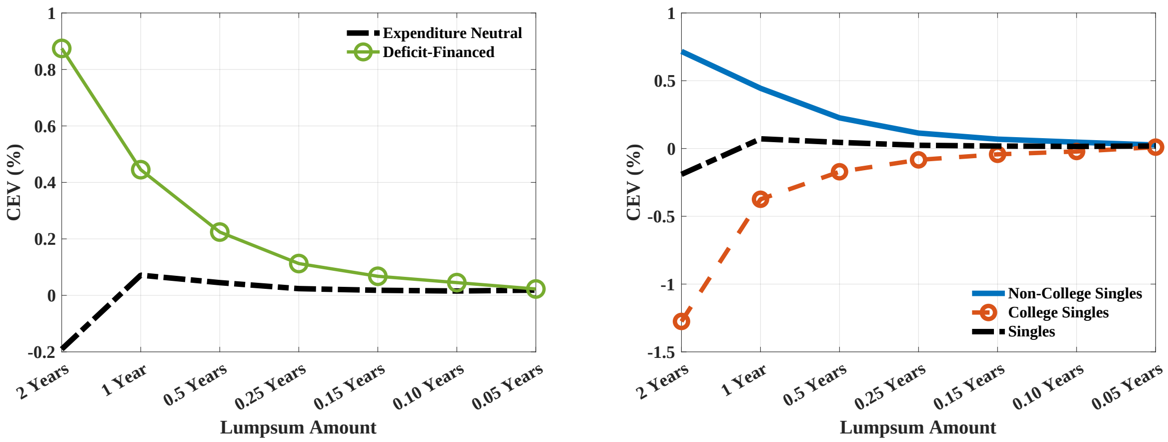
expenditure-neutral, the relationship between EOL transfers and CEV seems non-monotonic — welfare increases at lower levels of EOL transfers and decreases at higher levels. While singles value the liquidity provided by the EOL transfer, they also highly value the size of the annuity they receive. Moreover, the cost in terms of annuity reduction, is much larger for even a small EOL transfer.

## 5.4 Back to the Universal Transfer Reform: What EOL Transfer has the Highest Average CEV?

The previous section documents significant heterogeneity in the value that different workers associate to combinations of EOL transfers and annuities. One natural question is what amount of EOL lump sum transfer would result in the highest average welfare change.

We explore this question by solving the model for different bundles of EOL transfer and annuity, and computing the average change in CEV across all workers. Figure 5 shows that CEV is locally maximized at a lump-sum value of roughly 5.5 years of benefits–the value of end-of-life

Figure 3: Welfare Across Experiments: Non-Universal Transfer Reform




(a) (b)

*Notes*: Panel (a) shows the average CEV of singles across two sets of policy experiments 1) individuals are paid lump sum without corresponding decrease in annuity (deficit financed) and 2) individuals are paid lump sum with a corresponding decrease in annuity (expenditure neutral). Panel (b) presents CEV of all-singles, college-singles and non-college singles for a policy which pays out a lump sum worth some years of annual social security benefits at the end of life. The annuity benefits are reduced in each experiment to make lump sum payments revenue neutral and ranges up to 42 percent for a EOL transfer of two years of benefits.

transfer considered in our original universal transfer reform.

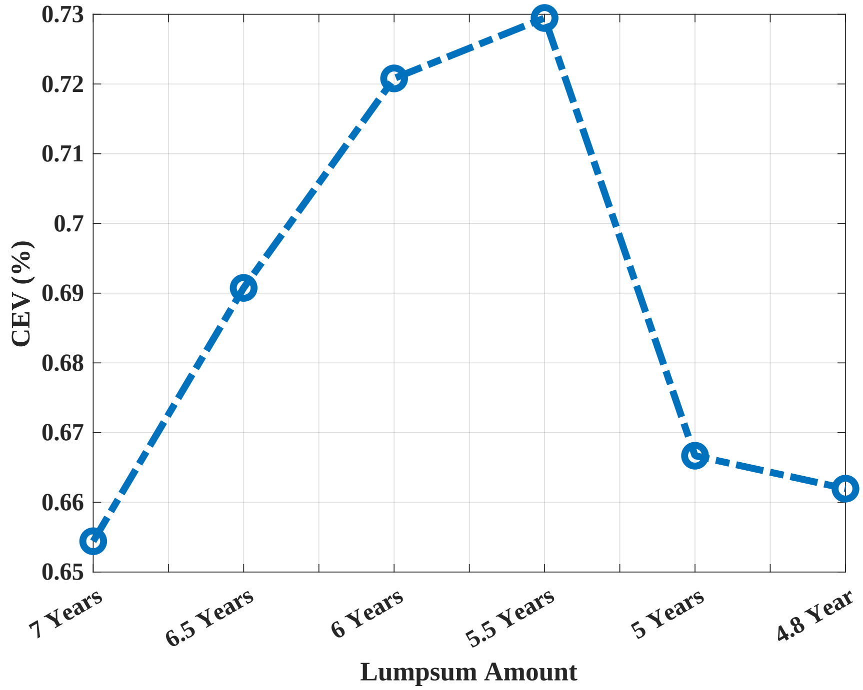
# 6 Conclusion

Uncertainty about lifespan duration introduces a preference for end-of-life liquidity. This motive has implications for consumption and labor supply over the life cycle. To assess the quantitative importance of these motives, we study the way individuals respond to changes in social security entitlements. In particular, we examine the effects of a policy reform whereby individuals are allowed to cash in a small part of their entitlements upon death to satisfy a desire for end-of-life liquidity. This policy change induces large responses that we quantify in a dynamic model of consumption and labor supply.

Using a variety of data sources, we estimate the baseline model under the current SS system and show that it can rationalize household choices along all relevant margins, including the timing of benefit claims and late-life asset holdings. Our analysis suggests that the illiquid nature of the current Social Security system has a strong impact on the life cycle choices of program participants and distorts their life-cycle decisions.

To illustrate the magnitude of these distortions, we consider a policy that pays out part of the entitlements at the end of life, wherever that may occur while preserving the expected value of

Figure 5: Average CEV by EOL Transfer




*Notes*: Figure reports average CEV of the simulated population across different EOL transfer sizes. Each EOL size is associated with a decrease in annuity payments ranging from 0 (for a lump-sum of 4.8 years of benefits) to 16 percent (for a lump-sum of 7 years of benefits)

benefits. Bundling a guaranteed end-of-life entitlement and an annuity into the SS benefit significantly changes labor supply and saving patterns over the entire life cycle. Policy impacts are heterogeneous in the population and tend to be larger for single individuals with less education. The welfare changes induced by the policy are large and positive across marital and education groups and come close to being Pareto-improving ex-post.

By focusing on a moderate departure from the current system, we show that small tweaks that guarantee partial access to entitlements in case of premature death can have strong impacts and bring about significant welfare gains. Our work highlights how late-life liquidity needs that extend up to the time of death can shape behaviors much earlier in the life cycle and affect the value of existing policies. More generally, our findings suggest that end-of-life preferences for liquidity may exert a large influence on individual choices.

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# Appendix

# A 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:

$$\sum_{t=1}^{T} E\beta^t \left[ s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu}\right)^{1-\rho}}{1-\rho} + (1-s_t)\Omega(a_{t+1}^p) \right] = \sum_{t=1}^{T} E\beta^t \left[ s_t \frac{\left(c_t^{p\nu}(1-l_t^p)^{1-\nu}\right)^{1-\rho}}{1-\rho} \right] \times \kappa_1 \tag{17}$$

$$\sum_{t=1}^{T} E\beta^t \left[ s_t \frac{\left(c_t^{*\nu}(1-l_t^*)^{1-\nu}\right)^{1-\rho}}{1-\rho} + (1-s_t)\Omega(a_{t+1}^*) \right] = \sum_{t=1}^{T} E\beta^t \left[ s_t \frac{\left(c_t^{*\nu}(1-l_t^*)^{1-\nu}\right)^{1-\rho}}{1-\rho} \right] \times \kappa_2 \tag{18}$$

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 $(\tau)$ in our framework is computed as follows:

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

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

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

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

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

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.

Table B.1: Life Insurance Coverage by Age, Education, Marital Status

| | Any LI | | Term LI | | Whole LI | |
|---|---|---|---|---|---|---|
| | coverage | value | coverage | value | coverage | value |
| Overall | 71.9 | 226,852 | 56.6 | 224,287 | 29.2 | 122,345 |
| single, no children | 49.6 | 113,451 | 38.5 | 109,625 | 16.8 | 89,185 |
| single with children | 59.4 | 118,293 | 43.9 | 125,962 | 22.5 | 70,913 |
| married | 76.0 | 246,248 | 60.3 | 241,580 | 31.5 | 129,155 |
| No College | 64.2 | 106,982 | 48.9 | 110,514 | 25.6 | 60,750 |
| single, no children | 39.6 | 55,183 | 29.6 | 63,468 | 12.8 | 31,536 |
| single with children | 53.7 | 58,478 | 38.1 | 67,758 | 20.1 | 34,173 |
| married | 68.0 | 115,626 | 52.3 | 117,474 | 27.5 | 64,988 |
| College | 77.8 | 303,449 | 62.6 | 291,948 | 32.1 | 160,491 |
| single, no children | 54.5 | 133,724 | 42.7 | 124,297 | 18.8 | 108,076 |
| single with children | 65.9 | 173,932 | 50.5 | 173,862 | 25.3 | 104,245 |
| married | 82.2 | 329,769 | 66.6 | 315,990 | 34.6 | 168,779 |

*Source*: SCF 1989-2019, Authors' calculations

*Notes*: coverage measures the share of individuals who report having any life insurance policy (column 1), a term life insurance policy (column 2), and a whole life insurance policy (column 3). The value columns show the average insurance value of the policy in 1998 dollars. Individuals who hold both a term LI policy and a whole LI policy will show up in both columns

# B Life Insurance

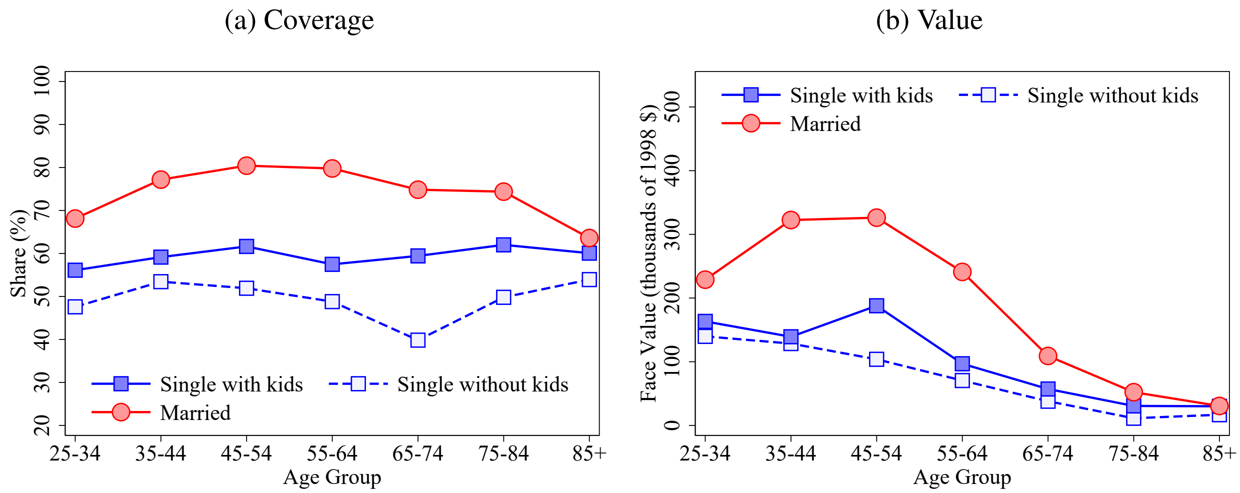
Life insurance, provided through an employer or purchased on the private market, can satisfy the end-of-life motive we highlight. Therefore, the prevalence and value of this life insurance across heterogeneous individuals gives insights into this motive for people who vary by marital status (and fertility) and education. Using data from the Survey of Consumer Finances (SCF) for years 1989 - 2019, we demonstrate the widespread life insurance indicates an end-of-life motive, even for those without familial dependents.

Table B.1 demonstrates that many individuals, even those with spouses or children, hold some life insurance policy. Over 70 percent of men have life insurance coverage; nearly 50 percent of single men without children have life insurance coverage. These share align well with statistics in Hong and Rios-Rull (2012).[22] We are not able to separate employer sponsored from privately purchased term life insurance in SCF. However, we do find that over 15 percent of childless singles

[22]Hong and Rios-Rull (2012) uses data from the Stanford Research Institute for the year 1990.

hold a whole life insurance policy – a policy assumed to be purchased optimally. This indicates that while some life insurance may not be optimally chosen by the policy holder, the motive to buy insurance does exist.[23] This is further seen when we consider coverage over the life-cycle. Figure B.1 shows coverage rates by age and marital status. We observe some variation in coverage between those who are married, single with children, and single without children. Importantly, we see coverage rates at older ages, the time when workers are less likely to be covered through plans that are not purchased on the market, are similar across groups with roughly 50 percent of those over age 85 holding a policy.

Figure B.1: Life Insurance by Age and Marital Status




*Notes*: figure presents the the share of individuals who hold a life insurance policy and the average face value of all life insurance policies held by individuals of a given age and marital status. Value of life insurance held is calculated as the face value net any cash value that has been accumulated (for whole LI policies). All values are in thousands of 1998 $.

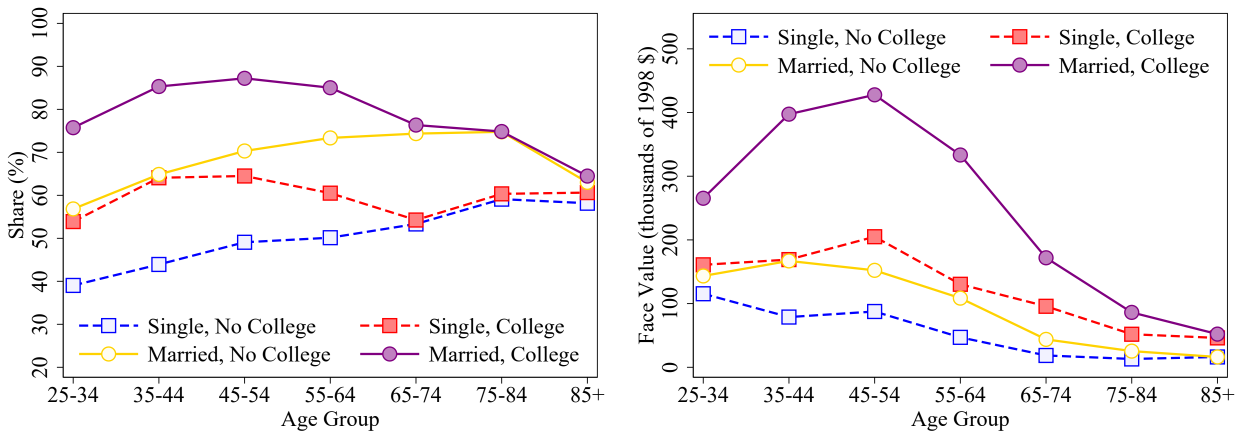
Figure B.2 shows how life insurance coverage (Panel (a)) and the face value of life insurance (Panel (b)) varies over the life-cycle for education-marital status groups.[24] We highlight three facts that emerge from this. First, Figure B.2a shows high life-insurance coverage across the life-cycle. Average coverage is roughly 60 percent across all age groups. Second, we observe more variation in life insurance coverage across demographic groups early in the life-cycle. Coverage rates among 25-34 year old men ranges from roughly 40 percent for singles with no college education to over 70 percent for college educated, married men. The gap between education groups for a given marital status disappear at retirement age (those in the 65-74 age group); and the gap in coverage rates by married is eliminated for those oldest individuals (age 85+). Finally, Figure B.2b shows that while there is substantial variation in the face value of life insurance held, this is mainly due to high values for mid-career college educated, married men.

[23]Hong and Rios-Rull (2012) are able to separate group plans from purchased plans in the SRI. They find that over 70% of life insurance value is voluntary.

[24]For this calculation, single men with and without children are combined.

Figure B.2: Life Insurance by Age, Education, and Marital Status

(a) Coverage (b) Value




*Notes*: figure presents the the share of individuals who hold a life insurance policy and the average face value of all life insurance policies held by individuals of a given age, education, and marital status. Value of life insurance held is calculated as the face value net any cash value that has been accumulated (for whole LI policies). All values are in thousands of 1998 $.

# C Evidence on Intentions to Leave Bequests

In this section, we explore whether there is empirical support for strong bequest motives among those who do not have dependents–either a spouse or children.

We use data from Waves 4-13 (covering years 1998-2016) of the Health and Retirement Study (HRS) in which workers are asked about the probability that they will leave of bequest of various sizes.[25] 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 upon the response. If the individual reports a probability strictly above 0, he or she is asked ”What is the probability that you will leave a bequest of $100,000 or more?”[26] If an individual, on the other hand, reports a 0 probability of leaving a bequest of at least $10,000, that individual is asked for the probability of leaving any bequest.

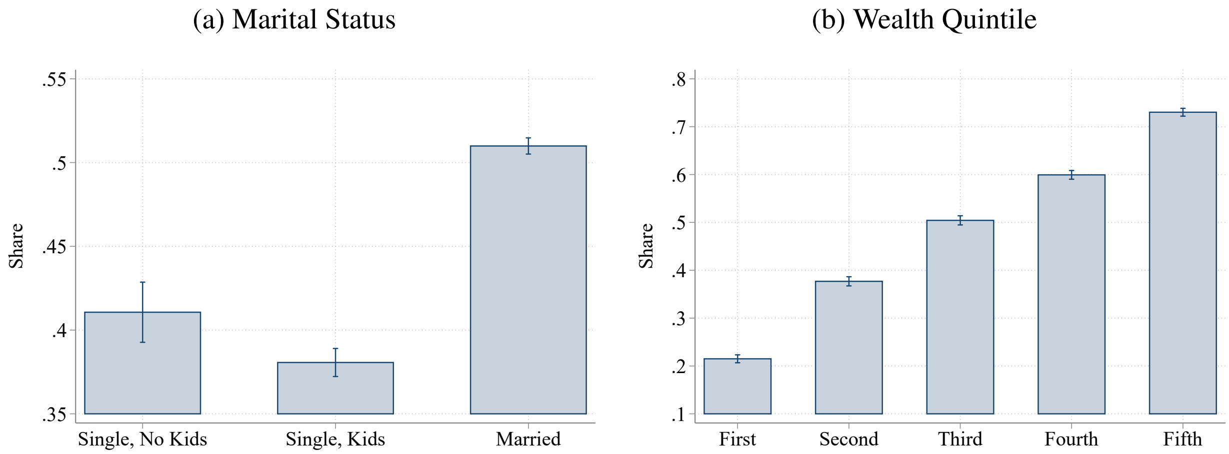
We use these questions to construct an indicator of whether or not an individual has an intention to leave a bequest. This indicator takes a value of 1 if the worker between ages 50 and 75 reports at least a 95 percent chance of leaving any bequest. This construction is chosen to address three issues. First, we limit the sample to workers between the ages of 50 and 75 to drop older workers for whom many unforseen expenses that could interfere with bequest abilities may have already been revealed. This aims to focus on bequest intentions rather than higher probabilities due to arriving late in life with more wealth than expected. Second, the 95 percent threshold is set so that we get as close to picking up the intentional choice to leave a bequest rather than a future chance

[25]In Wave 1, rather than reporting the probability of leaving a bequest, workers are asked, on a 5-point scale (Yes, definitely to No, definitely) how likely they are to leave a ”large” bequest. Prior to Wave 4, the order of question is changed. Workers are asked the probability of leaving any bequest before being asked about a bequest of $10,000 or more.

[26]Beginning in Wave 6, those who report 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.

of leaving a bequest. Finally, we choose to use the probability of leaving any bequest rather than the probability of leaving a bequest of $10,000 or $100,000 to also try to highlight the desire to leave wealth. We hope that by doing this a decline in the probability can be interpreted as a lower desire to leave a bequest rather than a lower probability of having wealth above these amounts.

Figure C.1: Bequest Intentions by Marital Status, Wealth

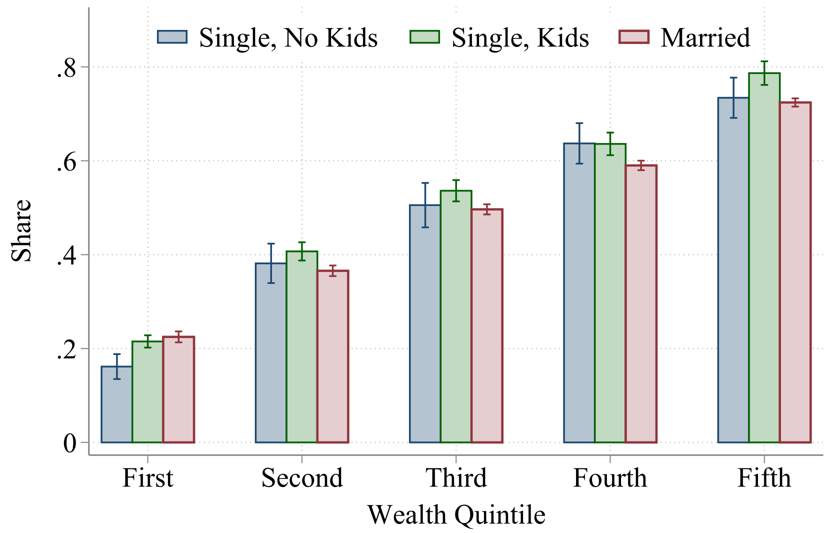



*Notes*: figure presents the share of workers between the ages of 50-75 who report over 95% probability of leaving a bequest (of any size).

Figure C.1 shows the share of workers who report this intention to leave a bequest; Figure C.1a shows how the share vary by marital status while figure C.1b demonstrates variation in the share by wealth quintile. The main take-away from these figures is that there is evidence that bequest intentions are much more correlated with wealth than whether a worker has a spouse or child to which the the bequest would be left. While a slightly higher share of married workers have desire to leave a bequest (46 percent), the difference between married and singles is minimal (7-10 percentage points). Additionally, when we look only at single individuals. Having children does not leave to larger probability of leaving a bequest. Rather while 40 percent of those without children report intention to leave a bequest, this share is only 36 percent among singles with children. Panel (b) indicates that wealth, on the other hand, is a much stronger predictor of bequest intentions. While 68 percent of those in the highest wealth quintile have an intention leave a bequest, only 20 percent of those in the lowest wealth quintile do.

In a final test, we computed this share for various marital status types conditional on a given quintile of wealth. This is shown in Figure C.2. This figure, once again, highlights that wealth seems to be a much more important indicator of intentions to leave bequests than marital status. Specifically, once we condition on the quintile of the wealth distribution, there is very little little–if any–differences in the share of workers who intend to leave a bequest based upon marital status or the presence of children.

Figure C.2: Bequest Intentions by Marital Status and Wealth

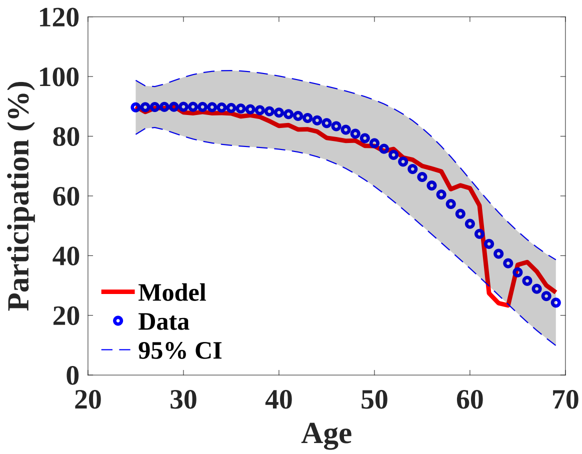



*Notes*: figure presents the share of workers between the ages of 50-75 who report over 95% probability of leaving a bequest (of any size).

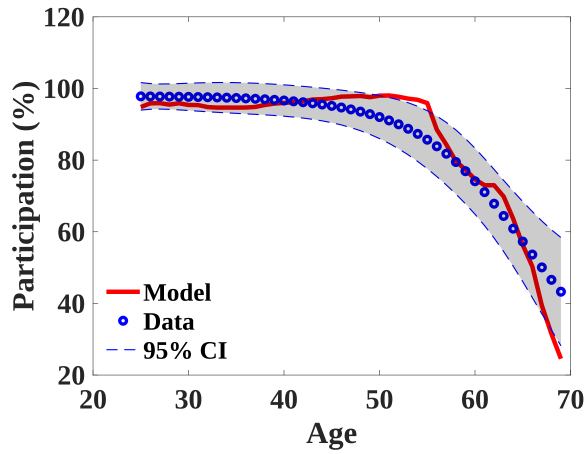
# D Additional Figures and Tables

Figure D.1: Model Fit: Labor force participation rates

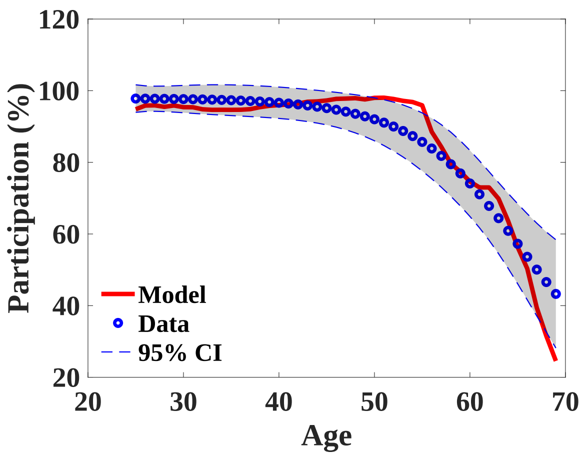
(a) Non-College, Non Married




(b) College, Non Married




(c) Non-College, Married




(d) College, Married

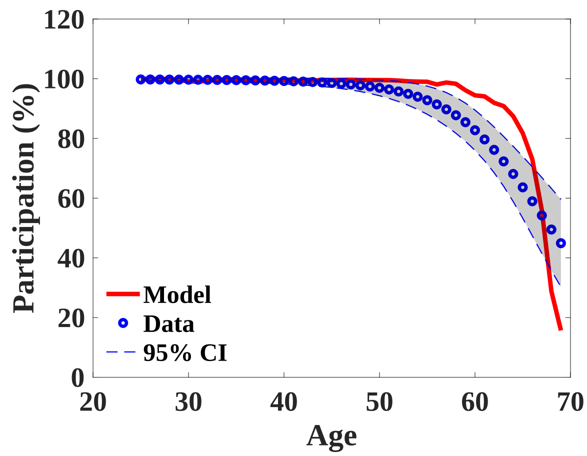
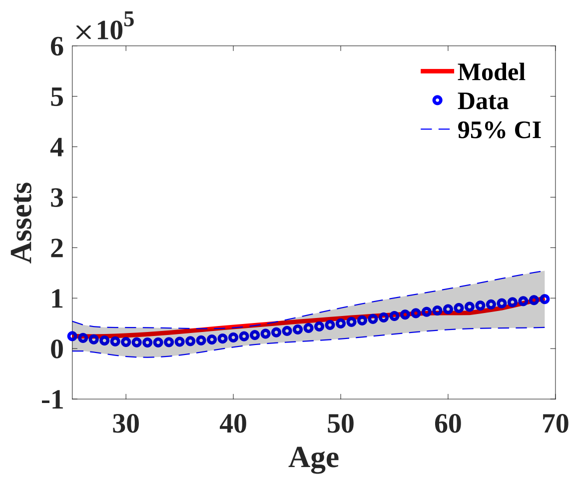
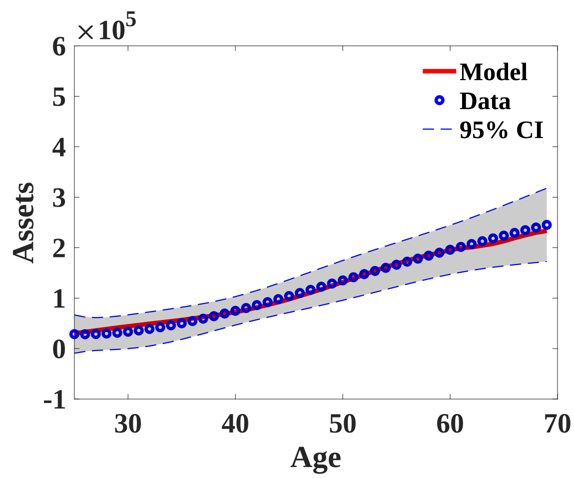


Figure D.2: Model Fit: Wealth

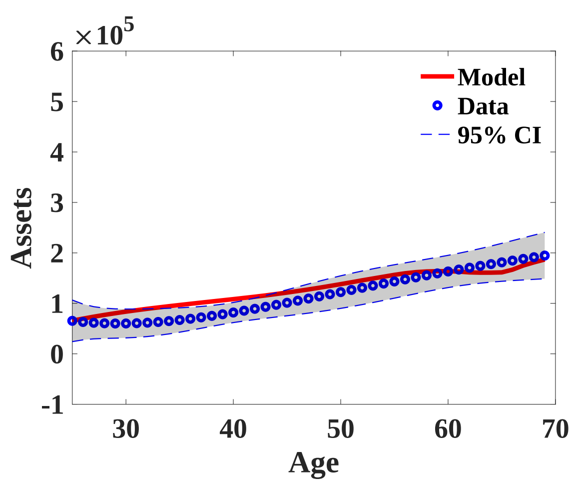
(a) Non-College, Non Married




(b) College, Non Married




(c) Non-College, Married




(d) College, Married

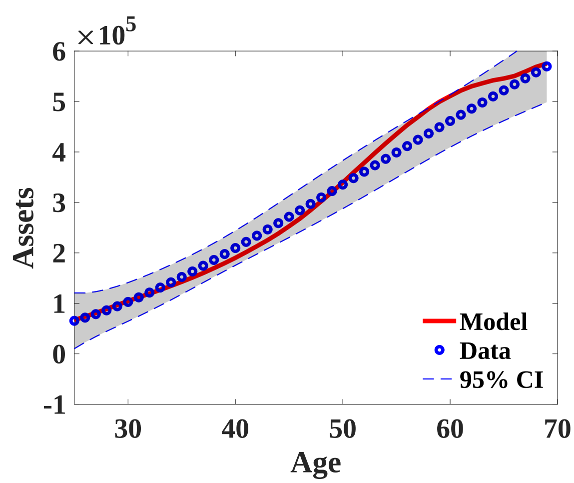


Figure D.3: Model Fit: SS Claiming Behavior

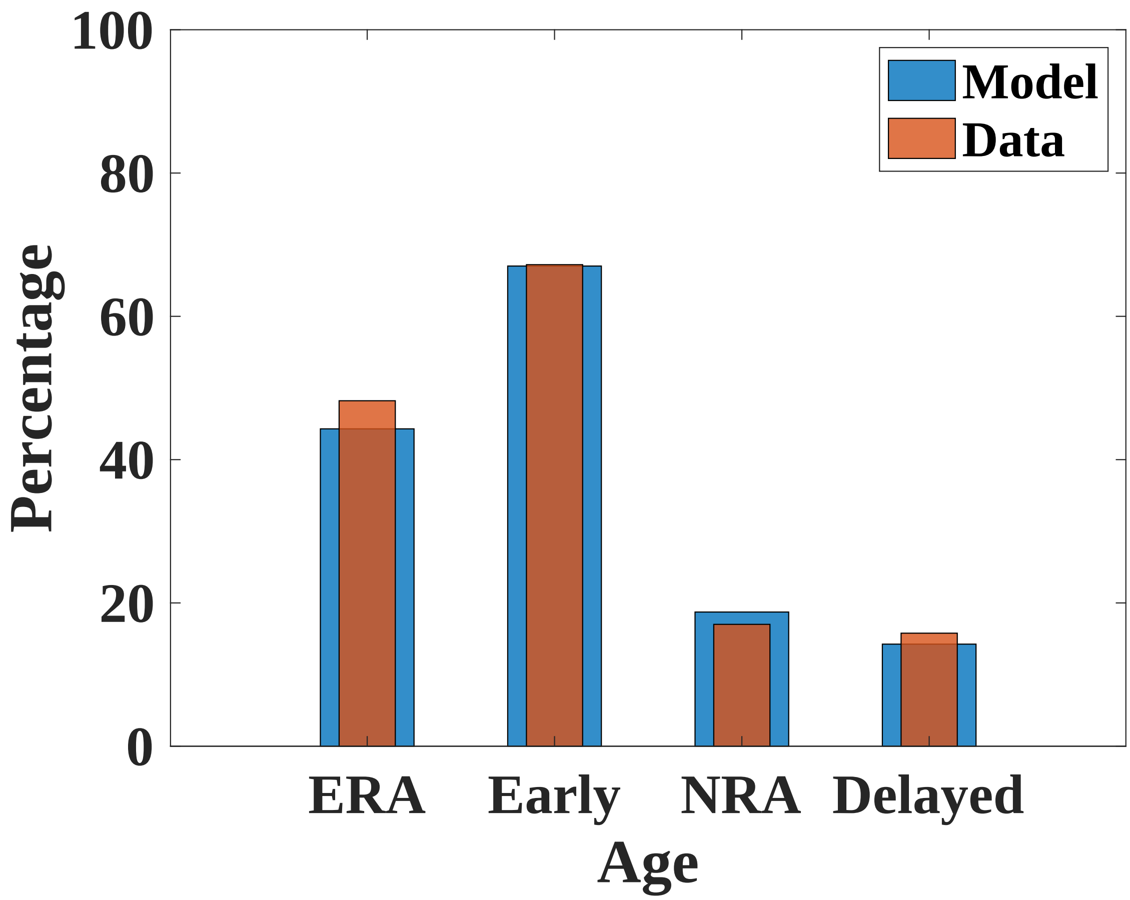


Figure D.4: Life cycle Hours: Universal Transfer Reform

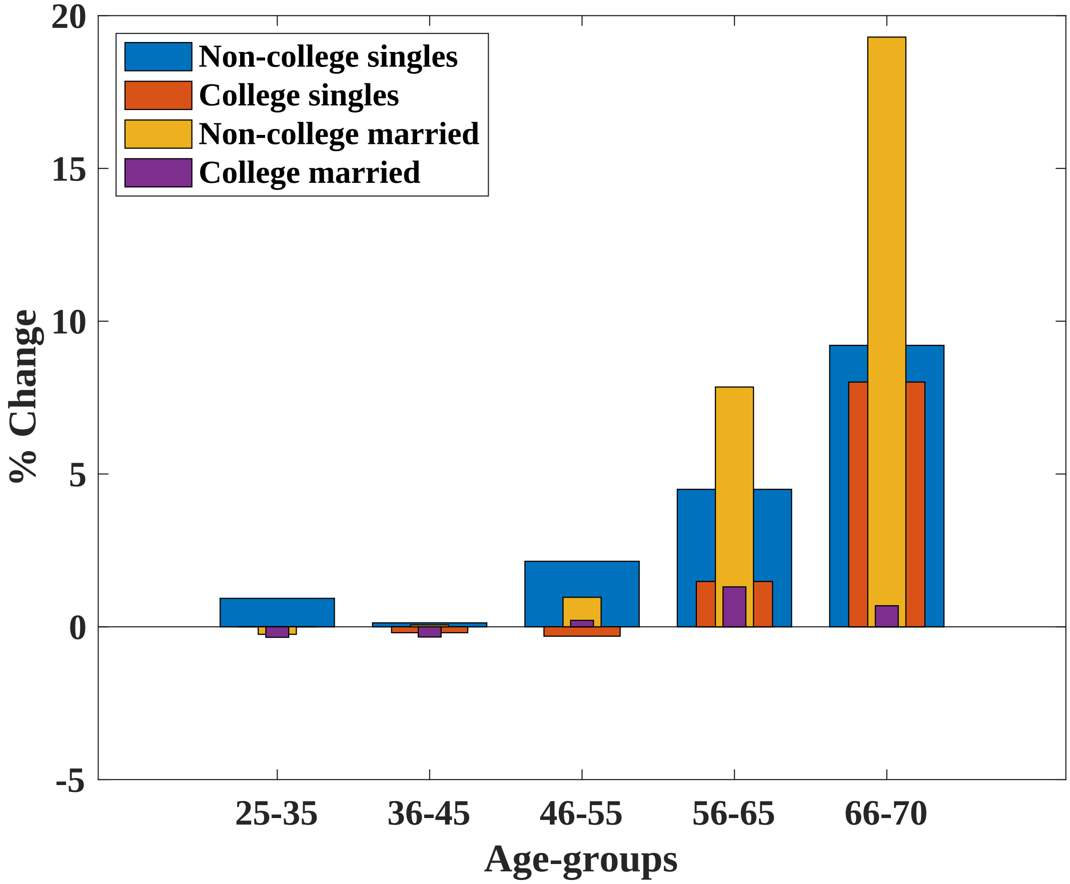


Figure D.5: Life cycle Assets: Universal Transfer Reform

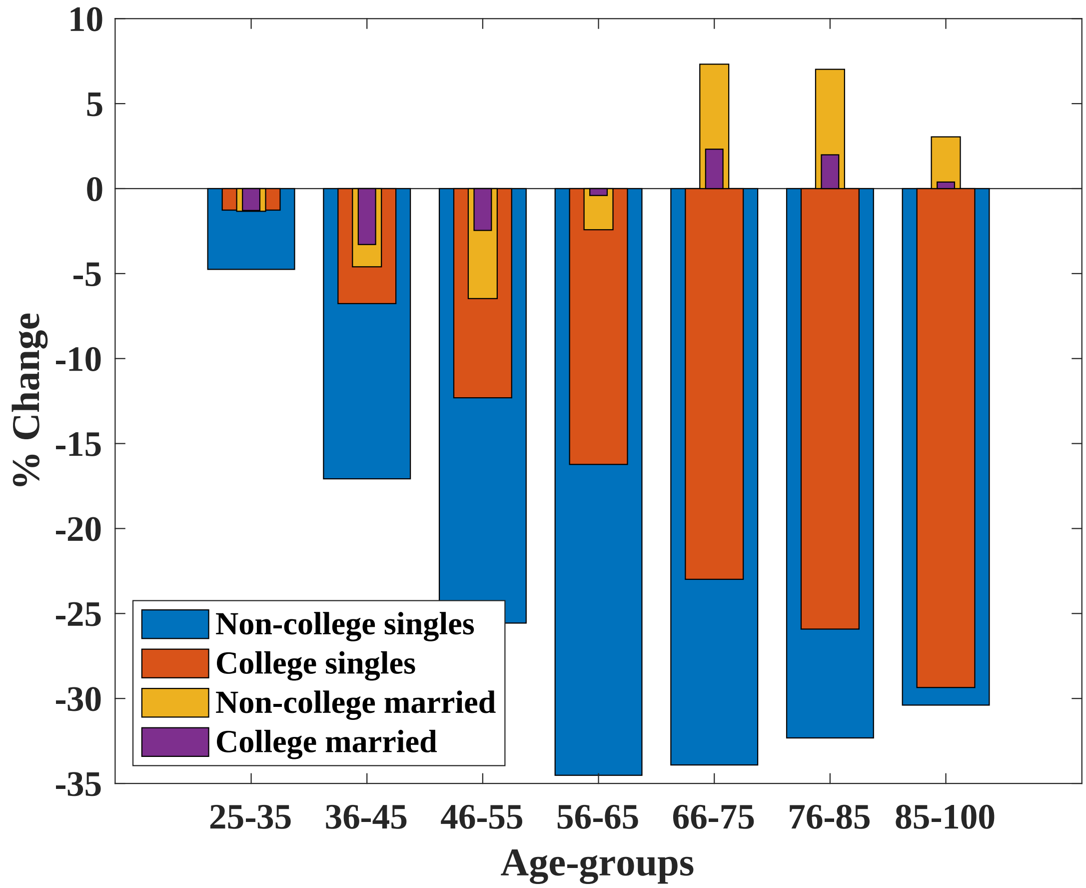


Figure D.6: Life cycle Consumption: Universal Transfer Reform

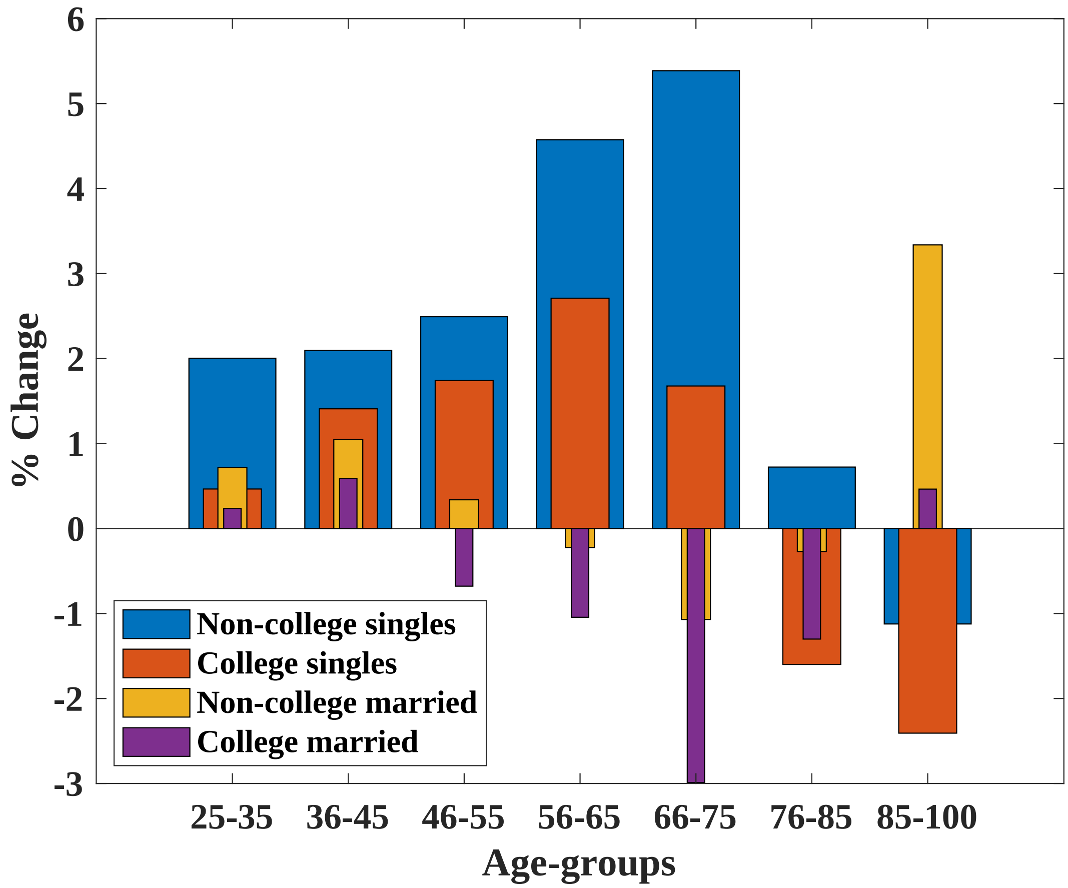
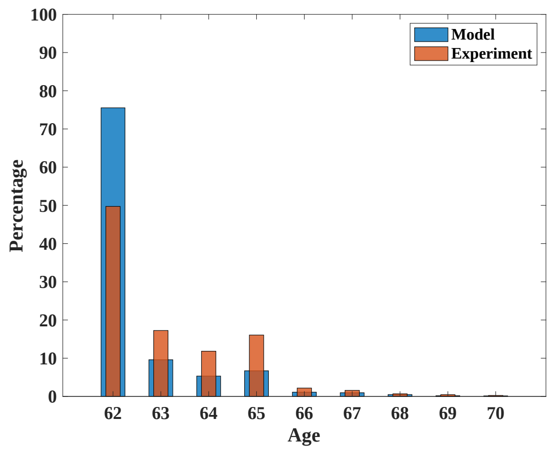
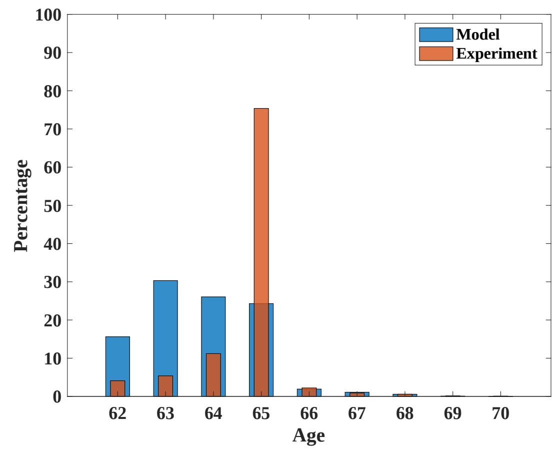


Figure D.7: Social Security Claiming Behavior: Universal Transfer Reform

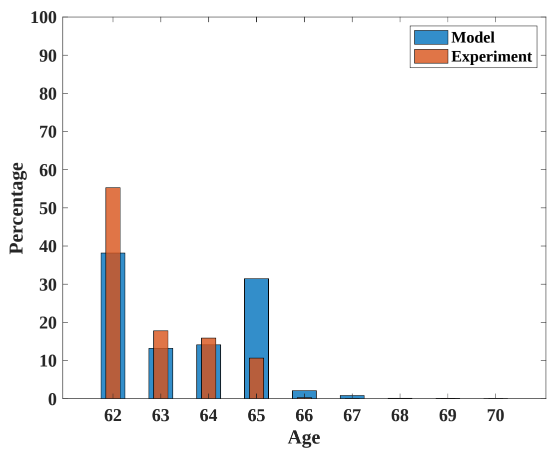
(a) Non-College, Non Married




(b) College, Non Married




(c) Non-College, Married




(d) College, Married

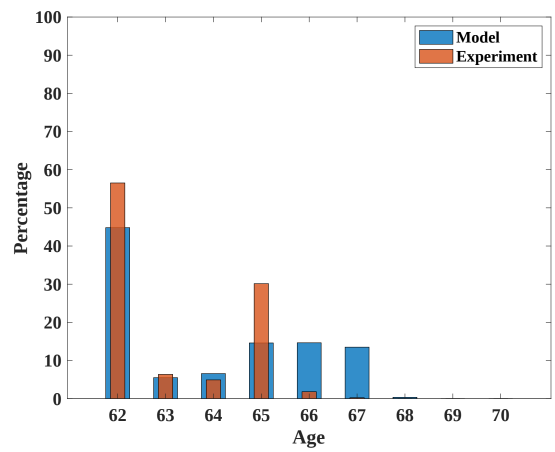
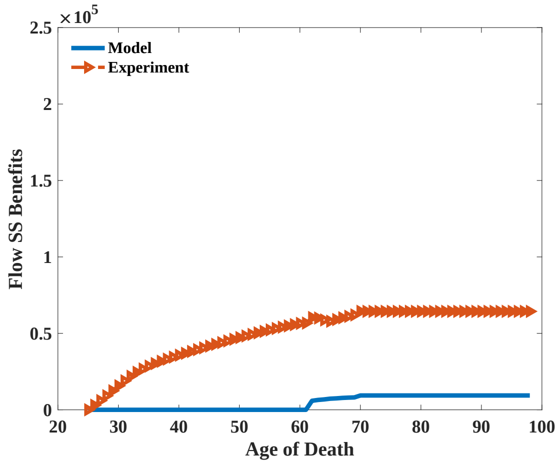
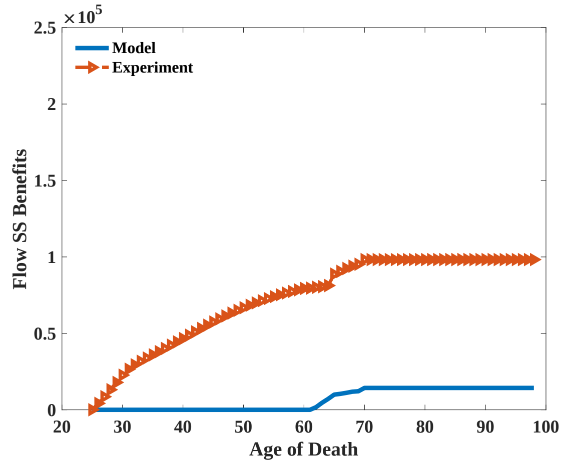


Figure D.8: Flow SS Benefits by Age: Universal Transfer Reform

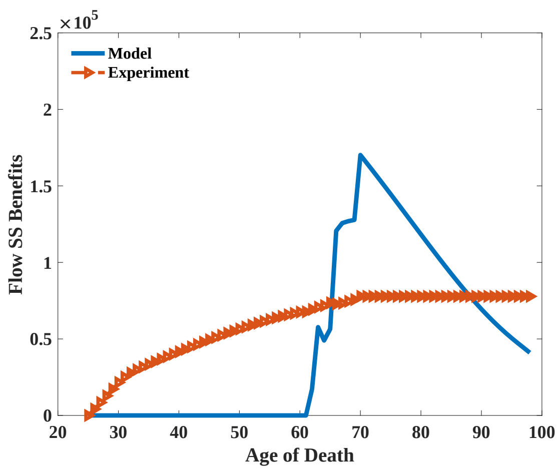
(a) Non-College, Non Married



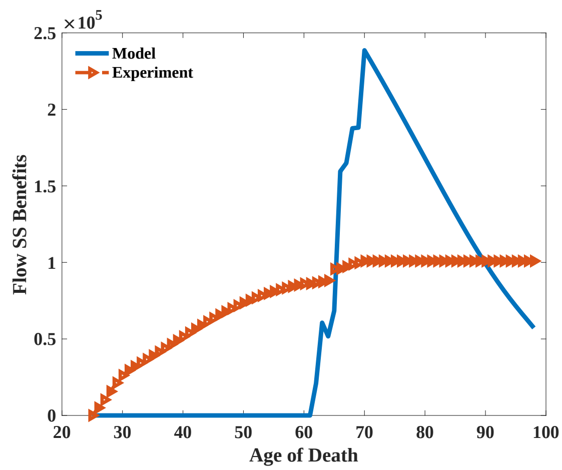

(b) College, Non Married




(c) Non-College, Married

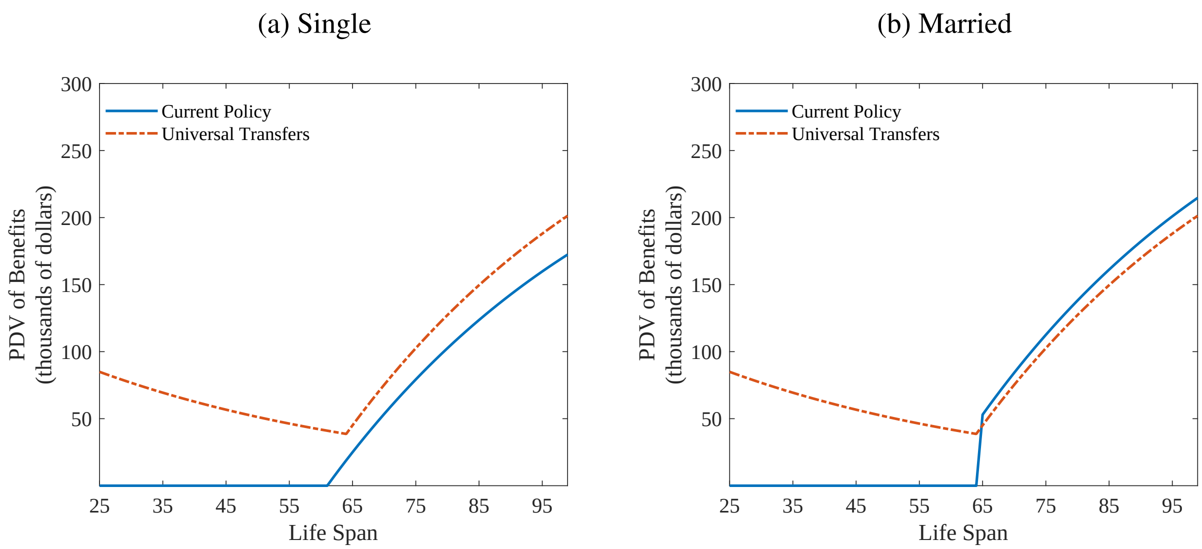



(d) College, Married




*Notes*: The figure plots the size of annual Social Security benefits by age, conditional on dying at the end of that period. In the benchmark, the flow is zero until upon claiming. In the counterfactual experiment, individuals receive a lump sum upon dying which is 5.5 times the PIA at the dying age.

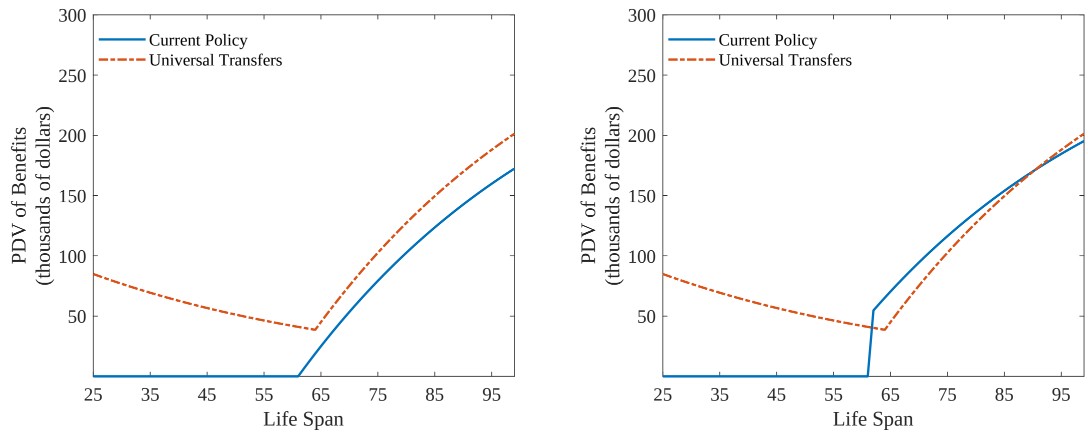
Figure D.9: Present Value of SS Benefits Received: Current Policy and Universal Transfer Reform



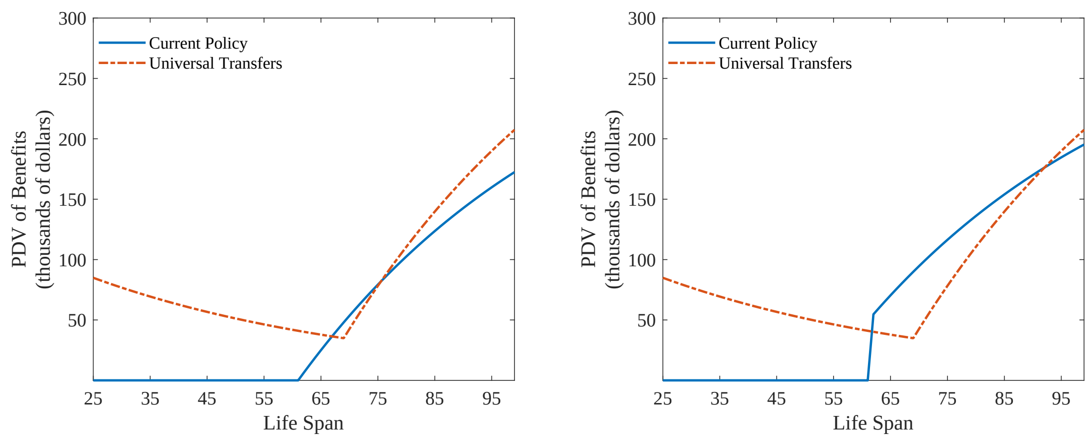

*Notes*: The figure plots the present value at age 25 of SS benefits received (old-age + survivors benefits) by lifespan. This calculation is done for a fixed AIME of $52,000 annually and discounted at a rate of 2%. Singles workers are assumed to claim benefits at age 62 in the current policy and delay claims to age 65 in the Universal Survivors Benefits experiment; married workers are assumed to claim benefits at age 65 and not change claiming decisions due to the reform. In the current policy, married couples receive Survivors Benefits equal to 6 years of PIA if they die after claiming. In the Universal Survivors Benefits experiment, all workers are eligible to leave Survivors Benefits equal to 5 years of PIA for any premature death and annual old-age benefits are decreased by 0.5%.

Figure D.11: Present Value of SS Benefits: Alternative Social Security Claiming Ages

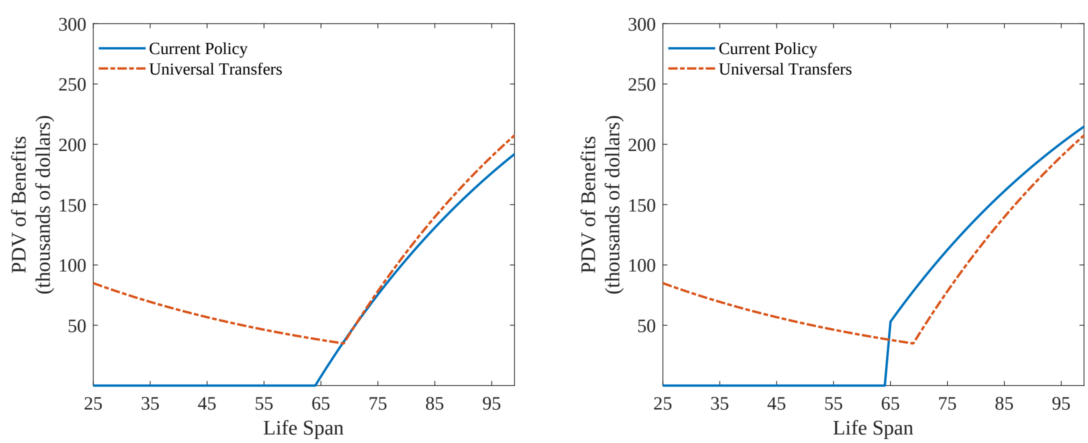
(a) Delay SS Claiming from Age 62 to Age 65




(b) Delay SS Claiming from Age 62 to Age 70




(c) Delay SS Claiming from Age 65 to Age 70




*Notes*: The figure plots the present value at age 25 of SS benefits received (old-age + survivors benefits) by lifespan. This calculation is done for a fixed AIME of $52,000 annually and discounted at a rate of 2%. In the current policy, married couples receive Survivors Benefits equal to 6 years of PIA if they die after claiming. In the Universal Survivors Benefits experiment, all workers are eligible to leave Survivors Benefits equal to 5 years of PIA for any premature death and annual old-age benefits are decreased by 0.5%.