Early Social Security Claiming and Slow Asset Decumulation: Experimental Evidence and Theory

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Abstract

Retirement behavior in the U.S. exhibits two well-documented anomalies: most individuals claim Social Security benefits early, before reaching their full retirement age (FRA), and retirees decumulate their assets more slowly than predicted by standard life-cycle models. This paper provides experimental evidence that these patterns emerge even in a controlled individual decision-making environment where such choices are not optimal. In a baseline treatment calibrated to current U.S. Social Security rules, participants display both early claiming and slower-than-optimal asset decumulation. Replacing greater annuities with lump-sum incentives in two alternative treatments as has been proposed by some researchers works to accelerate asset decumulation but not to delay claiming. These findings generalize from a convenience student sample to an older sample aged 45–55 and align with the observed behavior of similarly situated respondents in the Health and Retirement Study (HRS). We consider two mechanisms—probability misperception and a wealth-preservation motive—that may jointly explain these behavioral anomalies, and we find stronger support for the latter.

Keywords: Life-cycle model, consumption and savings, Social Security claiming, behavioral and experimental economics.

JEL Codes: C91, D91, E21, H55.

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1 Introduction

Two well-documented anomalies in retirement behavior consistently emerge in empirical data. The first is that the majority of beneficiaries claim Social Security benefits *before* reaching the full retirement age (FRA)—currently 67 for individuals born in 1960 or later (see Table 6.A4 of the Annual Statistical Supplement to the Social Security Bulletin, 2023)—despite many having sufficient assets to delay claiming (Goda et al., 2018). Commonly cited reasons for early claiming include unexpected job loss, liquidity constraints, health shocks, fears of future benefit cuts, and social norms that encourage claiming at retirement (Shoven et al., 2017). However, claiming early leads to a permanent reduction in monthly benefits, increasing the risk of financial insecurity—especially for individuals who live longer than expected, as their savings and reduced benefit income may not be sufficient to meet their needs later in life.

The second anomaly is that retired households are often reluctant to draw down their wealth—a phenomenon commonly referred to as the "retirement savings puzzle." Slow asset decumulation can lead to a lower standard of living in retirement, as households forgo consumption they could otherwise afford. As summarized in the review paper by French et al. (2023), three main factors contribute to slow asset decumulation: (1) precautionary savings motives related to longevity and medical expense risks (Ameriks et al., 2020), (2) bequest motives (Lockwood, 2018), and (3) a reluctance to draw down housing wealth (Poterba et al., 2011).[1] In this paper, we construct an experimental environment in which it is always optimal to delay Social Security claims beyond the current FRA, and where the sole reason to save is to insure against longevity risk. This design offers a clean test of whether early claiming and slow asset decumulation can be fully explained by rational responses to complex real-

[1] These two anomalies are not unique to the U.S. economy. Similar patterns are observed in Canada, where the public pension system offers an implicit return to delayed claiming that exceeds the return of comparable investment products. Yet, many workers still claim their benefits at age 60, the earliest age possible (Glenzer et al., 2025). Slow asset decumulation during retirement has also been widely documented in many other OECD countries; see, for example, Blundell et al. (2016); Niimi and Horioka (2019); Yuji Horioka and Ventura (2024).

world risks, preferences, and institutional rules, or whether they also stem from systematic behavioral deviations.

Our experimental design confronts participants with the consumption and savings choices faced by a typical individual during retirement. Each subject begins at age 62 with an initial asset endowment equal to the median level of accumulated retirement wealth, and each period represents one year. In the first eight periods, corresponding to ages 62 through 70, subjects choose when to claim Social Security benefits. As in actual practice, this decision is made only once and cannot be changed thereafter. In each period, subjects also choose how much of their cash-on-hand to convert into consumption, with the remainder carried forward as savings. Consumption translates into earnings through a known concave utility function, so maximizing expected experimental payments is equivalent to maximizing expected lifetime utility. Between-period *continuation probabilities* are set as the product of a constant discount factor and an age-dependent survival probability calibrated to match the period life table. Subjects are incentivized to optimize their decisions, as their final earnings depend on their cumulative utility from consumption earned prior to a randomly determined termination shock.

The baseline treatment is calibrated to reflect current U.S. Social Security rules, in which delayed claims are rewarded with larger annuity payments. Our primary research question is whether early claiming and slow asset decumulation—relative to the theoretical optimum—persist in a controlled environment calibrated to the current U.S. Social Security incentive structure but designed to rule out rational responses to real-world risks, preferences, and institutional complexities. We also examine two alternative environments that replace larger annuities with actuarially fair lump-sum payments. These two new treatments are motivated by past U.S. policy proposals—such as H.R. 3889 (117th Congress), H.R. 3112 (115th Congress), and H.R. 6489 (114th Congress)—which proposed offering retirees the option to receive actuarially fair lump-sum payments in exchange for delaying Social Security benefits.[2] Although these proposals were not enacted, they reflect growing policy interest in alternative payout structures. Our secondary research question is whether such changes in delaying rewards can influence claiming and decumulation behavior.

In the baseline treatment, experimental data from student subjects reveal systematic deviations from the rational choice model: participants tend to claim Social Security benefits earlier and decumulate assets more slowly than predicted. These behavioral patterns arise even in a simplified environment with only longevity risk, suggesting that non-rational factors contribute to early claiming and slow drawdown behavior in retirement. When annuity benefits are replaced by actuarially equivalent lump-sum payments as in our two treatments, we find little effect on the timing of claims but a marked increase in the rate of asset decumulation.[3]

To evaluate whether these behavioral patterns generalize beyond the student sample, we replicate the experiment with an older group (ages 45–55) recruited through the Prolific platform. The results are remarkably consistent: participants again claim Social Security benefits earlier and decumulate assets more slowly than is optimal and the treatments where annuity benefits are replaced by actuarially equivalent lump-sum payments have little effect on the timing of claims. We further compare these experimental patterns with the behavior of individuals in the Health and Retirement Study (HRS) who face comparable circumstances. The experimental outcomes closely align with the patterns observed in the field, reinforcing the external validity of our findings. Finally, we consider two behavioral mechanisms that may help explain the observed deviations from standard rational choice predictions: probability misperception and an asset-preservation motive. We find that the

[2] Alternatively, a lump-sum payment could be implemented upon a worker's death, and using a quantitative life-cycle model, Bairoliya et al. (2023) show that such a policy improves welfare, particularly for single, low-wealth individuals.

[3] Maurer et al. (2018) and Maurer and Mitchell (2021) use strategic surveys to study how lump-sum incentives affect claiming behavior and find that lump sums encourage delayed claiming. Our findings are *not* contradictory, as we calibrate the environment so that the optimal claiming age remains constant across treatments. Their estimates reflect a combination of theoretical and behavioral effects. As shown in the heterogeneous-agent models of Maurer et al. (2021) and Pashchenko and Porapakkarm (2024), offering lump sums can, on average, lead rational agents to delay Social Security claims. In contrast, our estimates are designed to isolate purely behavioral deviations.

latter mechanism is better able to generate both early claiming and slow asset decumulation.

Our work builds on and contributes to three strands of research. The first examines Social Security claiming decisions using field surveys or field experiments. Prior studies (Liebman and Luttmer, 2012; Brown et al., 2016) show that the framing of delayed claiming rewards—such as describing them in terms of "break-even" points versus gains—can significantly affect claiming behavior. To avoid introducing such framing effects, we present benefit adjustments in a neutral way, stating only that they are actuarially fair. To further mitigate anchoring effects associated with the full retirement age (FRA) label (Behaghel and Blau, 2012), we provide a table showing how benefit amounts vary with claiming age, without referencing the FRA. Moreover, Brown et al. (2021) shows that increasing the complexity in describing the decision problem reduces respondents' ability to value incremental changes in Social Security annuity benefits. Motivated by this evidence, we design our experimental environment to present only essential information to minimize complexity. Using a stated preference approach, Maurer et al. (2018) and Maurer and Mitchell (2021) conclude that offering lump-sum incentives encourages delayed claiming. As noted in footnote 3, their findings reflect both behavioral responses and variation in rational model predictions across treatments. In contrast, we calibrate incentives such that the optimal claiming age under the rational model is fixed at age 68 across all treatments. This allows us to attribute observed differences in claiming behavior solely to behavioral factors. Our paper complements this literature in two ways. It confirms that early Social Security claiming remains prevalent even in our controlled setting where delaying is unambiguously optimal. Additionally, it offers insights into how future consumption–savings decisions respond to changes in claiming incentives—a question that is difficult to address using field data alone.

Our paper also contributes to the literature on the retirement savings puzzle (see French et al. (2023) for a review). Using an induced utility framework, we can directly calculate the asset decumulation path predicted by rational choice theory and compare it with subjects' observed behavior. We find that even in the absence of medical risks, bequest motives, and housing wealth, individuals still hold onto assets longer than is optimal, particularly under the baseline treatment calibrated to current Social Security rules.

The final strand of literature we contribute to uses laboratory experiments to study life-cycle consumption and savings behavior. In this literature, human subjects make incentivized dynamic, intertemporal choices, and their behavior is compared to rational choice benchmarks (e.g., Hey and Dardanoni (1988), Carbone and Hey (2004), Carbone (2005), Ballinger et al. (2003, 2011), Brown et al. (2009), Carbone and Duffy (2014), Carbone and Infante (2014, 2015), Feltovich and Ejebu (2014), Meissner (2016), Carbone et al. (2019), Duffy and Li (2019, 2025), Ahrens et al. (2022), Miller and Rholes (2023); see also Arifovic and Duffy (2018) for a survey). A general finding is that, relative to rational choice benchmarks, subjects tend to overconsume early in the life-cycle and consequently underconsume later. Duffy and Li (2025) were the first to incorporate mortality risk into the retirement phase of the life-cycle. We extend their approach by introducing a more realistic, *age*-adjusted mortality risk. More fundamentally, unlike all prior studies, we focus exclusively on consumption/savings choices in the *retirement phase* of the life-cycle and we incorporate the pivotal decision of when to claim Social Security benefits—a key choice that has not previously been examined in experimental life-cycle settings.

2 Theoretical Framework

We begin by outlining the life-cycle optimization problem faced by a retiree (subject) in our study, which serves as the benchmark for rational behavior. Individuals enter retirement with initial assets a_1, representing their pre-retirement savings, and face a known, age-dependent survival probability s_j, where j indexes the period. The maximum lifespan is J periods, with each period corresponding to one year. Retirees make two key decisions: when to claim Social Security benefits and how to allocate their resources between consumption and savings in each period over their remaining lifetime.

Consistent with the U.S. system, subjects in our experimental study can claim Social Security benefits between periods 1 (equivalent to age 62) and 9 (equivalent to age 70). Upon claiming they receive benefits $ss(k, j)$, where k denotes the claiming period and j represents the current period. Delayed claims are rewarded with predetermined lump-sum payments and/or a greater lifetime annuity. Social Security claiming is required if an individual's assets cannot sustain a certain minimum consumption level $\underline{c}$, or if they reach period 9, the final period in which claiming is allowed. To strengthen the incentive for consumption smoothing, we impose a minimum consumption constraint that can be viewed as a subsistence requirement. We set $\underline{c}$ equal to the smallest Social Security annuity benefit available across the three treatments, ensuring that this minimum consumption level is always attainable. However, consuming only at this minimum yields a zero payoff (see below), thereby encouraging subjects to make forward-looking decisions about claiming and saving.

Every period, individuals make consumption and savings decisions. Let c_j denote the consumption level and a_j denote the initial assets for period j. We can write the recursive problem for individuals of age j who have claimed Social Security benefits as follows:

$$V_j^b(a_j, k) = \max_{c_j \geq \underline{c}} \left\{ u(c_j) + \beta s_j V_{j+1}^b(a_{j+1}, k) \right\}$$

subject to

$$c_j + a_{j+1} = (1 + r)a_j + ss(k, j) \tag{1}$$

$$a_{j+1} \geq 0, \tag{2}$$

where $V_j^b(a_j, k)$ denotes the value function of individuals at period j with an initial asset amount a_j and who *have already* claimed Social Security benefits at period k. Here, β denotes the discount factor and $u(\cdot)$ represents the utility function. Equation (1) defines the budget constraint, where r denotes the interest rate. Condition (2) is a no-borrowing constraint.

Let $V_j^c(a_j)$ denote the value function for those who claim in the *current* period. Their recursive problem is given by:

$$V_j^c(a_j) = \max_{c_j \geq \underline{c}} \left\{ u(c_j) + \beta s_j V_{j+1}^b(a_{j+1}, j) \right\}$$

subject to (2) and:

$$c_j + a_{j+1} = (1+r)a_j + ss(j,j). \tag{3}$$

Finally, let $V_j^n(a_j)$ denote the value function for those who are considering whether to claim benefits or not but have *not* yet done so. Their recursive problem is given by:

$$V_j^n(a_j) = \max \left\{ \max_{c_j \geq \underline{c}} \left\{ u(c_j) + \beta s_j V_{j+1}^n(a_{j+1}) \right\}, V_j^c(a_j) \right\}$$

if they choose not to claim, subject to (2) and:

$$c_j + a_{j+1} = (1+r)a_j. \tag{4}$$

3 Experimental Design

In this section we first discuss the parameterization of the model that we use in the experiment. Next, we present the rational choice solution for our different treatments, which we use to formulate theoretical predictions for evaluating our experimental data. Finally, we describe the experimental procedures that we followed in collecting the data.

3.1 Parameterization

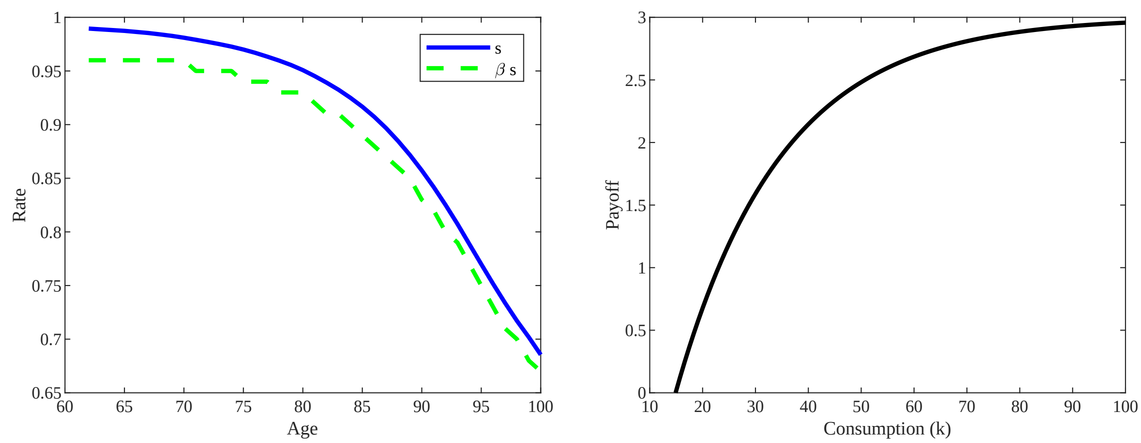
The experiment is calibrated to match the details of the 2016 U.S. economy, the year for which we had all necessary data when we first began working on this project. We set the maximum period J to 40, allowing a retirement span from age 62 to 101. The interest rate r is 2.7%, matching the intermediate real interest rate assumed in the 2016 Social Security Trustees' report. The discount factor, β, is set to $1/(1+r)$. The initial asset position, $(1+r)a_1$, is set to $145,350, matching the median household assets for the age group 61-62 in the 2016 Survey of Consumer Finance. (For married households, assets are equally split between the spouses).

Figure 1(a) displays the period-specific survival rates, s_j, which represent the average survival rates for men and women reported in the 2016 Period Life Table for the Social Security Area population. The between-period continuation probability is set equal to the product of β and s_j (rounded to two decimal places), reflecting the survival-adjusted discount rate. Subjects are presented with a figure and a table containing a set of numbers $(\beta s_j) \times 100, j = 1 \ldots J$ that are rounded to the nearest integer. We implement continuation risk using the block-random termination design of Fréchette and Yuksel (2017), in which the random draws that determine whether the sequence continues are withheld until all 40 periods have been completed. Subjects were instructed that continuation in each period depended on drawing a random number uniformly distributed between 1 and 100, which must not exceed the period-specific threshold $(\beta s_j) \times 100$. However, they did not observe the outcome of these draws until the end of the sequence. This approach ensures a complete panel of decisions across all 40 periods, thereby eliminating the selection bias that arises in field data where consumption decisions are only observed for individuals who survive.[4]

As shown in Figure 1(b), the per-period utility function used to convert consumption choices into experimental earnings was $u(c) = 3 \times (1 - e^{-(c-14{,}887)/20{,}000})$. This concave function was chosen to induce diminishing marginal utility of consumption and to ensure a

[4]Fréchette and Yuksel (2017) and Duffy et al. (2024) find similar behavior by subjects under block-random termination as compared with standard random termination, where subjects immediately know when a sequence has ended; the advantage of using block-random termination for our purpose is that it provides a practical solution for collecting sufficient data on asset decumulation decisions in old age. Additionally, many subjects, particularly those assigned to T50 and T100, deplete their assets rapidly by consuming above the conditionally optimal level. This behavior suggests that they understand the continuation risk, despite the fact that the random termination draws are revealed only at the end of each sequence.

unique optimal solution. It also sets a minimum consumption level of $14,887 per period which is equal to the amount received by individuals who claim Social Security at age 62, the earliest claiming age in all three treatments (see Table 1). As noted earlier, the addition of a minimum consumption requirement is intended to provide stronger incentives for finding the optimal claiming period and consumption path, since subjects will receive zero earnings if they adopt the simple strategy of claiming at the earliest possible age and consuming their Social Security annuity benefits in every period thereafter. Note that even if subjects choose to delay claiming until age 70, their initial assets are sufficient to easily meet the minimum consumption requirement of $14,887 and in fact, enable a maximum constant consumption level of $19,907 for the eight periods before claiming.



(a) Survival and continuation rate

(b) Utility function

Figure 1: Environmental Variables

3.2 Treatments and Predictions

We consider three different treatments that vary in terms of how delayed claims are rewarded. Each treatment provides an actuarially fair benefit adjustment based on the claiming age. Baseline treatment T0 (0% lump sum) is designed to replicate the current Social Security rules, which do not provide lump-sum rewards for delayed claiming. The benefit amount for those who claim at the FRA of 67 is set to $20,858, matching the average Primary Insurance Amount (PIA) of beneficiaries aged 65-69 in 2016 on an annual basis. The benefit levels for alternative claiming ages are actuarially adjusted using the survival probabilities shown in Figure 1(a) and a real interest rate of 2.7%, such that the expected present value of Social Security benefits remains constant across claiming ages.. Specific benefit levels are detailed in Table 1.[5]

In treatment T100 (100% lump sum), we replace the permanent increase in benefit levels associated with delaying claims with a one-time lump-sum payment issued at the time of claiming. Similar to T0, this lump-sum amount is calculated to maintain the present value of Social Security benefits unchanged across different claiming ages. As detailed in columns 4-5 of Table 1, under this treatment, individuals consistently receive a fixed annuity amount of $14,887 upon claiming at any age, while the lump-sum benefits increase with claiming age. Treatment T50 (50% lump sum) serves as an intermediate case between the two treatments, T0 and T100. In the T50 treatment, individuals who delay Social Security claims receive 50% of the permanent benefit increase seen in T0, coupled with a lump-sum payment that is 50% of that provided in T100 (Table 1). Recall that the latter two treatments, which replace larger annuities with actuarially fair lump-sum payments upon claiming, are based on proposals recently considered by the U.S. Congress with the aim of encouraging delayed claiming of Social Security benefits.

Figure 2 illustrates the relationship between claiming age and expected lifetime utility (expected experimental payoff), revealing an inverted U-shaped pattern. Because the implicit return for delaying a claim surpasses the return on assets (i.e., $(1+r)/s_j > 1+r$), delaying Social Security claims is the preferred method of saving for the future, leading to a gradual increase in expected lifetime utility from claiming at age 62 to claiming at age 68. The utility gain from delaying claiming follows the order of $T0 > T50 > T100$, reflecting the insurance value of greater annuities in T0 and T50. Delays beyond age 68 remain a feasible option, but

[5] Appendix Table C1 compares the adjustment factors relative to the FRA in our treatment T0 versus the actual adjustment factors applicable to the 1960 and later birth cohorts, demonstrating a close resemblance.

Table 1: Changes to Social Security Benefits across Treatments

	T0	T50		T100	
Claiming age	Per period benefits (1)	Per period benefits (2)	Lump Sum when claim (3)	Per period benefits (4)	Lump Sum when claim (5)
62	14887	14887	0	14887	0
63	15865	15376	7725	14887	15447
64	16938	15913	15744	14887	31506
65	18117	16502	24112	14887	48219
66	19418	17153	32812	14887	65637
67	20858	17873	41912	14887	83838
68	22457	18672	51449	14887	102893
69	24241	19564	61457	14887	122915
70	26238	20563	71999	14887	144014

at the cost of unfavorable reductions in early-period consumption and hence lower expected lifetime utility. Notice that, by design, across all three treatments, it is optimal to claim Social Security at the same age of 68 (period 7). However, it is important to note that under alternative parameterizations of the model, the optimal claiming age may differ across treatments. Conditional on claiming optimally at age 68, expected lifetime utility follows the order: $T0 = 16.98 > T50 = 16.44 > T100 = 15.57$.

Figure 3 displays the optimal consumption profile and asset profile over the retirement phase for an individual who claims optimally at age 68. As shown in Figures 3(a), the larger annuity provided in T0 increases consumption in the later periods but comes at the cost of reduced consumption in the early periods. Before claiming, individuals in T50 and T100 consume at the same rate and fully deplete their assets by the end of age 67, in anticipation of receiving large lump-sum payments in the next period ($51,449 in T50 and $102,893 in T100). The binding no-borrowing constraint at age 67 accounts for the subsequent rise in consumption in these two treatments. Conversely, in T0, without lump-sum payments, individuals must spend less in order to retain about $5k in assets until age 68. After claiming, due to early access to a greater portion of Social Security wealth, consumption levels are higher in T100 until they fall below the annuity level provided by the other two treatments.

Crucially, in the presence of longevity risk alone, the rational choice model does not predict slow asset decumulation. As shown in Figure 3(b), the optimal asset holdings are projected to reach zero after age 73 in T0, after age 81 in T50, and after age 84 in T100.

Note that the optimal decisions shown in Figure 3 are conditional on claiming benefits optimally at age 68. As demonstrated in Appendix Figures C1-C3, individuals who claim at different ages will have distinct optimal consumption and asset paths. Across all three treatments, two common features emerge. First, delaying claims results in greater consumption in later periods at the expense of smaller consumption in early periods. Second, due to the declining continuation probability and the availability of Social Security annuity benefits, individuals should fully deplete their assets long before reaching the maximum lifespan of age 101. For a given claiming age, asset levels permanently reach zero more quickly in treatments with greater annuities and smaller lump sums. For all combinations of claiming age and treatment, it is optimal to hold no assets after age 86.[6]

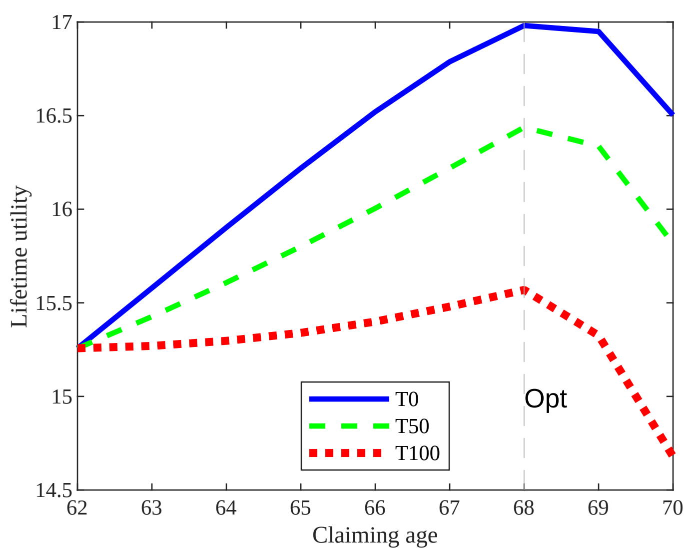
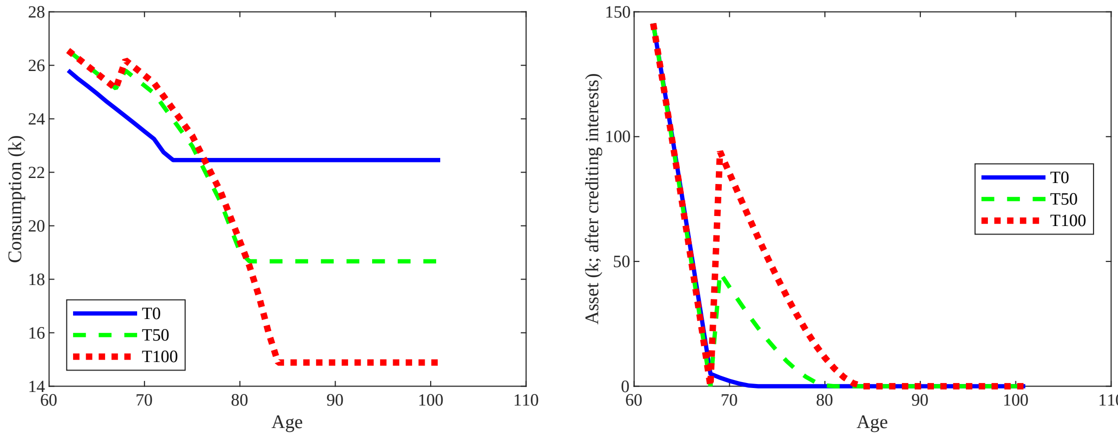


Figure 2: Expected lifetime utility by claiming age

[6]In the experiment, we restrict consumption to integer values, and asset levels less than 1 point are effectively treated as having zero assets.



(a) Consumption

(b) Asset

Figure 3: Optimal consumption and asset profile over the retirement phase

3.3 Experimental Procedures

We have two subject pools: a sample of undergraduate students recruited from the UC Irvine Experimental Social Science subject pool using SONA Systems, and an older sample recruited through the Prolific platform (`www.prolific.com`). Each subject was restricted to participating in only one treatment (a single experimental session). Random assignment was employed to allocate subjects to the different treatment conditions.

The experiment was computerized and programmed in oTree (Chen et al., 2016). The experimental program consisted of an instruction phase, including tests to assess subjects' comprehension of the instructions, followed by two 40 period life-cycle "sequences". Subjects were informed that one of the two sequences would be randomly selected for payment. Since they did not know in advance which of the two sequences would be chosen, they were incentivized to do their best in both sequences. Appendix A provides the experimental instructions and computer screenshots for treatment T50. The instructions and decision screens for the other two treatments are variants of these instructions with only the benefit amounts replaced by the treatment-specific values.

In each of the first nine periods, subjects who had not yet claimed Social Security benefits were presented with two decision screens in each period. On the first screen, they were informed about their current age, current-period starting assets (after crediting interest payments), and how Social Security annuity benefits and lump-sum payments varied based on their claiming age. On the same first screen, they were asked to decide whether to claim benefits in that period. Subjects were required to claim if they did not have enough assets to cover the minimum consumption requirement or if they had reached age 70 (period 9 of the study). On the second screen, information about their age and their asset position for the period was repeated. Additionally, subjects were provided with their Social Security payment (if they had claimed benefits) and their total available cash-on-hand for consumption. On this second screen, subjects made their consumption decision using a slider or directly entering their desired consumption level into an input box if they preferred. Immediately below this slider/input box, subjects observed the period dollar earnings (utility) and updated asset positions resulting from their consumption choice. Before clicking on a submit button to finalize their decisions, subjects could experiment with various consumption amount choices to see how different choices would impact their current-period earnings, current-period ending assets, and next-period starting assets (there were no time limits). All of these values were updated in real time as subjects moved the slider or entered different numbers in the input box. Furthermore, the positioning of the slider was dynamic; in each new period, the slider was positioned at the previous period's choice if that amount remained affordable; otherwise, it was positioned at the value of available cash-on-hand. For the first period, the slider position was set to the minimum consumption amount of $14,887.

At the end of the session, subjects were asked to complete a risk preference elicitation task designed to reveal their degree of risk aversion as well as to answer four cognitive reflection test (CRT) questions (Frederick, 2005; Toplak et al., 2014) and three financial literacy (FL) questions (Lusardi and Mitchell, 2011). Only the risk elicitation task was incentivized with a small additional monetary payment, depending on the choices that subjects made. We also collected additional data on demographics, preferences, and expectations. Appendix B provides details about this end-of-experiment questionnaire, which asked for information on age, gender, education, income, risk attitudes, time preferences, anticipated lifespans, anticipated retirement age, anticipated claiming age, and confidence in the Social Security system. After completing the study, subjects were paid their earnings from one of the randomly selected sequences and the risk elicitation task.

4 Findings

Table 2 presents the mean characteristics of subjects across the three treatments for both the student and Prolific samples.[7] As the bottom row of Table 2 reveals, we have around 30 subjects (independent observations) per treatment in each sample: 96 for the student sample and 90 for the Prolific sample, or 186 subjects in total. The next to last line in the table ("Payoff") reports mean payoffs from the one randomly selected sequence (40 period life-cycle) plus the risk elicitation payment but excluding the show-up payment. Notice that subjects recruited via Prolific earned substantially lower experimental payoffs than those in the student sample, despite facing identical incentive structures. This disparity is primarily attributable to larger deviations from rational choice predictions in the Prolific sample. Similar patterns of weaker performance among online participants relative to university student samples have been documented in prior research (e.g., Snowberg and Yariv, 2021; Duffy and Li, 2025).

In the remainder of this section, we analyze data from the student sample only, as it provides a cleaner testing ground with less heterogeneity and higher task engagement. In the next section, assess the generalizability of our results by examining whether these findings hold in the more diverse Prolific sample.

To quantify how behavior in the student sample deviates from the rational choice bench-

[7] Of the 54 pairwise comparisons reported in Table 2—corresponding to 3 treatments, 9 characteristics, and 2 samples—only the difference in financial literacy between T0 and T50 in the student sample is statistically significant at the 5% level.

Table 2: Summary Statistics (Means)

	Student sample				Prolific sample			
	All (1)	T0 (2)	T50 (3)	T100 (4)	All (5)	T0 (6)	T50 (7)	T100 (8)
Male	0.31	0.37	0.27	0.29	0.50	0.50	0.50	0.50
White	0.19	0.17	0.20	0.19	0.73	0.73	0.70	0.77
Age	20.46	20.66	20.37	20.32	49.71	49.10	49.97	50.07
College	0.26	0.29	0.20	0.29	0.76	0.73	0.73	0.80
Inc. 50-75k	0.00	0.00	0.00	0.00	0.27	0.27	0.30	0.23
Inc. 75-100k	0.01	0.00	0.00	0.03	0.26	0.20	0.30	0.27
Inc. 100k+	0.04	0.06	0.07	0.00	0.20	0.17	0.17	0.27
CRT score	2.33	2.09	2.47	2.48	3.10	3.00	3.27	3.03
FL score	2.22	1.97	2.40	2.32	2.64	2.67	2.53	2.73
Payoff	15.28	18.12	14.64	12.70	10.85	10.96	11.23	10.37
No. Obs	96	35	30	31	90	30	30	30

Note: The table reports the overall mean and treatment-specific means for the student sample (columns 1-4) and for the Prolific sample (columns 5-8).

mark, we estimate the following regression equation.

$$\begin{aligned}\Delta y_{isj} =& \text{Const.} + \beta_1 T50_i \times S1_s + \beta_2 T100_i \times S1_s \\ &+ \beta_3 S2_s + \beta_4 T50_i \times S2_s + \beta_5 T100_i \times S2_s + X_i\zeta + \epsilon_{is} \end{aligned} \tag{5}$$

where Δy_{isj} represents the deviation of the observed outcome variable y_{isj} for subject i in sequence s and period j from the rational choice model prediction y^r_{isj}, i.e., $\Delta y_{isj} = y_{isj} - y^r_{isj}$. Tk_i is a 0-1 indicator variable equal to 1 if subject i is assigned to treatment Tk. $S1_s$ ($S2_s$) is an indicator variable equal to 1 for sequence 1 (sequence 2). The variables X_i represent all individual characteristics reported in Table 2 and are included to improve precision.[8] To interpret the constant term as the average of Δy_{isj} in T0 of sequence 1 (S1), we reconstruct these control variables by demeaning them. The coefficients β_1 and β_2 capture the treatment effect on the deviations from the rational choice model in S1. The coefficient

[8]We control for income brackets only in the Prolific sample, as there is little variation in income within the student sample. As a robustness check, we estimate specifications that include all variables from the end-of-experiment questionnaire as controls. The results are very similar and are relegated to Appendix Table C2.

β_3 measures whether there is any learning between the two sequences in T0. Coefficients β_4 and β_5 measure treatment effects on deviations in sequence 2 (S2). Our null H_0 is that: Const. $= \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$, i.e., the observed behavior conforms with the predictions of the rational choice model. Standard errors are clustered at the subject level. Note that in the regression analysis reported on in Table 3, only asset levels are observed multiple times across periods within each sequence; for all other outcome variables, there is one observation per sequence. In the regressions using asset levels, observations are weighted by the unconditional probability of continuing to accumulate payments in each period.

As reflected by the constant term in Table 3, in the baseline treatment (T0), which is calibrated to match the current U.S. Social Security rules, we observe clear evidence of early claiming and slow asset decumulation. On average, subjects claim benefits 1.71 years earlier than the optimal age predicted by the rational choice model.[9] Experience accumulated from S1 delayed the average claiming age by 0.86 years, but the S2 average claiming age remains significantly earlier than the model-predicted optimal age of 68. Over the full decision horizon in S1, subjects hold an average of \$27.9k more in assets at the end of each period than predicted, conditional on their claiming ages, with larger deviations observed in later periods. In S2, the deviation in asset holdings for the 80+ group (column 3) is reduced by \$14.8k relative to S1, a statistically significant difference. Note that even at the end of the sequence—when it is clearly optimal to spend down all remaining assets—33% of subjects in S1 still left more than \$1,000 unspent, with this share declining only slightly to 27% in S2. The final column of Table 3 reports the effects on expected lifetime utility, the sum of per-period utility weighted by the unconditional probability of continuing to accumulate payments in each period, which is the objective function that a rational agent seeks to maximize. Taken together, all decision errors result in expected lifetime utility in S1 being \$3.88 lower than the rational benchmark of \$16.98. The improvement from S1 to

[9] Appendix Figures C4, C5, C6, and C7 report, respectively: (1) the cumulative distribution function (CDF) of claiming age; (2) the mean and median ending-period assets; (3) the mean and median log consumption; and (4) the CDF of ex-ante utility. These figures provide visual illustrations of the deviations from rational choice theory predictions.

S2 is modest and statistically insignificant, amounting to just $0.59.

The two experimental treatments—T50 and T100—partially or fully replace the annuity-based rewards for delaying Social Security claims with actuarially equivalent lump-sum payments. We find no evidence that these interventions lead to delayed claiming in our controlled environment, where the optimal claiming age is invariant across treatments. If anything, fully replacing greater annuities with a lump sum, as in T100, results in even *earlier claiming*, by 1.20 years in S1 and by 1.47 years in S2. Notably, partially or fully replacing larger annuities with a lump sum significantly speeds up asset decumulation. Over the full 40-period horizon, average asset holdings are no longer statistically different from the levels predicted by the rational choice model. Nonetheless, assets do not decline to zero as quickly as the model predicts. In the later periods—ages 80 and above—observed asset levels remain significantly higher than theoretical predictions in both T50 and T100, with average differences in S1 of $23.9k for T50 and $11.9k for T100. Fully replacing the annuity with a lump sum, as in T100, significantly reduces the probability that subjects leave more than $1k in assets at the end of the 40 periods—bringing it close to zero. In contrast, the partial replacement in T50 does not lead to a significant reduction. In terms of ex-ante utility, the two treatments lead to an additional reduction of about $1 in both sequences beyond the differences predicted by the theory, suggesting that subjects make more decision errors under treatments that provide lump-sum payments. However, these treatment effects are not statistically significant.

5 Generalizability of Our Findings

Our experimental findings rely on a student sample, which may raise concerns about the generalizability of those findings to the "real world." We address this generalizability issue in two ways. First, we conducted the same three experimental treatments with an older population of participants aged 45–65, recruited via the Prolific platform. Second, we compare the claiming and asset decumulation patterns observed in the laboratory with data from the

Table 3: Deviations in Claiming Age, Asset Holdings, and Ex-ante Utility in the Student Sample

	Claiming	Assets			Final	Ex-ante
	Age	62-79	80-101	62-101	assets>1k	Utility
	(1)	(2)	(3)	(4)	(5)	(6)
Cons	-1.71***	23.60***	44.29***	27.89***	0.33***	-3.88***
	(0.37)	(5.12)	(7.55)	(5.33)	(0.08)	(0.40)
T50×S1	-0.53	-21.58***	-20.38**	-21.33***	0.04	-0.93
	(0.59)	(7.71)	(9.77)	(7.71)	(0.12)	(0.75)
T100×S1	-1.20**	-43.44***	-32.35***	-41.14***	-0.32***	-0.79
	(0.57)	(8.09)	(9.35)	(7.92)	(0.08)	(0.68)
S2	0.86***	-5.11	-14.80**	-7.12	-0.06	0.59
	(0.30)	(5.24)	(6.96)	(5.08)	(0.07)	(0.46)
T50×S2	-1.12*	-25.76***	-9.75	-22.44***	-0.13	-1.54*
	(0.61)	(8.13)	(10.44)	(8.08)	(0.11)	(0.84)
T100×S2	-1.47**	-26.05***	-20.97***	-25.00***	-0.26***	-0.72
	(0.64)	(7.91)	(7.91)	(7.43)	(0.08)	(0.72)
R^2	0.06	0.18	0.16	0.16	0.14	0.04
N	192	3456	4224	7680	192	192

Note: This table presents estimates from Equation (5). The dependent variables are: the deviation of claiming age from the unconditional optimum (column 1); the deviation of ending assets (k) from the optimal level, conditional on claiming age, for different age brackets (columns 2–4); the share of subjects leaving more than $1,000 in assets unspent at the end of 40 periods (column 5); and the deviation of expected lifetime utility from the unconditional optimum (column 6). Standard errors are clustered at the subject level. *** p<0.01, ** p<0.05, and * p<0.10.

HRS survey, linking experimental choices to real-world financial behavior.

5.1 Older subject Prolific cohort

We recruited a separate sample of 30 participants aged 45 and 55 for each treatment using the Prolific platform.[10] This older sample allows us to examine whether the observed biases in retirement planning generalize to a population that is closer to actual retirement age, and may be more competent at intertemporal optimization. We chose the 45–55 age range because most individuals in this group have not yet made their retirement or Social Security claiming decisions, making it less likely that their behavior in the experiment is influenced by prior personal claiming choices. We applied pre-screening criteria to obtain a gender-balanced sample of participants who reside in the U.S. and who are fluent in English (the language of our instructions). As reported earlier in Table 2, 76% of our Prolific sample holds a college degree, and 72% report annual personal income above 50k. Both numbers are higher than those reported in U.S. Census data likely reflecting a selection effect: only more cognitively sophisticated individuals were able to understand and complete our experimental task. To maintain consistency between the student sample and the Prolific sample, we kept the experimental design unchanged but we increased the participation payment to $12. To comply with platform requirements, we also guaranteed a minimum payment of $18 for participants who completed the experiment. The median completion time was 90 minutes. Among the 90 participants, 21 received a bonus payment, with an average bonus of about $8.

Table 4 provides an analysis of deviations in behavior from the rational choice model predictions for the Prolific sample, using the same methodology described earlier and reported on for the student sample in Table 3. As a comparison of these two tables reveals, the Prolific sample replicates several key findings from the student sample. In the baseline treatment

[10]For this Prolific sample, which was collected in 2025, we pre-registered our analysis plan prior to data collection. The pre-registration is available at `https://aspredicted.org/6krg-pz67.pdf` (AsPredicted #211975).

Table 4: Deviations in Claiming Age, Asset Holdings, and Ex-Ante Utility in the Prolific Sample

	Claiming	Assets			Final	Ex-ante
	Age	62-79	80-101	62-101	assets>1k	Utility
	(1)	(2)	(3)	(4)	(5)	(6)
Cons	-2.92***	24.86***	76.92***	35.66***	0.39***	-8.06***
	(0.46)	(8.74)	(17.14)	(9.69)	(0.09)	(0.88)
T50×S1	-0.09	-25.86**	-44.08*	-29.64**	-0.19	2.50**
	(0.63)	(11.93)	(22.58)	(13.24)	(0.12)	(1.14)
T100×S1	0.43	-20.45	-29.14	-22.25	-0.23**	1.90*
	(0.61)	(12.49)	(21.60)	(13.40)	(0.11)	(1.10)
S2	0.13	-9.21	-18.06	-11.05	-0.07	1.21
	(0.50)	(8.86)	(16.20)	(9.47)	(0.10)	(0.83)
T50×S2	-0.09	-10.83	-18.60	-12.44	-0.02	0.87
	(0.74)	(12.55)	(22.87)	(13.53)	(0.12)	(1.16)
T100×S2	1.36*	6.01	-7.73	3.16	-0.13	1.27
	(0.75)	(10.33)	(20.63)	(11.30)	(0.11)	(1.02)
R^2	0.15	0.12	0.06	0.09	0.02	0.05
N	180	3240	3960	7200	180	180

Note: This table presents estimates from Equation (5). The dependent variables are: the deviation of claiming age from the unconditional optimum (column 1); the deviation of ending assets (k) from the optimal level, conditional on claiming age, for different age brackets (columns 2–4); the share of subjects leaving more than \$1,000 in assets unspent at the end of 40 periods (column 5); and the deviation of expected lifetime utility from the unconditional optimum (column 6). Standard errors are clustered at the subject level. *** p<0.01, ** p<0.05, and * p<0.10.

(T0) as reflected in the Constant term, subjects continue to claim benefits 2.92 years earlier than the optimal age, and, on average, hold $35.7k more in assets than is predicted by the rational choice model. In S1, 39% of subjects left more than $1,000 unspent at the end of the sequence, and on average, ex-ante utility is $8.06 lower than the optimal level. Both ex-ante utility and experimental payoffs (see Table 2) are substantially lower in the Prolific sample, reflecting greater decision errors and larger deviations from the rational benchmark.

The treatment effects also appear broadly consistent with those observed in the student sample. Replacing greater annuities with lump sum payments does not lead to any significant delay in claiming Social Security benefits but causes subjects, on average, to avoid holding on to significantly more assets than predicted by the rational choice model. There are two minor differences. First, in the Prolific sample, even under treatment T100, a significant share of subjects left more than 1k points unspent in both sequences. This discrepancy likely reflects the greater noise in the Prolific sample, as subjects complete the experiment remotely without direct experimenter supervision, which may reduce attention and attenuate the treatment effect. Second, the deviation of ex-ante utility from rational choice predictions is smaller (less negative) in T50 and T100 as compared to T0, although only the difference between T50 and T0 in S1 is statistically significant. This divergence suggests that the effect of providing lump-sum payments may vary depending on subjects' cognitive maturity and financial experience. For student subjects, the salience of a lump sum payment may be more likely to trigger overconsumption, leading to utility losses. By contrast, the older Prolific subjects may be less prone to such overconsumption when receiving lump-sum payments, resulting in modest gains in expected utility.

Despite greater noise in the Prolific sample, the persistence of the key behavioral patterns—early claiming, slow decumulation of assets in the baseline, and faster decumulation under T50 and T100—supports the generalizability of our core findings. Summary statistics on income and education indicate that the Prolific sample is more cognitively sophisticated than the median U.S. adult approaching retirement, suggesting that these behavioral biases may be even more pronounced in the broader, non-selected population.

5.2 HRS data

To provide further evidence on the generalizability of our experimental results, we use data from the HRS (1992–2020) to examine real-world patterns of Social Security claiming and post-claiming asset decumulation among individuals whose circumstances more closely resemble the simplified decision environment of our experiment.[11] Specifically, we focus on the original HRS cohort born between 1931 and 1941, who are at least 81 years old in the final wave of the 2020 data. To reduce complications arising from household-level decision-making and health-related shocks, we further restrict the sample to single individuals who have never reported any limitations in activities of daily living (ADLs) and who survived at least through 2021. We also exclude individuals who ever received Social Security Disability Insurance (SSDI) and limit the sample to those who claimed Social Security benefits between ages 62 and 70, and who are between ages 62 and 81 to ensure a balanced observation window. To rule out the influence of binding liquidity constraints on claiming decisions, we restrict HRS sample to individuals who held at least $10,000 (in 2016 constant dollars) in combined financial and IRA assets at the time of claiming and the laboratory sample to those with at least 10,000 points in wealth at the time of claiming. To enable comparisons across individuals with different levels of initial wealth, we normalize each person's asset path by their asset holdings in the claiming year. The resulting full HRS sample consists of 287 individuals. We also analyze a subsample of 79 individuals who never had children and are therefore less likely to have bequest motives. The decisions of both HRS samples, full and without child, are compared with behavior observed in Treatment T0, which uses the current Social Security benefits rules. HRS estimates are weighted using the combined person-level and nursing home weights, while each observation in the experimental data is assigned equal weight.

[11] To avoid the impact of COVID-related disruptions, we exclude the 2022 HRS wave from our analysis.

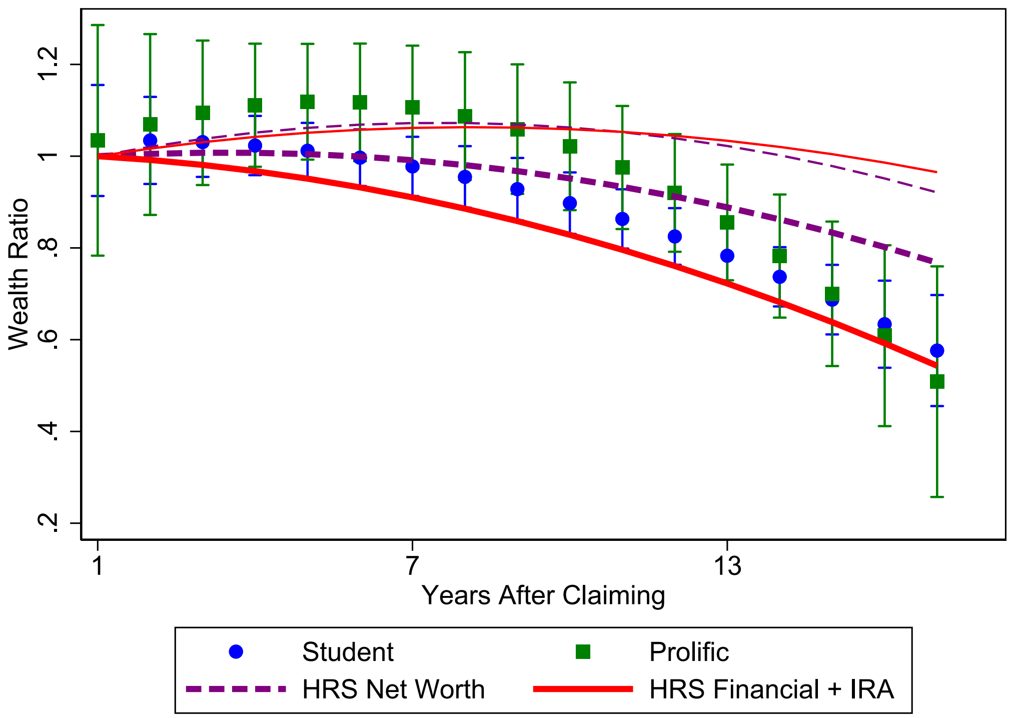
Table 5: Difference Between Observed Claiming Age and Normal Retirement Age

	Laboratory		HRS data	
	Student	Prolific	Full	W/o child
Mean	-0.86	-1.70	-1.15	-1.38
95% CI	(-1.59, -0.13)	(-2.63, -0.77)	(-1.35, -0.95)	(-1.77, -0.98)
Median	-1.00	-2.00	-0.90	-1.90
Obs	35	30	287	79

An important difference between the HRS and our experimental design is that the original HRS cohort has a lower FRA. [12] To reconcile this discrepancy, we calculate difference between the observed claiming age and the statutory FRA as an early-claiming measure. As reported in Table 5, the mean differences between observed claiming ages and FRA are negative for both HRS samples, and these values fall within the 95% confidence intervals of the student and Prolific samples. The medians across all four samples are also negative and closely aligned in magnitude. Taken together, these similarities indicate that the early claiming behavior found in our experiments is consistent with that of individuals in the field who make actual social security claiming decisions in similar circumstances.

Figure 4 shows the evolution of median household asset positions, where each individual's wealth is normalized to 1 in the claiming year (or the first observed post-claiming wave in the HRS). This normalization yields a wealth measure that facilitates comparisons across individuals with widely varying asset levels. The solid line shows the trajectory of median financial and IRA wealth, while the dashed line represents median total net worth, which also accounts for the net value of real estate, vehicles, and businesses. For the first seven years after claiming, the decumulation of total net worth in the HRS closely tracks the student sample median. However, the pace slows considerably thereafter, and by 17 years post-claiming, the HRS median lies above the 95% confidence intervals of both the student and Prolific samples. This discrepancy in later years likely reflects retirees' reluctance to liquidate housing wealth (French et al., 2023), which we do not have in our framework.

[12] The FRA is 65 for individuals born in 1937 or earlier, and gradually increases to 65 and 8 months for the 1941 birth cohort. We set the FRA to 67 in the experiment to conform with the current policy for those born after 1960.



Notes: This figure plots median asset levels by the number of years since claiming Social Security with each individual's wealth in the claiming year normalized to 1. For each sample, the asset profile is obtained by regressing the outcome variable on a second-order polynomial in years after claiming and then plotting the fitted values for each year since claiming. Outcome variables are normalized to 1 in the claiming year (year 0). Thinner lines represent the subsample of individuals who never had children, while thicker lines represent the full sample.

Figure 4: Median Asset Holdings by Years Since Claiming

In contrast, the medians of financial and IRA assets remain largely within the 95% confidence interval of the student sample median throughout the entire 17-year period. Between four and fourteen years after claiming, however, asset levels tend to lie near or just below the lower bounds of the student sample's confidence intervals. This pattern may reflect institutional rules requiring minimum distributions from tax-deferred accounts, which began at age 70.5 prior to 2020. Blanchett and Finke (2025) show that retirees often treat these required distributions as current income and spend them at higher rates than other forms of savings.

The decumulation pattern for the subsample of individuals who never had children is much flatter, with the median wealth ratio remaining close to 1 even 17 years after claiming, indicating almost no asset decumulation. This likely reflects a greater ability among individuals without children to align their expenses with income, as they face fewer rigid obligations related to supporting children and grandchildren—such as gifts and inter vivos transfers (Hurd et al., 2011).

The slow decumulation process also extends to couples. As documented by Poterba et al. (2011), among continuing two-person households, most do not tap housing equity to maintain their pre-retirement non-housing standard of living, and median financial assets increase in most wave-to-wave intervals. Smith et al. (2009) combine housing equity with financial assets to construct a measure of net worth. They find that from 1998 to 2006, households in the top wealth quintile experience rising net worth until roughly age 85, those in the middle quintiles exhibit only modest declines with age, and only households in the lowest quintile draw down their non-annuitized wealth rapidly.

The slow decumulation of assets observed in the baseline treatment is also consistent with consumption patterns documented in prior research. For example, Taylor et al. (2018) report that relatively few retirees systematically draw down their retirement portfolios to finance consumption; instead, many appear to anchor spending to guaranteed income sources—such as Social Security and defined-benefit pensions—supplemented by interest and dividend flows. This behavior aligns with a preference for expenditure paths that preserve, rather than deplete, accumulated wealth (BlackRock, 2020). Using data from the Consumption and Activities Mail Survey linked to the HRS, Banerjee (2018) show that the median ratio of spending to income remains close to unity across the age distribution, rising only modestly at older ages. Their income measure excludes withdrawals from tax-deferred accounts; including such withdrawals would further reduce the spending-to-income ratio. Consistent with the earlier evidence discussed above, this paper also finds extremely gradual asset decumulation over the first 18 years of retirement, with roughly one-third of retirees experiencing an increase in net assets over this period.

6 Mechanisms

In this study, the experimental design intentionally rules out several leading explanations commonly associated with early Social Security claiming and slow asset decumulation. These include unexpected job loss, liquidity constraints, health shocks, concerns about future benefit cuts, prevailing social norms around early claiming, bequest motives, medical expense risk, and illiquid housing wealth. Nevertheless, we continue to find robust and statistically significant evidence of the two behavioral anomalies—early claiming and slow asset decumulation—that diverge from standard rational choice predictions. In this section, we examine two mechanisms that may help explain the behavioral patterns observed in our baseline treatment (T0), which mirrors the current U.S. Social Security rules.

The first possibility is misperceptions about continuation probabilities. Heimer et al. (2019) and O'Dea and Sturrock (2023) among others, document a pattern of pessimistic subjective mortality beliefs in the early years of retirement and optimistic beliefs later on in life. Bairoliya and McKiernan (2021) show that misperceived survival probabilities are a key factor behind early claiming behavior. In theory, pessimism about survival around age 60 may lead individuals to claim Social Security benefits earlier than is optimal, whereas optimism later on in retired life may contribute to slower asset decumulation. We evaluate this explanation using a quantitative approach by extending the baseline rational choice model to incorporate subjective beliefs about continuation probabilities, parameterized according to the functional form proposed by Zhang and Maloney (2012):

$$\log \frac{p(\beta s_j)}{1 - p(\beta s_j)} = \eta \log \frac{\beta s_j}{1 - \beta s_j} + (1 - \eta) \log \frac{p_0}{1 - p_0}.$$

Here, η governs the slope of the log-odds transformation, and p_0 denotes the fixed point at which the perceived survival probability coincides with the objective probability. This specification implies that

$$p(\beta s_j) = \frac{1}{1 + \left(\frac{1-\beta s_j}{\beta s_j}\right)^{\eta} \left(\frac{1-p_0}{p_0}\right)^{1-\eta}},$$

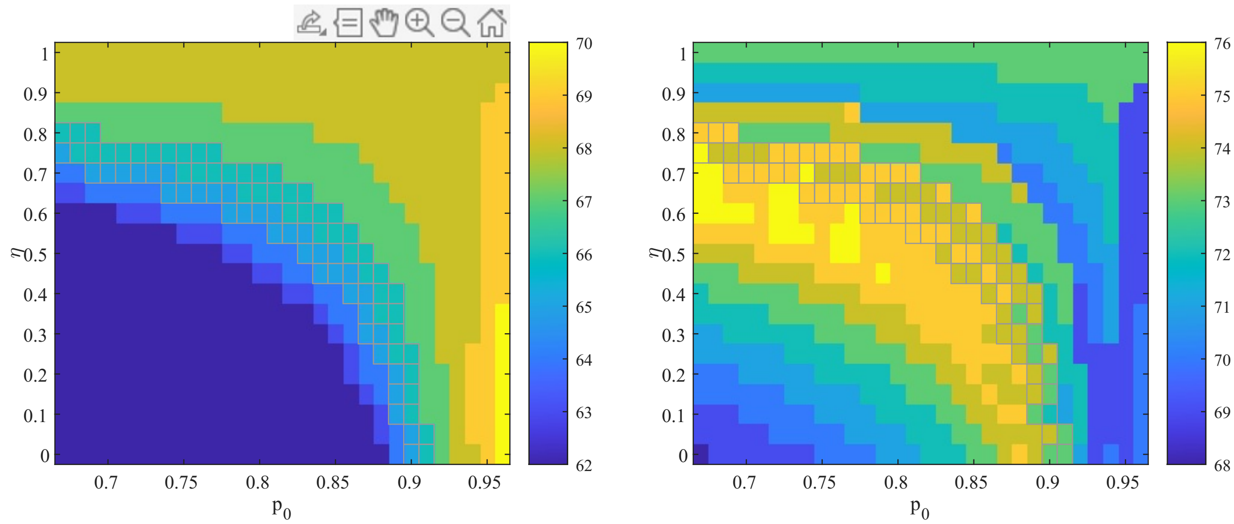
so that when $\eta < 1$, individuals exhibit pessimism about continuation probabilities in earlier periods (when $\beta s_j > p_0$) and optimism in later periods (when $\beta s_j < p_0$). We then solve the rational actor model using various different values for $\eta \in [0, 1]$ and $p_0 \in [0.67, 0.96]$, which spans the range of objective continuation probabilities over the first 39 periods of our study.[13]

Figure 5 plots the optimal claiming age (Panel a) and the period in which assets are fully decumulated (Panel b) as a function of p_0 and η. Claiming decisions are highly responsive to changes in both η and p_0. In particular, when η is sufficiently small, variation in p_0 can generate optimal claiming ages ranging from as early as 62 to as late as 70 (Figure 5(a)). However, none of the (p_0, η) combinations can produce a slow asset decumulation. As shown in Figure 5(b) , for parameter combinations that yield an optimal claiming at either 65 or 66 (highlighted by gray boxes, with 65 corresponding to the Prolific sample mean and 66 to the student sample mean), the implied age of complete asset exhaustion ranges only from 71 to 75; by contrast in our data, agents are holding on to assets for a much longer period of time, with the average age of asset exhaustion being 99 in the student sample and 98 in the Prolific sample. Thus, although probability misperception can generate early Social Security claiming consistent with observed behavior, it cannot replicate the the gradual drawdown of assets that we observe in our experimental data under our chosen environmental parameters.

A second explanation, following Carroll (2000), is that retirees derive satisfaction from holding wealth itself and therefore seek to preserve it even in retirement.[14] Indeed, a reluc-

[13]The mapping between these two parameters and the implied pessimism at age 62 and optimism later in life at age 100 is illustrated in Appendix Figure C8. As shown in this figure, the corresponding degree of pessimism in continuation probabilities at age 62 ranges from –0.02 to –0.06, while optimism at age 100 ranges from 0 to 0.24.

[14]We also examine a related specification in which participants derive intrinsic utility from leaving a bequest. Results from this modification are similar and available upon request.



(a) Claiming age

(b) Asset Exhaustion Age

Figure 5: Distribution of Claiming Age and Asset Exhaustion Age by η and p_0

Note: Gray boxes indicate the parameter combinations that yield an optimal claiming age of either 65 or 66, consistent with what is found in our experimental data.

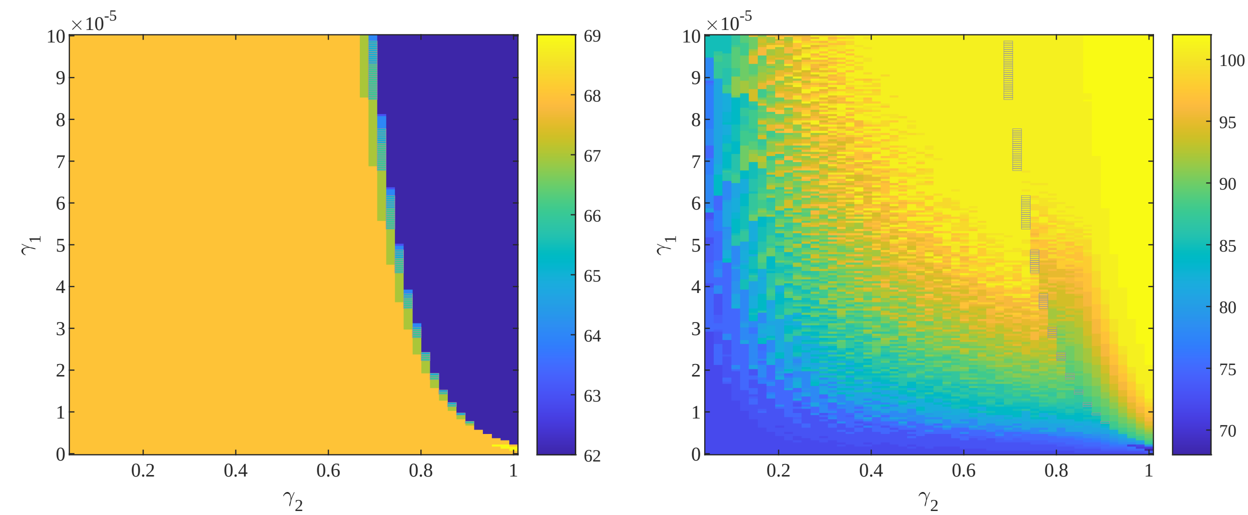
tance to decumulate assets is well documented in survey data. The Risks and Process of Retirement Survey conducted by Society of Actuaries (2019) finds that 25% of retirees lack a formal plan for managing their financial assets; among those with a plan, 76% intend to maintain or *grow* their asset balances. These patterns align closely with findings from the Retirement Confidence Survey administered by Employee Benefit Research Institute (2023), which reported that among retirees with financial assets and a plan, 91% aim to maintain or increase their wealth.

To investigate this "wealth preservation" mechanism, we modify the value function as follow:

$$V_j^b(a_j, k) = \max_{c_j \geq \underline{c}} \left\{ u(c_j) + \beta s_j V_{j+1}^b(a_{j+1}, k) + \gamma_1 a_{j+1}^{\gamma_2} \right\}$$

where γ_1 captures the intensity of the wealth-preservation motive, and γ_2 controls its curvature, with $\gamma_2 < 1$ implying diminishing returns to holding additional wealth.

As shown in Figure 6, introducing even a small wealth-preservation motive makes it optimal to claim Social Security benefits early and to decumulate assets more slowly.[15] For parameter values that generate an optimal claiming age of 65 or 66, the corresponding asset exhaustion age ranges from 86 to 101, which is much closer to our experimental data means. Comparing these two alternative mechanisms, we find that the wealth-preservation motive better accounts for both early claiming and slow asset decumulation.



(a) Claiming age (b) Asset Exhaustion Age

Figure 6: Distribution of Claiming Age and Asset Exhaustion Age by γ_1 and γ_2

Note: Gray boxes indicate the parameter combinations that yield an optimal claiming age of either 65 or 66.

7 Conclusions

We began with a behavioral puzzle: retirees often claim Social Security benefits early yet draw down their accumulated assets only slowly. We have shown that these two features

[15] Appendix Figure C9 reports the ratio of utility and marginal utility from carrying forward \$10,000 in end-of-period assets to the corresponding utility and marginal utility from consuming the annuity payment one would receive if claiming at age 66. For parameter combinations that rationalize an optimal claiming age of 66, the utility ratio remains below 0.10, while the marginal utility ratio is approximately 0.03.

of retirement behavior—early claiming and sluggish decumulation—can be replicated in a controlled laboratory setting designed to mirror the key institutional features of the U.S. Social Security system. Our contribution is to show that early claiming of benefits and slow asset decumulation arise even in a controlled environment in which such behavior is not optimal.

In our baseline treatment, which includes only longevity risk, participants exhibit the same behavioral regularities observed in field data, even in the absence of factors such as financial necessity, uninsured medical expenses, or bequest motives. When annuitized benefits are replaced by lump-sum payments—which have been proposed by researchers as a potential mechanism to delay early claiming—claiming ages remain largely unchanged, but participants spend down their assets more quickly. This pattern highlights distinct psychological responses to income framing and liquidity.

Our experimental design offers a clean environment for analyzing intertemporal consumption–saving behavior in retirement, free from many of the confounds that complicate inference in observational data. In household surveys and administrative records, inference is often hampered by unobserved heterogeneity in preferences, cognitive ability, and health; measurement error in income, assets, and expenditures; and the absence of incentivized decision-making. In addition, selection into retirement and portfolio composition generates endogeneity that makes it difficult to separate behavioral tendencies from institutional or financial constraints. By contrast, our laboratory setting isolates decision-making under controlled incentives and clearly defined risks, enabling causal interpretation of behavioral patterns. The fact that the twin phenomena of early claiming and slow decumulation emerge even in our simplified, incentive-compatible environment suggests that these patterns arise from systematic behavioral mechanisms rather than from unobserved shocks, liquidity constraints, or informational frictions.

While our laboratory environment abstracts from several real-world complexities—including endogenous retirement timing, joint household decision-making, state-dependent utility, debt, and bequest motives—it provides a tractable foundation for studying how individuals navigate the complex trade-offs of late life. We view this work as a first step toward a broader behavioral theory of retirement that recognizes households may derive utility from holding wealth.

From a policy perspective, our findings suggest that interventions targeting decumulation behavior should go beyond simply improving financial literacy or providing more information. Retirees' behavior appears rooted in strategies that prioritize wealth preservation and stable income. Professional financial advisors might partially mitigate this bias by educating clients that excessive wealth preservation can reduce lifetime consumption without materially improving financial security. However, such advice is often delivered by advisers whose compensation is tied to assets under management, creating an inherent conflict of interest that may reinforce, rather than correct, slow asset decumulation. Designing incentive-compatible advisory systems—or policy tools such as default withdrawal plans and structured annuities—could help align retiree behavior with welfare-improving outcomes. We hope that our findings encourage further research in this direction.

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Online Appendix (Not Intended for Publication)

A Experimental Instructions and Screenshots

A.1 Instructions for T50

Welcome to this study in the economics of individual decision-making. You are guaranteed $10.00 for completing this study.

These instructions explain how you can earn additional amounts of money from the decisions that you make.

The study consists of two main tasks. After completing the second task you will be asked to complete a questionnaire. After you complete the questionnaire, one of the two tasks will be randomly chosen with equal probability and your earnings from the chosen task will be added to your $10.00 participation payment and paid out to you. Since you do not know in advance which of the two tasks will be chosen for payment, you will want to do your best in both tasks.

Please note that the experiment can take up to 2 hours to complete, though you may be able to complete it more quickly.

In the first decision task you make a sequence of consumption and savings decisions over the "retirement phase" of a life-cycle. This sequence consists of 40 "periods", corresponding to each year of a retirement lifetime from age 62 to age 101. Whether you continue to "survive" and make decisions from one period to the next depends on a pre-drawn random whole number between 1 and 100 (both inclusive), where each of the 100 numbers had an equal chance of being drawn. If the random number is strictly greater than the period specific survival cutoff, then you "die" and your earnings for the sequence are determined by your current, cumulative earnings over the life-cycle up to the period in the retirement phase when you die. Any remaining savings balances that you have as of that period will become worthless.

The survival cutoffs are displayed in the Table below. For instance, the cutoff for period 1 (age 62) is 96. This means that, if the random number drawn for period 1 is 97, 98, 99, or 100, then the sequence is over and your earnings for the sequence are determined by the amount of consumption you chose for the period 1 only. All future decisions do not affect your payment for the current sequence. If the random number drawn for period 1 (age 62) is between 1 and 96 (both inclusive), then you "survive" to the second period and your savings from period 1 carry over to that next period. Similarly, a cutoff of 92 for period 20 means that, conditional on living to period 20, if the random number for period 20 is either 93, 94, 95, 96, 97, 98, 99, or 100, then period 20 is the last period that you would accumulate payments for consumption choices in the sequence and all future decisions do not affect your payment for the sequence. The results of all draws will be revealed to you only at the end of the sequence. This means that you will not know whether the sequence has ended until after you have completed all 40 periods of the sequence.

Period	Corresponding age	Cutoff	Expected periods remaining	Period	Corresponding age	Cutoff	Expected periods remaining
1	62	96	16.09	21	82	91	7.37
2	63	96	15.72	22	83	91	7
3	64	96	15.33	23	84	90	6.59
4	65	96	14.93	24	85	89	6.22
5	66	96	14.51	25	86	88	5.86
6	67	96	14.07	26	87	87	5.52
7	68	96	13.62	27	88	86	5.2
8	69	96	13.14	28	89	85	4.88
9	70	96	12.65	29	90	83	4.57
10	71	95	12.13	30	91	82	4.3
11	72	95	11.72	31	92	80	4.02
12	73	95	11.28	32	93	79	3.78
13	74	95	10.83	33	94	77	3.52
14	75	94	10.34	34	95	75	3.27
15	76	94	9.94	35	96	73	3.02
16	77	94	9.51	36	97	71	2.77
17	78	93	9.05	37	98	70	2.49
18	79	93	8.66	38	99	68	2.14
19	80	93	8.24	39	100	67	1.67
20	81	92	7.78	40	101	0	1

Note: that the "Expected periods remaining" is based on the cutoff numbers and includes the current period, which has a survival probability of 1. The displayed cutoff numbers reflect both real life mortality risk and intertemporal discounting of amounts received in the future.

You enter the first period of retirement with an initial, lump-sum, one-time savings endowment of 145,350 "points". You can think of this as the amount that you saved during your working years for your retirement. You are also entitled to Social Security benefits paid per period, also in points. Social security benefits are composed of two amounts: 1) an annuity amount that increases with your claiming age, and 2) a one-time lump-sum amount that also increases with claiming age and that is paid out only in the year/period of claiming benefits. As shown in the table below, the amount of Social Security benefits and lump-sum benefits you receive each period depends on when you start claiming those Social Security benefits, between ages 62-70 or periods 1-9. You receive zero Social Security benefits before claiming, and after claiming benefits you receive the one-time lump-sum payment and the same per period (annual) benefit for all remaining periods of the sequence (conditional on "survival"). The benefit formula is designed so that on average, the Social Security system will neither lose nor make money regardless of when you start to claim benefits. In addition to deciding when to claim Social Security benefits, your other main task in each period is to choose how much of your available points to convert into current period consumption or "money"; the remaining point balance is automatically saved for consumption use in future periods.

Claiming age	Claiming period	Annual Benefit after claiming	Lump Sum in claiming period	Total in claiming period
62	1	14887	0	14887
63	2	15376	7725	23101
64	3	15913	15744	31657
65	4	16502	24112	40614
66	5	17153	32812	49965
67	6	17873	41912	59785
68	7	18672	51449	70121
69	8	19564	61457	81021
70	9	20563	71999	92562

The following table presents the above information in an alternative manner. Your per-period Social security benefit depends on when you claim it. After you claim it, you will get the same SSB amount in every subsequent period. Your SSB benefit in all periods until you claim it is 0 as depicted by the blanks in the table.

Claiming period		1	2	3	4	5	6	7	8	9
SSB at age	SSB in period	Per period Social Security benefit								
62	1	14887								
63	2	14887	23101							
64	3	14887	15376	31657						
65	4	14887	15376	15913	40614					
66	5	14887	15376	15913	16502	49965				
67	6	14887	15376	15913	16502	17153	59785			
68	7	14887	15376	15913	16502	17153	17873	70121		
69	8	14887	15376	15913	16502	17153	17873	18672	81021	
70	9	14887	15376	15913	16502	17153	17873	18672	19564	92562
71+	10+	14887	15376	15913	16502	17153	17873	18672	19564	20563

Your earnings for each period depend on your consumption choice, which is the number of points you choose to convert into money for that period. What you don't consume is saved, and your savings can matter for the number of points that you can convert into money (or consume) in future periods. As shown in the table below, your savings earn 2.7% interest each period, paid out in additional points.

Ending period savings for current period	Interest Earned between periods	Beginning period savings for next period
0	0	0
5,000	135	5,135
10,000	270	10,270
15,000	405	15,405
20,000	540	20,540
25,000	675	25,675
30,000	810	30,810
35,000	945	35,945
40,000	1080	41,080
45,000	1215	46,215
50,000	1350	51,350
55,000	1485	56,485
60,000	1620	61,620
65,000	1755	66,755
70,000	1890	71,890
75,000	2025	77,025
80,000	2160	82,160
85,000	2295	87,295
90,000	2430	92,430
95,000	2565	97,565
100,000	2700	102,700
200,000	5400	205,400
400,000	10800	410,800
800,000	21600	821,600
1,600,000	43200	1,643,200

Beginning balance = Ending balance of last period × 1.027

You will be given tables and figures showing the relationship between consumption choices in each period and money earned, and the slider used to make choices on your decision screen also calculates your period earnings from your consumption choice. The precise formula is as follows:

$$\text{Earnings} = [1 - e^{-(\frac{\text{consumption}-14887}{20000})}] \times 3$$

Note the following:

1. The greater the consumption you choose, the greater are your earnings for that period, but the less income/points you will have for future periods.
2. The money you earn from consumption is proportionally diminishing; the difference in your earnings from consuming 25,000 rather than 20,000 points is larger than the difference from consuming 30,000

rather than 25,000 points, and so on.

3. To avoid negative payoffs, you will never be able to consume less than 14887 points in any period. You can think of this as the minimum consumption expenditure you need in order to live. Your choices will be restricted so that you can never consume less than 14887 points.

For periods 1 to 8, you will be asked whether you want to claim Social Security Benefits if you have not yet done so. You will be forced to claim benefits in the current period, if your available points are not sufficient to cover the minimum of consumption of 14887 or if you enter into period 9 (age 70), the period when annual benefits will stop growing with further claiming delays. In addition, each period you are asked to submit how much you want to consume. The remaining amount will be saved. Once you move the slider to a particular consumption choice, the computer will calculate for you your current period earnings from consumption and your end of period savings using the following formula:

If you have claimed Social Security benefits:

Savings at the end of current period = Savings at the beginning of the current period + Total Social Security payments - consumption

If you have not yet claimed Social Security benefits:

Savings at the end of current period = Savings at the beginning of the current period - consumption

Given the method for determining savings at the end of the current period, your savings for the beginning of the next period is determined by the formula:

Savings at the beginning of the next period = Savings at the end of the current period × (1.027)

Following the first period of a sequence, and in every period thereafter, you will be reminded of your Social Security benefit amount (the amount is 0 if you have not yet claimed benefits), your beginning period savings, your consumption amount, your end of period savings, the money (consumption) earned for the period, and your cumulative money earned for the sequence.

Recall that whether you continue to "survive" from one period to the next depends on a pre-drawn random whole number between 1 and 100 (both inclusive), where each of the 100 numbers had an equal chance of being drawn. You will be informed about the termination period in the 40-period sequence only after all 40 periods have been played. The listed cumulative money earned on the information screen, is assuming that the random draw is always at or below the period threshold. If the random draw is above the period threshold, then all periods after that draw will be excluded from your final payment for the sequence.

After this first task is completed, you will receive instructions for the second task. Your earnings from the first or second task determine how much additional money you earn in the experiment (above your $7.00 participation payment). You can never earn less than $0 from the first or the second task of the experiment.

There is a quiz on the next page based on the given instructions. There will be no 'Back button', so please make sure that you understand the instructions so far.

Quiz

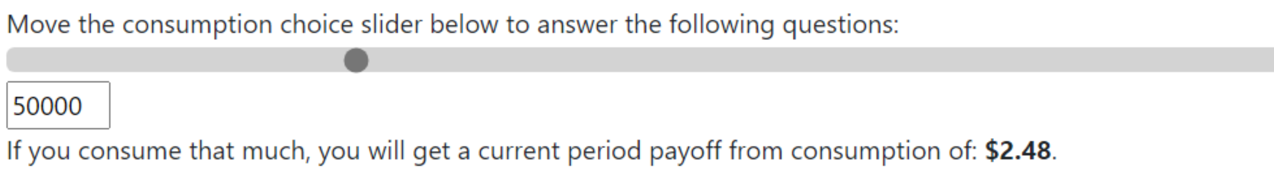
Before continuing on to the first part of the study, we ask that you successfully complete the following quiz (on this and next page). If you get an answer wrong, you will be told so, and you will have the opportunity to correct your answer. Your performance on this quiz does not affect your payoff in any way, but you will not be able to proceed to the first task until you have correctly answered all of the quiz questions.

In answering these quiz questions, you may consult the table provided below.

Claiming age	Claiming period	Annual Benefit after claiming	Lump Sum in claiming period	Total in claiming period
62	1	14887	0	14887
63	2	15376	7725	23101
64	3	15913	15744	31657
65	4	16502	24112	40614
66	5	17153	32812	49965
67	6	17873	41912	59785
68	7	18672	51449	70121
69	8	19564	61457	81021
70	9	20563	71999	92562

In the first task I will make decisions in a sequence of [Answer: 40] periods.

Suppose you claim Social Security benefits at age 64. The amount of Social Security payments you receive at age 62 is [Answer: 0] . The amount of Social Security payments you receive at age 64 is [Answer: 31657] . The amount of Social Security payments you receive at age 80 is [Answer: 15913].



Suppose you consumed 15,000, you earnings for current period is $ [Answer: 0.02].

Suppose you consumed 20,000, you earnings for current period is $ [Answer: 0.68].

Suppose you consumed 25,000, you earnings for current period is $ [Answer: 1.19].

Please answer the following questions.

If you get an answer wrong, you will be told so, and you will have the opportunity to correct your answer. Your performance on this quiz does not affect your payoff in any way, but you will not be able to proceed to the first task until you have correctly answered all of the quiz questions.

The interest rate is 2.7%. Suppose at the end of the current period, your savings is 10000, how much interest you will earn on this saving in the next period? [Answer: 270]

True or False: The length of the "living" periods depends on a sequence of random draws. Earnings will stop being accumulated once the draw is above the period specific cut-off (see the table below). But you will continue to make decisions until the end of 40 periods. [Answer: True]

Conditional on living to period 10, earnings will stop being accumulated after period 10 if you draw which one of the following numbers?

A. 94,95,96,97,98,99,100

B. 95,96,97,98,99,100

C. 96,97,98,99,100 [Answer]

D. 1,2,...,94

E. 1,2,...,95

Life table is listed on the this quiz page but not copied here to save space.

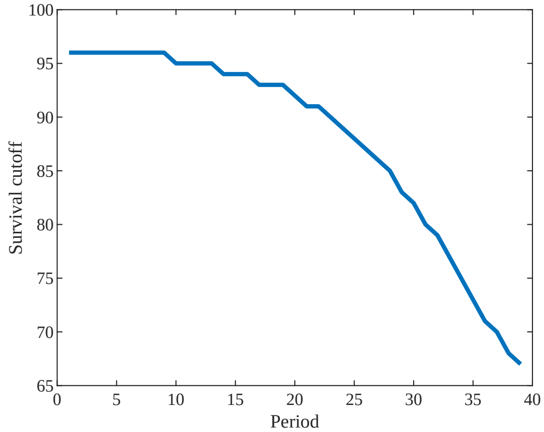
Which one of the following formulae incorrectly describes the relationship between beginning period savings and ending period savings?

- For those who have claimed Social Security benefits: Savings at the end of current period = Savings at the beginning of the current period + Total Social Security payments - consumption

- For those who have not yet claimed Social Security benefits: Savings at the end of current period = Savings at the beginning of the current period - consumption
- Savings at the beginning of the next period = Savings at the end of current period × (1.027)
- Savings at the beginning of the next period = Savings at the end of current period [Answer]

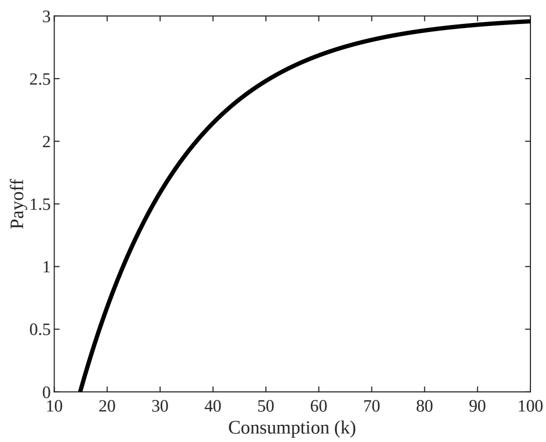
True or False: Your earnings will depend on your cumulative money earnings from one of the two tasks you play, but you will not know which task will be chosen until the end of the session. [Answer: True]

A.2 Handouts on continuation probability and utility function



Note: Period 40 is the last period, and it has a survival cutoff of 0 (not shown)

Figure 1: Survival cutoff



Note: Payoff function is $3 \times (1 - e^{-(c-14887)/20000})$, where c is the consumption choice.

Figure 2: Payoff function

Table 1: Survival cutoff

Period	Survival Cutoff	Expected periods remaining	Period	Survival Cutoff	Expected periods remaining
1	96	16.09	21	91	7.37
2	96	15.72	22	91	7.00
3	96	15.33	23	90	6.59
4	96	14.93	24	89	6.22
5	96	14.51	25	88	5.86
6	96	14.07	26	87	5.52
7	96	13.62	27	86	5.20
8	96	13.14	28	85	4.88
9	96	12.65	29	83	4.57
10	95	12.13	30	82	4.30
11	95	11.72	31	80	4.02
12	95	11.28	32	79	3.78
13	95	10.83	33	77	3.52
14	94	10.34	34	75	3.27
15	94	9.94	35	73	3.02
16	94	9.51	36	71	2.77
17	93	9.05	37	70	2.49
18	93	8.66	38	68	2.14
19	93	8.24	39	67	1.67
20	92	7.78	40	0	1.00

Note: "Expected periods remaining" is calculated based on the cutoffs and includes the current period. The displayed cutoff numbers reflect both real life mortality risk and intertemporal discounting of amounts received in the future.

A.3 Screenshots for T50

In task 2 we repeat task 1.

The rules are the same as before; that is, you make a series of consumption/savings decisions over 40 periods, not knowing how long you live over that period.
The survival chances from one period to the next are the same as before.
You also have to decide when to start claiming social security benefits in the first 9 periods (ages 62-70).
As in the first sequence of 40 periods, you will not know until the end, the period in which you "die". Your cumulative earnings up to that period will comprise your earnings for task 2.

After you complete task 2, we will randomly determine with equal probability, whether task 1 or task 2 is selected for payment.

You will then be asked to complete a questionnaire. After completing the questionnaire, you will be paid your total earnings for the experiment ($7.00 participation payment plus earnings from task 1 or task 2).

Next

Task 2, period 1

Your age is 62.
Your current saving is 145350.00 points points.

As shown in the below table, the amount of Social Security benefits you would receive each period will depend on when you claim the benefit. You will receive zero Social Security benefits before claiming, and receive the same annual benefits since claiming. The benefit formula is designed that on average, the Social Security system will neither lose nor make money no matter when benefits are claimed.

Claiming age	Claiming period	Annual Benefit after claiming	Lump Sum in claiming period	Total in claiming period
62	1	14887	0	14887
63	2	15376	7725	23101
64	3	15913	15744	31657
65	4	16502	24112	40614
66	5	17153	32812	49965
67	6	17873	41912	59785
68	7	18672	51449	70121
69	8	19564	61457	81021
70	9	20563	71999	92562

Do you want to claim benefits this period?

- ○ Yes
- ○ No

Next

Task 2, period 1

Your age is 62.
Your total available points for consumption: 145350.00 points

Use the slider or insert numbers below to choose and submit your choice of consumption in this period.

If you do not make a choice, the default value of 14887.00 points will be used. This default will be updated each period to match your choice in the previous period (unless this is not a feasible option).

Consumption in this period: 30072 points.

If you consume that much, you will get a payoff this period of: **$1.60**
Your ending period savings is **115278.00 points** (available points – consumption).
After crediting interest, your savings for the next period is **118390.51 points** (ending balance * 1.027).
The highest payoff you could get from consumption this period is: **$3.00**

Submit Consumption Choice

Results of Task 2, period 1

Your beginning period savings:	145350.00 points
Your social security benefits:	0.00 points
Your consumption this period:	30072.00 points
Your ending period savings:	115278.00 points
Money earned this period:	$1.6
Money earned this sequence (assuming the sequence was not terminated):	$1.6

Next

History of results

Task	Period	Beginning Savings	Social Security Benefit	Consumption	Ending Savings	Period Payoff	Cumulative Payoff
2	1	145350.00 points	0.00 points	30072.00 points	115278.00 points	$1.6	$1.6

Task 2, period 2

Your age is 63.
Your current saving is 118390.51 points points.

As shown in the below table, the amount of Social Security benefits you would receive each period will depend on when you claim the benefit. You will receive zero Social Security benefits before claiming, and receive the same annual benefits since claiming. The benefit formula is designed that on average, the Social Security system will neither lose nor make money no matter when benefits are claimed.

Claiming age	Claiming period	Annual Benefit after claiming	Lump Sum in claiming period	Total in claiming period
63	2	15376	7725	23101
64	3	15913	15744	31657
65	4	16502	24112	40614
66	5	17153	32812	49965
67	6	17873	41912	59785
68	7	18672	51449	70121
69	8	19564	61457	81021
70	9	20563	71999	92562

Do you want to claim benefits this period?

○ Yes

○ No

Next

Task 2, period 2

Your age is 63.
Your total available points for consumption: 141491.51 points (Last period's ending balance of 115278.00 points * 1.027 + Social Security benefit of 23101.00 points including the annual benefit of 15376.00 points and a one-time lumpsum in this period of 7725.00 points).

Use the slider or insert numbers below to choose and submit your choice of consumption in this period.

If you do not make a choice, the default value of 30072.00 points will be used. This default will be updated each period to match your choice in the previous period (unless this is not a feasible option).

Consumption in this period: 32529 points.

If you consume that much, you will get a payoff this period of: **$1.76**
Your ending period savings is **108962.51 points** (available points – consumption).
After crediting interest, your savings for the next period is **111904.50 points** (ending balance * 1.027).
The highest payoff you could get from consumption this period is: **$2.99**

Submit Consumption Choice

Results of Task 2, period 2

Your beginning period savings:	118390.51 points
Your social security benefits:	23101.00 points
Your consumption this period:	32529.00 points
Your ending period savings:	108962.51 points
Money earned this period:	$1.76
Money earned this sequence (assuming the sequence was not terminated):	$3.36

Next

History of results

Task	Period	Beginning Savings	Social Security Benefit	Consumption	Ending Savings	Period Payoff	Cumulative Payoff
2	2	118390.51 points	23101.00 points	32529.00 points	108962.51 points	$1.76	$3.36
2	1	145350.00 points	0.00 points	30072.00 points	115278.00 points	$1.6	$1.6

Task 2, period 3

Your age:	64
Your savings (including interest):	111904.50 points points

You have already claimed your social security benefits.

Your social security amount per period:	15376.00 points points

Next

Task 2, period 3

Your age is 64.
Your total available points for consumption: 127280.50 points (Last period's ending balance of 108962.51 points * 1.027 + Social Security benefit of 15376.00 points).

Use the slider or insert numbers below to choose and submit your choice of consumption in this period.

If you do not make a choice, the default value of 32529.00 points will be used. This default will be updated each period to match your choice in the previous period (unless this is not a feasible option).

Consumption in this period: 33865 points.

If you consume that much, you will get a payoff this period of: **$1.84**
Your ending period savings is **93415.50 points** (available points – consumption).
After crediting interest, your savings for the next period is **95937.72 points** (ending balance * 1.027).
The highest payoff you could get from consumption this period is: **$2.99**

Submit Consumption Choice

Results of Task 2, period 3

Your beginning period savings:	111904.50 points
Your social security benefits:	15376.00 points
Your consumption this period:	33865.00 points
Your ending period savings:	93415.50 points
Money earned this period:	$1.84
Money earned this sequence (assuming the sequence was not terminated):	$5.2

Next

History of results

Task	Period	Beginning Savings	Social Security Benefit	Consumption	Ending Savings	Period Payoff	Cumulative Payoff
2	3	111904.50 points	15376.00 points	33865.00 points	93415.50 points	$1.84	$5.2
2	2	118390.51 points	23101.00 points	32529.00 points	108962.51 points	$1.76	$3.36
2	1	145350.00 points	0.00 points	30072.00 points	115278.00 points	$1.6	$1.6

B End of Experiment Tasks (All Treatments)

The experiment concluded with five additional tasks, reproduced here.

Task 1: Preferences

We now ask about your willingness to act in a certain ways. Please indicate your answer on the scale from 0 to 10, where 0 means you are “completely unwilling to do so” and a 10 means you are “very willing to do so”.

1. In general, how willing are you to take risks?
2. How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?

Please answer the following questions.

1. At what age do you expect to die?
2. At what age do you plan to retire?
3. At what age do you plan to claim Social Security Benefits? (In answering this question, you may consult the table below which shows the benefit formula):

Claiming Age	**Benefits**
62	0.70*PIA
63	0.75*PIA
64	0.80*PIA
65	0.87*PIA
66	0.93*PIA
67	1.00*PIA
68	1.08*PIA
69	1.16*PIA
70	1.24*PIA

   where PIA stands for your primary insurance amount, which is determined by average earnings during your working years.

4. How confident are you that you will receive the Social Security Benefits that you are entitled to?
   - Not at all confident
   - Not very confident
   - Somewhat confident
   - Very confident
   - Completely confident

Task 2: Lotteries

In this task you make 10 choices over pairs of ”lotteries”. Each pair of lotteries is labeled lottery A and lottery B. Each lottery describes two different possible dollar amounts that you could earn with an equal (50%) probability.
For each pair of lotteries, you must choose whether you prefer lottery A or lottery B for possible payment. You may choose lottery A for some choices and lottery B for other choices and you may change your decisions

or make them in any order that you want. Once you have made a lottery choice for all 10 pairs and clicked the Next button, the computer program will randomly select one of the 10 lottery pairs and implement your choice for that pair. It will then randomly determine whether you got the lower amount or the higher amount for that lottery, each with a 50% chance.

1. Lottery A: 50% chance of $0.75, 50% chance of $0.83; Lottery B: 50% chance of $0.15, 50% chance of $1.16: Choose: A, B
2. Lottery A: 50% chance of $0.75, 50% chance of $0.91; Lottery B: 50% chance of $0.15, 50% chance of $1.32: Choose: A, B
3. Lottery A: 50% chance of $0.75, 50% chance of $0.99; Lottery B: 50% chance of $0.15, 50% chance of $1.47: Choose: A, B
4. Lottery A: 50% chance of $0.75, 50% chance of $1.07; Lottery B: 50% chance of $0.15, 50% chance of $1.63: Choose: A, B
5. Lottery A: 50% chance of $0.75, 50% chance of $1.15; Lottery B: 50% chance of $0.15, 50% chance of $1.8: Choose: A, B
6. Lottery A: 50% chance of $0.75, 50% chance of $1.23; Lottery B: 50% chance of $0.15, 50% chance of $2.01: Choose A, B
7. Lottery A: 50% chance of $0.75, 50% chance of $1.31; Lottery B: 50% chance of $0.15, 50% chance of $2.29: Choose A, B
8. Lottery A: 50% chance of $0.75, 50% chance of $1.39; Lottery B: 50% chance of $0.15, 50% chance of $2.69: Choose A, B
9. Lottery A: 50% chance of $0.75, 50% chance of $1.47; Lottery B: 50% chance of $0.15, 50% chance of $3.65: Choose A, B
10. Lottery A: 50 chance of $0.75, 50% chance of $1.55; Lottery B: 50% chance of $0.15, 50% chance of $3.85: Choose A, B

Task 3 Cognitive Reflection Test [with Answers not provided to subjects.]

Please answer the following questions.

1. If John can drink one barrel of water in 6 days, and Mary can drink one barrel of water in 12 days, how many days would it take them to drink one barrel of water together? [Answer: 4 days]
2. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are in the class? [Answer: 29]
3. A man buys a pig for $60, sells it for $70, buys it back for $80, and sells it finally for $90. How many dollars has he made? [Answer: $20]
4. Simon decided to invest $8,000 in the stock market one day early in 2008. Six months after he invested, on July 17, the stocks he had purchased were down 50%. Fortunately for Simon, from July 17 to October 17, the stocks he had purchased went up 75%. As of October 17, Simon has: [Answer: a]

   a lost money in the stock market

   b broken even in the stock market

   c made money in the stock market

Task 4 Financial Literacy Test [With answers not shown to subjects]

1. Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

   a More than $102

   b Exactly $102

   c Less than $102

   d Do not know

   e Refuse to answer.

   [Answer: a]

2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

   a More than today

   b Exactly the same

   c Less than today

   d Do not know

   e Refuse to answer.

   [Answer: c]

3. Please consider whether this statement is true or false. "Buying a single company's stock usually provides a safer return than a stock mutual fund."

   a True

   b False

   c Do not know

   d Refuse to answer.

   [Answer: False]

Task 5: Questionnaire

What is your age?

What year were you born?

What is your gender?

What is your race?

What is your personal annual income?

What is your highest level of education completed?

What is your ZIP or postal code?

Please enter any comments about the experiment, or suggestions for improvement.

C Additional Tables and Figures

Table C1: Comparison of T0 (Treatment 1) with Social Security rules for 1960 and later birth cohorts

Claiming Age	62	63	64	65	66	67	68	69	70
T1	0.71	0.76	0.81	0.87	0.93	1.00	1.08	1.16	1.26
SS Rules	0.70	0.75	0.80	0.87	0.93	1.00	1.08	1.16	1.24

Note: Table reports benefit levels at each claiming age, expressed relative to the FRA benefit at age 67.

Table C2: Deviations in Claiming Age, Asset Holdings, and Ex-Ante Utility in the Student Sample, Controlling for Additional Covariates

	Claiming	Assets			Final	Ex-ante
	Age	62-79	80-101	62-101	assets>1k	Utility
	(1)	(2)	(3)	(4)	(5)	(6)
Cons	-1.57***	24.60***	45.00***	28.83***	0.35***	-3.97***
	(0.37)	(5.15)	(7.05)	(5.24)	(0.08)	(0.41)
T50×S1	-0.69	-19.80**	-17.36*	-19.29**	0.04	-1.29*
	(0.58)	(8.17)	(9.50)	(8.05)	(0.12)	(0.76)
T100×S1	-1.38**	-43.20***	-32.35***	-40.95***	-0.33***	-0.31
	(0.64)	(8.12)	(9.16)	(7.88)	(0.08)	(0.83)
S2	0.86***	-5.11	-14.80**	-7.12	-0.06	0.59
	(0.31)	(5.25)	(6.97)	(5.08)	(0.07)	(0.48)
T50×S2	-1.28**	-23.97***	-6.73	-20.40**	-0.14	-1.89**
	(0.63)	(7.93)	(10.40)	(7.89)	(0.11)	(0.84)
T100×S2	-1.65**	-25.82***	-20.97**	-24.81***	-0.27***	-0.25
	(0.69)	(8.02)	(8.37)	(7.58)	(0.09)	(0.84)
R^2	0.11	0.25	0.24	0.22	0.15	0.06
N	192	3456	4224	7680	192	192

Note: This table presents estimates from Equation (5). The additional control variables include: risk preference, risk attitudes, time preference, anticipated lifespan, anticipated retirement age, anticipated claiming age, and confidence in the Social Security system. The dependent variables are: the deviation of claiming age from the unconditional optimum (column 1); the deviation of ending assets (k) from the optimal level, conditional on claiming age, for different age brackets (columns 2–4); the share of subjects leaving more than $1,000 in assets unspent at the end of 40 periods (column 5); and the deviation of expected lifetime utility from the unconditional optimum (column 6). Standard errors are clustered at the subject level. *** p<0.01, ** p<0.05, and * p<0.10.

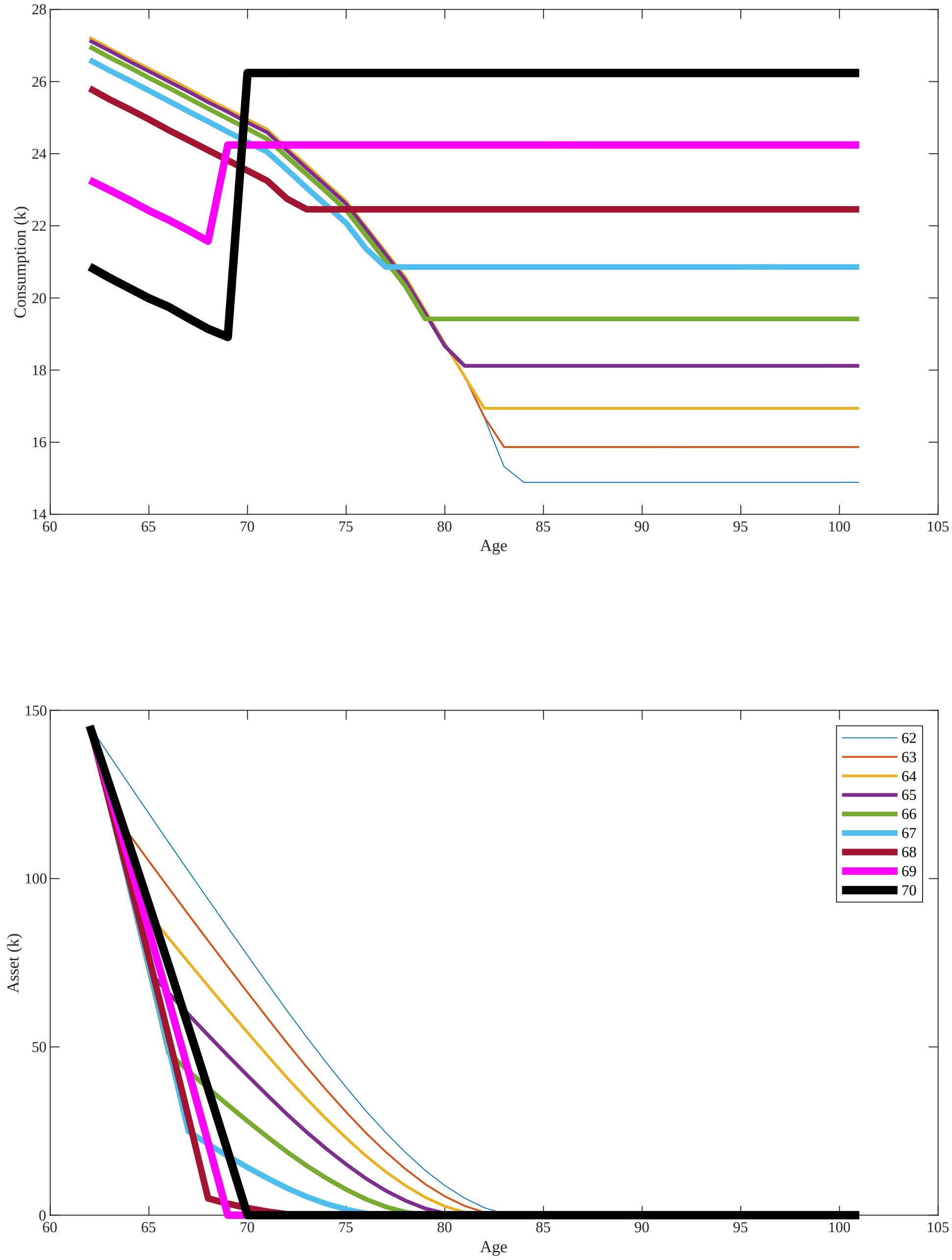


Figure C1: T0 optional decisions conditional on claiming age

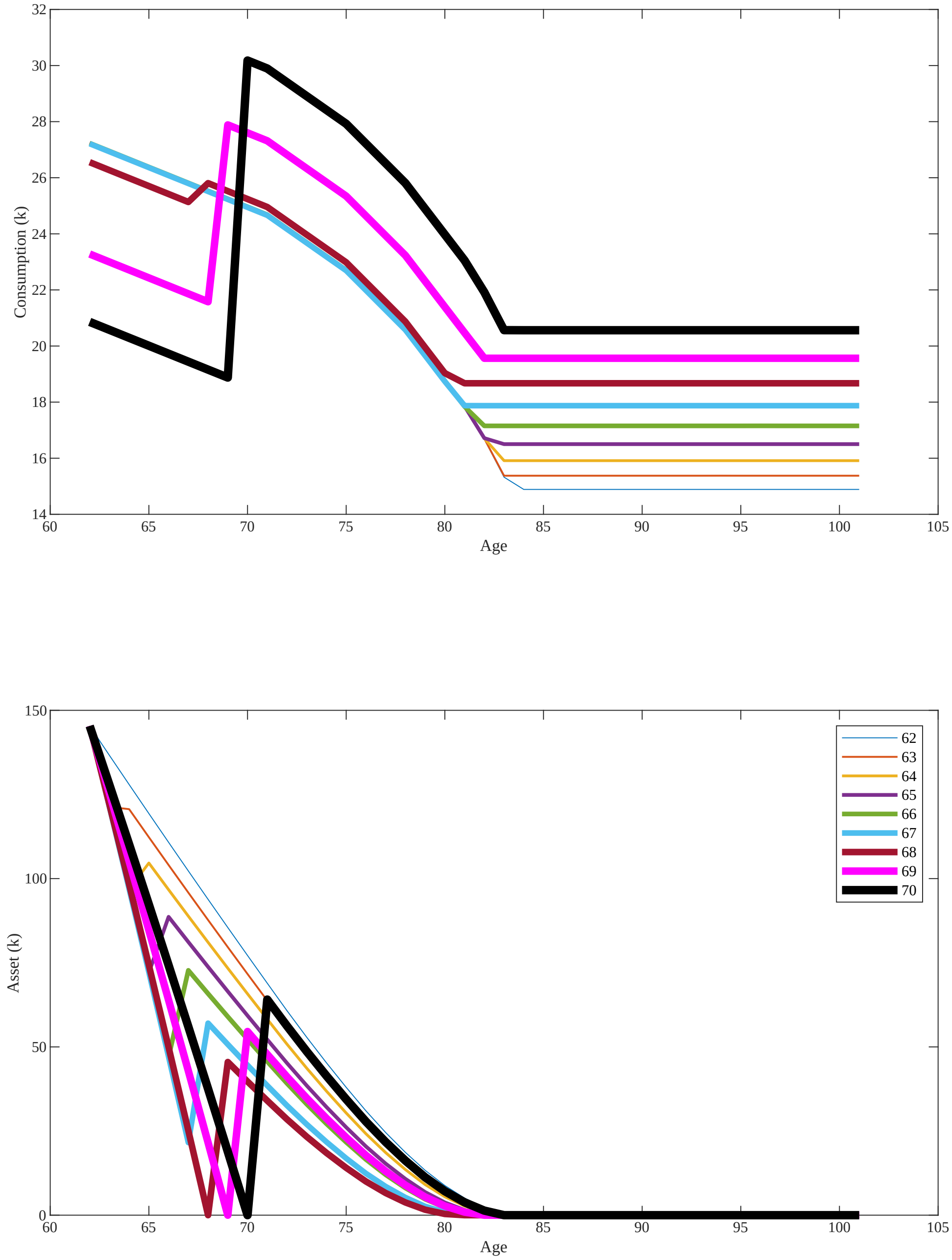


Figure C2: T50 optional decisions conditional on claiming age

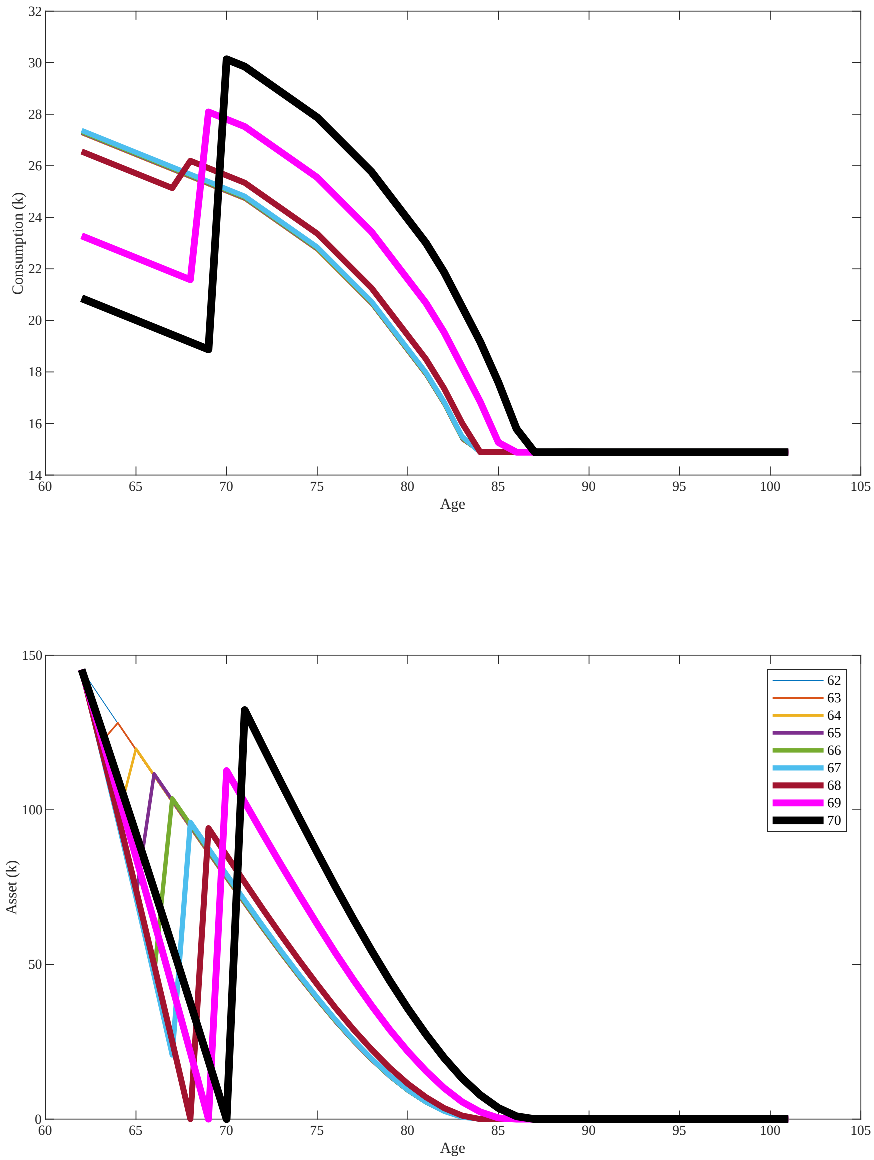


Figure C3: T100 optional decisions conditional on claiming age

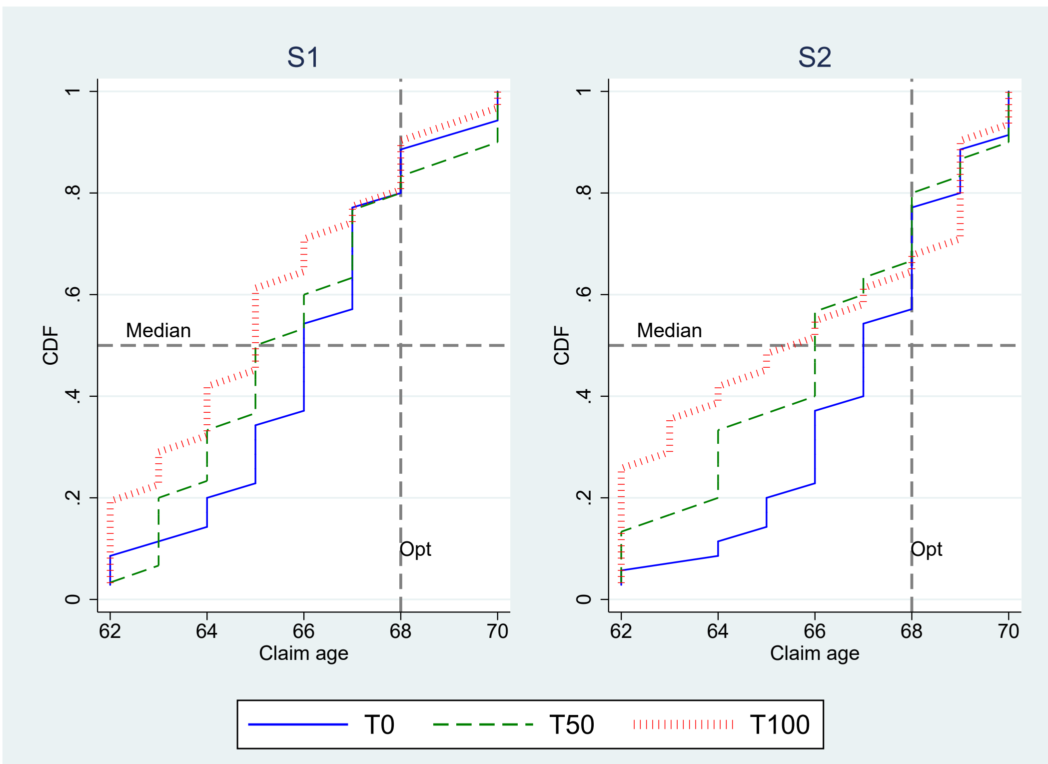
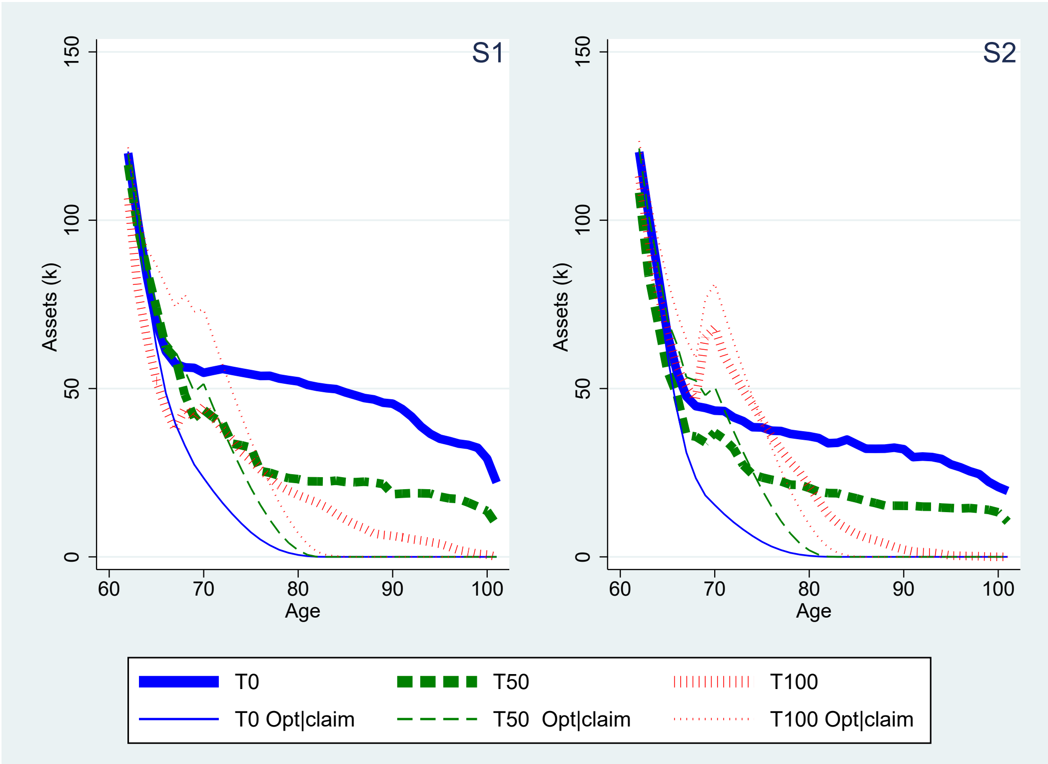
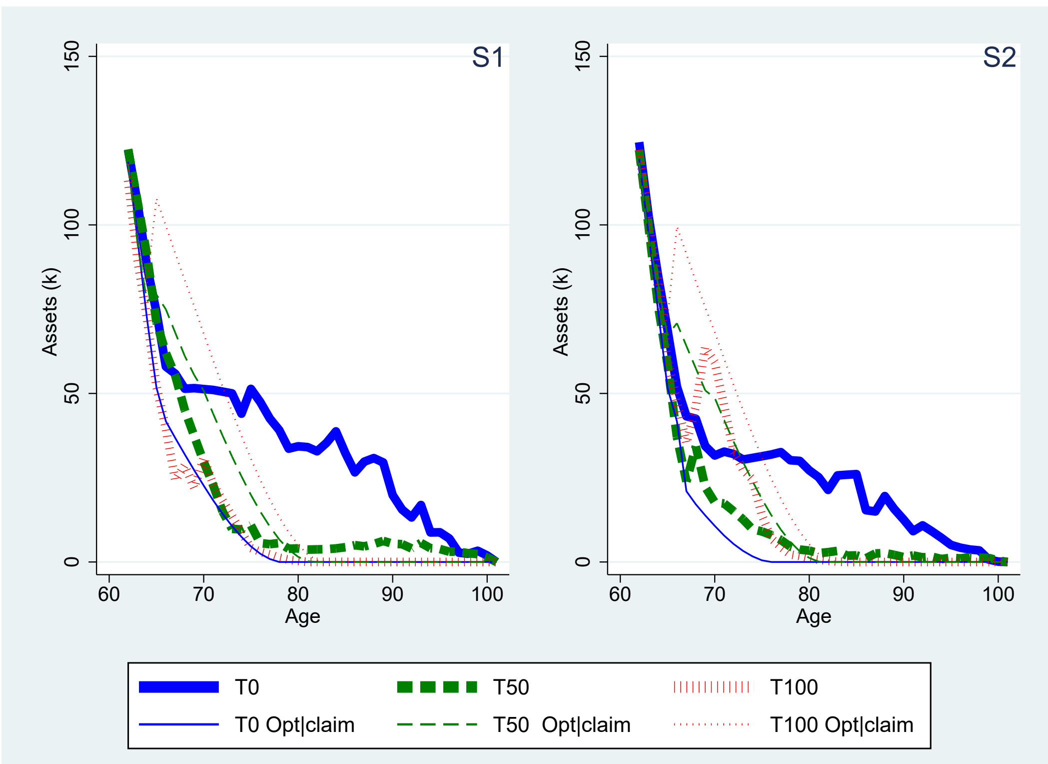


Figure C4: CDF of claiming age (Student Sample)

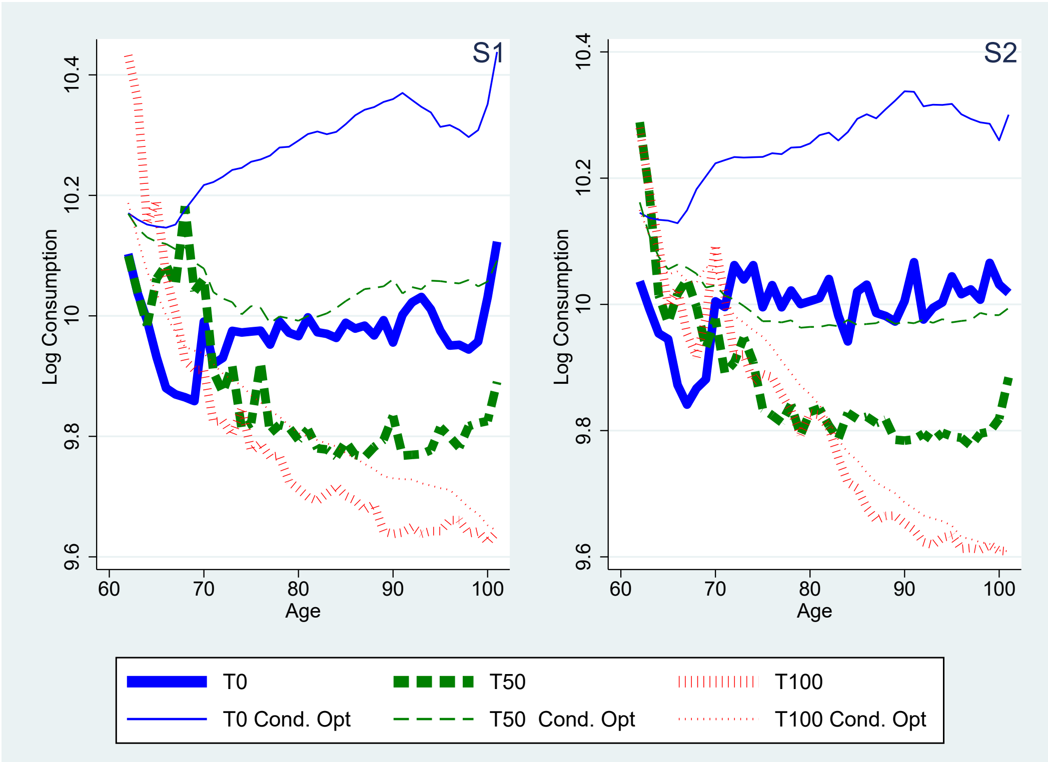


(a) Mean

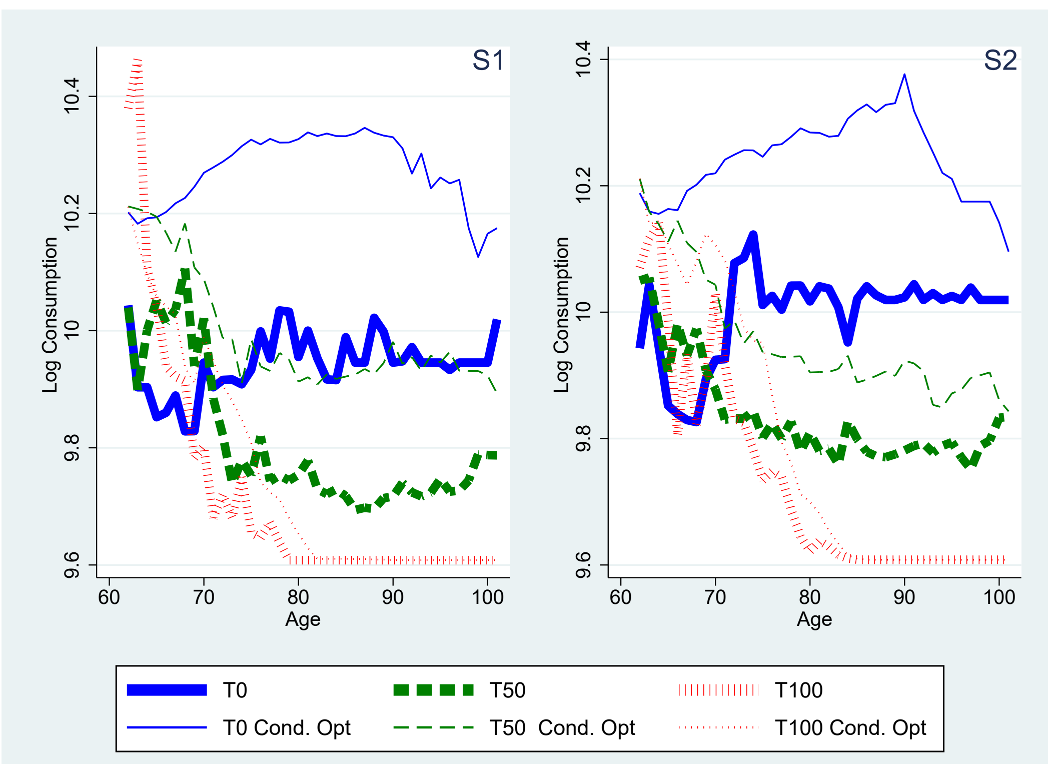


(b) Median

Figure C5: Ending Assets and Rational Choice Model Predictions, Conditional on Claiming Age (Student Sample)



(a) Mean



(b) Median

Figure C6: Log Consumption and Rational Choice Model Predictions, Conditional on Claiming Age and Starting Assets (Student Sample)

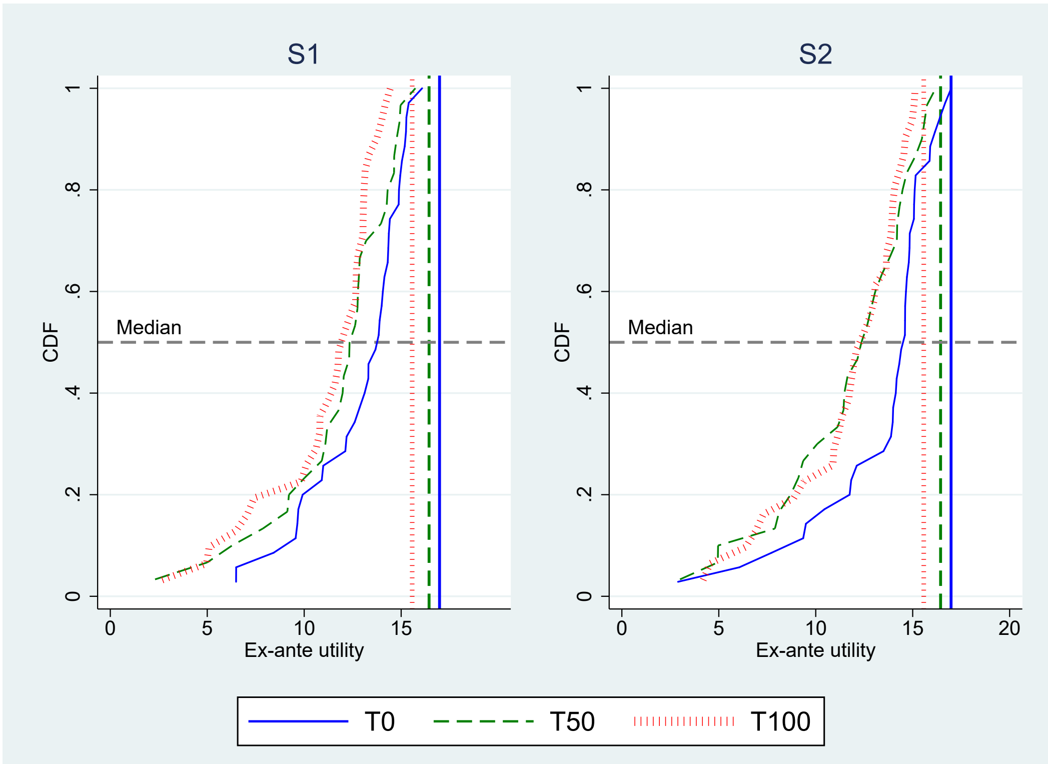
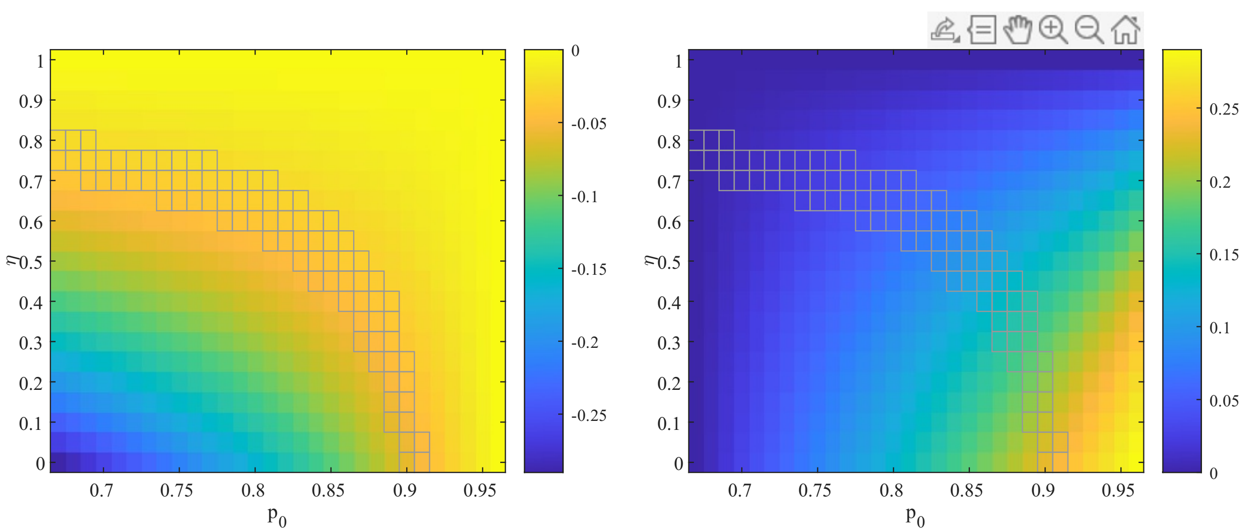


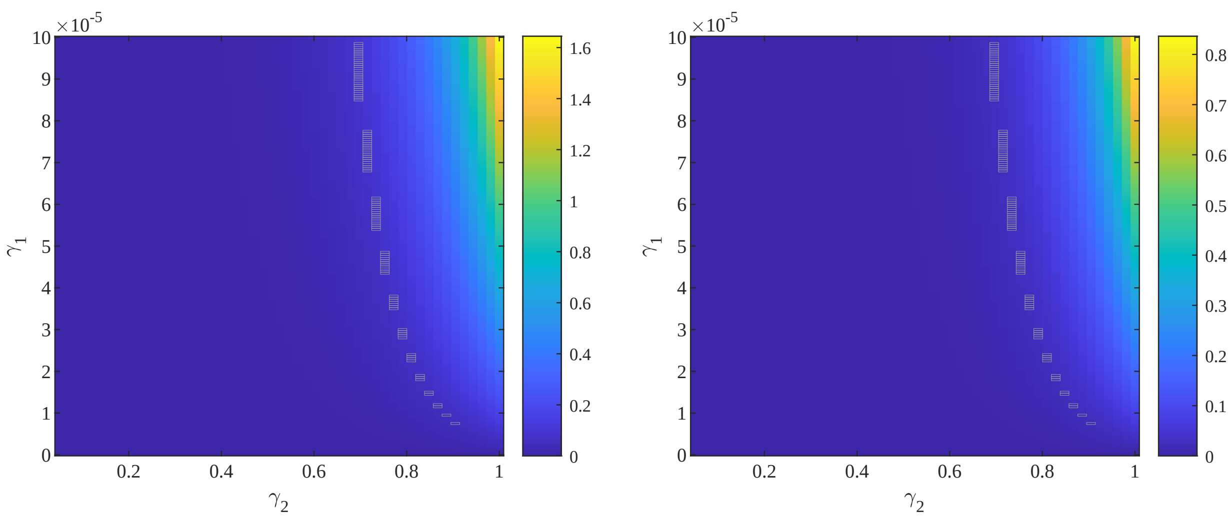
Figure C7: CDF of Expected Lifetime Utility (Student Sample)



(a) Pessimism at age 62

(b) Optimism at age 100

Figure C8: Misperception ($p(\beta s_j) - \beta s_j$) about continuation probability at age 62 and 100
Note: Gray boxes indicate the parameter combinations that yield an optimal claiming age of either 65 or 66. Due to rounding, the continuation probability is held constant at 0.96 from age 62 through age 70.



(a) Utility ratio $\frac{\gamma 1(10000)^{\gamma 2}}{u(19418)}$

(b) Marginal utility ratio $\frac{\gamma 1 \gamma 2(10000)^{\gamma 2-1}}{u'(19418)}$

Figure C9: Intensity of wealth preserving motive

Note: Gray boxes indicate the parameter combinations that yield an optimal claiming age of either 65 or 66.