Optimal Social Security Claiming Behavior under Lump Sum Incentives: Theory and Evidence

Raimond Maurer, Olivia S. Mitchell, Ralph Rogalla, and Tatjana Schimetschek

Version of January 31, 2017

Acknowledgements: Research support was provided by the Deutsche Forschungsgemeinschaft (DFG), the German Investment and Asset Management Association (BVI), the Pension Research Council/Boettner Center at The Wharton School of the University of Pennsylvania, the Metzler Exchange Professor program, and the Berkley Fellowship Program at the School of Risk Management of St. John's University's Tobin College of Business. We also acknowledge support from the Research Center SAFE, funded by the State of Hessen initiative for research excellence, LOEWE. We thank the Center for Scientific Computing of the Goethe University Frankfurt for granting us computing time at the supercomputer LOEWE-CSC. We are grateful for expert programming assistant from Yong Yu, as well as the RAND ALP team including Alerk Amin, Tim Colvin, and Diana Malouf. Opinions and conclusions expressed herein are solely those of the authors and do not represent the opinions or policy of any agency of the Federal Government, or any other institution with which the authors are affiliated.

Optimal Social Security Claiming Behavior under Lump Sum Incentives: Theory and Evidence

Raimond Maurer, Olivia S. Mitchell, Ralph Rogalla, and Tatjana Schimetschek

Abstract

People who delay claiming Social Security receive higher lifelong benefits upon retirement. We survey individuals on their willingness to delay claiming later, if they could receive a lump sum in lieu of a higher annuity payment. Using a moment-matching approach, we calibrate a lifecycle model tracking observed claiming patterns under current rules and predict optimal claiming outcomes under the lump sum approach. Our model correctly predicts that early claimers under current rules would delay claiming most when offered actuarially fair lump sums, and for lump sums worth 87% as much, claiming ages would still be higher than at present.

Keywords: Annuity, delayed retirement, lifetime income, pension, early retirement, Social Security
JEL Codes: G11, G22, H55, J26, J32

Raimond Maurer
Department of Finance, Goethe University Frankfurt
House of Finance
Theodor-W.-Adorno-Platz 3, D – 60323 Frankfurt
maurer@finance.uni-frankfurt.de

Olivia S. Mitchell
The Wharton School, University of Pennsylvania
3620 Locust Walk, 3000 SH-DH
Philadelphia, PA 19104
mitchelo@wharton.upenn.edu

Ralph Rogalla
School of Risk Management, Insurance, and Actuarial Science
St. John's University
101 Astor Place, New York, NY 10003
rogallar@stjohns.edu

Tatjana Schimetschek
Department of Finance, Goethe University Frankfurt
House of Finance
Theodor-W.-Adorno-Platz 3, D – 60323 Frankfurt
schimetschek@finance.uni-frankfurt.de

Optimal Social Security Claiming Behavior under Lump Sum Incentives: Theory and Evidence

1 Introduction

Deciding when to retire and claim Social Security benefits is one of the most consequential financial decisions people can make in later life, inasmuch as delaying claiming from age 62 to age 70, for instance, can boost old-age annuity payments as much as 75 percent. Nevertheless, a majority of American retirees – 57 percent of men and 64 percent of women – still claims benefits before the national "full retirement age" of 66 (Social Security Administration 2015, Table 6.B5). When they exercise the option to claim, and what financial incentives could induce them to delay claiming without making them worse off, are topics deserving greater attention in the literature and of keen interest to policy reformers.[1]

In this paper, we first briefly report on an online survey where we ask people if they might be willing to delay claiming, and how much, if they were offered a lump sum instead of an actuarially-adjusted deferred annuity from Social Security.[2] Next, we develop a theoretical model of a rational agent who optimally chooses lifecycle consumption and work effort trajectories.[3] Using a moment-matching approach, we calibrate preference parameters such that optimal average claiming behaviors under the current Social Security system are in line with those observed in our data. Using this model, we then study optimal claiming behavior under the lump sum alternative and compare our outcomes to what people report they would do in our

[1] Several studies examine retirement or claiming patterns under current Social Security rules (e.g., Coile, Diamond, Gruber, and Jouston 2002; Gustman and Steinmeier 2005, 2015; Hubener, Maurer, and Mitchell 2016a; Shoven and Slavov 2014; Yin 2015), and research examining workers' decisions to claim company pensions include Chalmers and Reuter (2012).

[2] The survey module is discussed in Maurer, Mitchell, Rogalla, and Schimetschek (2016a). A non-representative ad-hoc analysis of how lump sum benefits could influence claiming decisions was discussed in Featherstonehaugh and Ross (1999), while Orszag (2001) discussed design aspects of such a policy alternative.

[3] Brown, Kapteyn, Luttmer, and Mitchell (2016) took a behavioral finance perspective to examine whether people might be willing to give up some of their benefit stream in exchange for a lump sum, but they did not develop a rational consumer model as we do here. Chai, Maurer, Mitchell, and Rogalla (2013) developed a model of consumers who could delay claiming Social Security if offered lump sum payments instead of an increase in lifetime annuity benefits, but that study did not calibrate the model to empirical data as we do here.

survey. The model proves to be quite accurate in predicting the impact of the lump sum treatment on claiming ages, indicating the usefulness of our framework for assessing the financial incentives that can induce household to delay claiming without making them worse off.

Our findings show that the matching exercise in our life cycle setting replicates empirically observed average claiming patterns under current Social Security rules with realistic preference parameters. Based on this calibration, the model predicts an overall increase of 0.41 years in the claiming age when respondents are offered the lump sum incentive, very close to the average increase of 0.39 years found in the survey data. Furthermore, the model produces reliable predictions of the average claiming age response to lump sum incentives not only in aggregate, but also for key population subgroups. Overall, we predict and confirm that offering rational workers actuarially fair lump sums would result in reasonable delays in retirement benefit claiming.

The remainder of the paper is structured as follows: Section 2 provides a brief overview of the US Social Security system's provisions regarding benefits under the current scheme and the alternative lump sum structure we analyze. It also discusses the implied returns attainable when delaying claiming benefits. Section 3 briefly reviews the survey we conducted to assess how lump sum incentives could influence actual claiming decisions. Section 4 describes our life cycle model framework. Preference parameters are calibrated to align model-predicted claiming behavior with the survey data, described in Section 5. In Section 6 we show how the model replicates claiming age intensions under the lump sum alternative. Section 7 studies the sensitivity of claiming ages to the level of lump sum benefits, and Section 8 concludes.

2 Social Security Mechanics, Claiming Options, and their Financial Implications

Social Security old-age benefits are based on a worker's Average Indexed Monthly Earnings (AIME), calculated by averaging his indexed 35 highest earning years. The AIME is then converted into a Primary Insurance Amount (PIA) by applying a progressive benefit formula; this replaces 90/32/15 percent of the first $816/next $4,101/any remaining dollar amount of AIME up to a calendar-year-specific maximum taxable earnings (e.g. $117,000 in 2014). The PIA represents the monthly retirement benefit payable for life if the individual claims his Social Security benefits at his Full Retirement Age (FRA); this is age 66 for birth cohorts 1943–1954, rising to 67 for those born 1960 or later.[4]

In point of fact, Social Security permits workers to claim their old-age benefits at any age between 62 and 70.[5] Under current rules, which we call the *Status Quo*, benefits for those claiming prior to their Full Retirement Age are reduced by $\frac{5}{9}$ percent per month, for up to 36 months of early claiming (i.e., 6.67 percent per year). For even earlier claiming, retirement benefits are reduced by an additional $\frac{5}{12}$ percent. Hence, an individual with a FRA of 67 would receive a retirement benefit of $\left(100 - 36 \cdot \frac{5}{9} - 24 \cdot \frac{5}{12}\right)\% \cdot PIA = 70\% \cdot PIA$ when claiming at age 62, i.e. 60 months earlier than his FRA. For those claiming later than their FRA, monthly benefits are increased by $\frac{8}{12}$ percent per month of delayed claiming. Hence, an individual with a FRA of 67 would receive a retirement benefit of $124\% \cdot PIA$ when claiming at age 70.

Taking the perspective of an individual age 62 contemplating whether to claim immediately or delay benefits, the current Social Security mechanics can be reframed as follows: he could claim at age 62 and receive his reduced benefit for life, or he could delay claiming for a year or more, up to age 70. To illustrate, if he were entitled to $10,000 per year at age 62, he could delay claiming one year and receive a higher annual benefit of $10,714 from age 63 for life (see Table 1).[6] Delaying to age 70 would boost his annual benefit from the initial $10,000 to $17,714.

---

[4] See also Social Security Administration (2014b) and Shoven and Slavov (2012, 2014).

[5] While it is technically possible to claim after age 70, under regular circumstances this is not beneficial to the individual. Hence we do not consider it further here.

[6] This can be calculated as $\$10{,}000 \cdot \frac{100-36\cdot\frac{5}{9}-12\cdot\frac{5}{12}}{100-36\cdot\frac{5}{9}-24\cdot\frac{5}{12}}$.

< *Table 1 here*>

Our alternative approach that we examine in this paper would offer each individual a deferred benefit in the form of an actuarially fair lump sum if he delayed claiming, plus his age 62 benefit from the later benefit start date onward. For instance, under this *Lump Sum* approach, the individual in the above example would receive the cash value of his benefit increase upon claiming in addition to his baseline amount of $10,000 for life. Using the Social Security system's parameters, the lump sum for delaying claiming to age 63 would amount to $11,556.[7] Delaying claiming to age 70 would increase the lump sum payment to $102,300, on top of his baseline annual payment of $10,000.

From a financial perspective, therefore, deciding when to claim benefits must be seen as a financial decision where the individual forgoes current benefits in exchange for a different mix of higher future benefits. To illustrate the implications of this choice, we again consider the example 62-year old contemplating his claiming options. Under the *Status Quo*, his decision to delay claiming by one year is equivalent to purchasing a deferred life annuity paying $714 per year in exchange for a premium of $10,000. Subject to survival until age 63, the internal rate of return of this investment is 4.0 percent over his expected lifetime.[8] By contrast, under the *Lump Sum* alternative, the foregone benefit at age 62 of $10,000 buys him one-period future cash amount of $11,556 at age 63, implying a one-year return of 15.6 percent conditional on survival. Accordingly, delaying claiming could be valuable under either scenario.

These calculations demonstrate the general appeal of delaying claiming, yet they do not speak to whether delayed claiming would be relatively more attractive under the *Lump Sum* or

---

[7] This is calculated based on Social Security's 2013 Trustees Report mortality table for the cohort 1951, converted to a unisex table as in Bell, Bye, and Winters (2008), and using a discount rate of 2.9 percent, which is Social Security's best estimate in their intermediate cost scenario in the 2013 and 2014 Trustees Reports (Social Security Administration 2013, 2014a).
[8] This computation relies on Social Security's mortality table for the cohort 1951, converted to a unisex table (see footnote 7). For returns from delaying claiming using sex-specific mortality rates and assuming a FRA of 66, see Hubener, Maurer, and Mitchell (2016b).

the *Status Quo* regimes. This is because each person's valuation of the tradeoff will also depend on his time preference and risk aversion, as well as his subjective survival expectations. Additionally, people might be subject to liquidity constraints, so they might need to work longer to subsist during the delay period, reducing utility.[9] One must also analyze the retiree's re-investment opportunities before deciding which of the two investments with different maturities would be preferred. To this end, it is useful to develop some evidence on the relative appeal of the Lump Sum versus the Status Quo scenarios.

3 Survey Evidence on Claiming Ages Under the Status Quo and Lump Sum Approaches

We have collected survey information on claiming patterns under the *Status Quo* and *Lump Sum* alternatives using RAND's online American Life Panel (ALP). Our nationally representative sample consists of 2,428 respondents age 40-70.[10] To implement the survey, we first computed each respondent's anticipated monthly Social Security benefit if he were to claim at each age from 62 to 70 (i.e., the earliest and latest claiming ages under the current system rules) based on his earnings history. After being shown this information, the respondent was asked to report his expected claiming age (i.e., the *Status Quo* claiming age). Next, we presented the respondent with the *Lump Sum* scenario, again tailored to his earnings history, and we asked him to report his expected claiming age under the new option. In the second case, he was told to assume that he would receive lifelong monthly income in the amount of his age 62 Social Security benefit from his claiming date forward, plus a lump sum payable as of the *Lump Sum* claiming age. The lump sum amount was computed to be equal to the actuarial present value of

---

[9] We note, however, that Goda, Shoven, Ramnath, and Slavov (2015) found that one-third of Social Security early retirees had financial assets in their Individual Retirement Accounts sufficient to finance at least two additional years of deferral, and about one-quarter could self-finance at least four years of deferral. Other assets were not included in that calculation, so that the likely impact of liquidity constraints is probably far lower.

[10] As noted above, the survey module is detailed in Maurer, Mitchell, Rogalla, and Schimetschek (2016a). Our sample size here is slightly reduced from that studied previously due to the omission of 23 cases (<1 percent) lacking wealth information, though average claiming ages are the same.

his delayed retirement credit. In addition, our survey module gathered information on financial wealth, preferences, and attitudes.[11]

To summarize the results of this survey module, Table 2 provides sample means and standard errors for claiming ages, work effort, financial wealth, and PIA for the full sample of respondents. For the full sample, the lump sum option boosted expected claiming ages by about 0.4 years, from age 65.74 under the Status Quo to age 66.13, and the increase is highly statistically significant.

<Table 2 here>

We also disaggregated our ALP respondents into three subgroups according to their *Status Quo* claiming age: the *Early Claimers* having an expected claiming age under age 65 (N = 764); the *Normal Claimers* having an expected claiming age from 65 to 67 (N = 1074); and the *Late Claimers* who expected to claim after age 67 (N = 590). Table 2 shows that the *Lump Sum* offering induces deferred claiming among both *Early* and *Normal Claimers*. That is, *Early Claimers* reported a baseline mean expected claiming age of 62.72, but the lump sum raised their mean claiming age by about 1.2 years to age 63.89. For *Normal Claimers*, the mean claiming age increased by about 0.4 years, from 65.87 under the *Status Quo,* to 66.29 under the *Lump Sum* policy. These changes in claiming ages are highly statistically significant. By contrast, people who were *Late Claimers* under the baseline reduced their mean expected claiming age by about 0.7 years, from 69.43 under the baseline to 68.74. In sum, trading a benefit increase for a lump sum would have the largest impact on delayed claiming for those who, under the current rules, take their benefits before or at the Full Retirement Age. And since the majority of Americans currently take their benefits young, this policy could have a marked impact on behavior.

[11] See Appendix Table A 1 for a detailed list of variables and summary statistics.

Table 2 also provides information on household financial wealth and estimated monthly retirement benefits at the Full Retirement Age (i.e., the PIA). Below we use these as state variables in our life cycle model. In the full sample, mean household financial wealth was $90,750, and the mean PIA was $1,650. For *Early Claimers*, mean financial wealth and PIAs – at $83,910 and $1,590, respectively – are below the *Normal* Claimer values – at $94,710 and $1,690. The mean financial wealth and PIA differences are not significant between the *Late* and the *Normal Claimers.*[12]

Next we develop and calibrate a theoretical model of the claiming decision in the context using the ALP data for the *Status Quo* claiming age distribution. Having done so, we simulate the theoretical response to the *Lump Sum* alternative, which we can then compare to the survey responses just described.

4 Our Life Cycle Framework

In this section, we build a discrete-time lifecycle model for individuals maximizing Epstein-Zin (1989) utility over a composite good of consumption and leisure. Given their initial endowment of financial wealth and Social Security claims, they optimally choose consumption, saving, and work effort trajectories, as well as the optimal claiming age for Social Security benefits. We model each individual's life cycle from age 62 ($t = 1$) to age 100 ($\mathrm{T} = 39$), assuming that people have a time budget of 100 hours per week (as in Chai, Horneff, Maurer, and Mitchell 2011). Between age 62 and 70, individuals can decide to participate in the labor market by choosing to work for a discrete number of hours wh_t ($\in \{0,10,20,30,40,50,60\}$) per week, where we interpret 40 hours as full-time employment. The fraction of the time budget not dedicated to work is assumed to be leisure L_t ($= 1 - \frac{wh_t}{100}$). From age 70 onward, the time budget is fully devoted to leisure.

[12] A regression of expected *Status Quo* claiming ages on wealth and the base benefit level produces no significant results. Results appear in Appendix Table A 2.

Given a choice of how many hours to work, the individual receives a gross annual income GAI of:

$$GAI_t = \frac{wh_t}{40} \cdot 12 \cdot AIME. \tag{1}$$

The $AIME$ term represents the individual's average monthly full-time gross earnings, which we derive from the PIA by inverting the Social Security benefit formula. For simplicity, we assume that an individual's PIA does not depend on work effort decisions after age 62.[13] Gross income is adjusted according to current US tax laws to derive net annual income NAI_t.[14] Should the individual choose not to work ($wh_t = 0$), he can either live off his financial wealth or retire permanently and claim Social Security benefits.

On claiming retirement benefits at age k $(= 61 + t)$, the individual will receive a constant annual level of annuity payments (AB_k) for life plus a single lump sum (LSB_k) as of that age. This is calculated as:

$$AB_k = ABF_k \cdot PIA, \tag{2}$$

$$LSB_k = LSBF_k \cdot PIA,$$

where $LSBF_k$ and ABF_k are claiming-age-specific adjustment factors.[15] The lump sum benefit factors $LSBF_k$ are calculated based on the Social Security 2013 Trustees Report mortality table for the 1951 cohort, converted to a unisex table as in Bell, Bye, and Winters (2008), and a discount rate of 2.9 percent, which is Social Security's intermediate cost scenario (Social Security Administration 2013, 2014a). Table 3 presents the ABF_k and $LSBF_k$ factors for all claiming ages under the Status Quo (left panel) and for the Lump Sum scenario (right panel).

---

[13] Cocco, Gomes, and Maenhout (2005), among others, show that labor income exhibits a hump-shaped profile over the worklife, with earnings decreasing as people near retirement. The PIA is based on one's highest 35 years of earnings, which implies that late-life earnings have only a small impact on the typical worker's PIA.

[14] In particular, we apply tax-brackets, tax rates, and standard deduction amounts as of 2014 (see Internal Revenue Service 2014) to derive NAI_t. The tax brackets and associated tax rates are \$0 to \$9,075: 10%; \$9,076 to \$36,900: 15%; \$36,901 to \$89,350: 25%; \$89,351 to \$186,350: 28%; \$186,351 to \$405,100: 33%; \$405,101 to \$406,750: 35%; and \$406,751 or more: 39.6%. We use a standard deduction amount of \$6,200 to determine taxable income. In addition, we deduct before retirement the Social Security payroll tax of 6.2%, Medicare tax of 1.45%, and a city tax of 4%. After retirement, we set the tax rates equal zero, since due to generous deductions, most US households pay no taxes on Social Security benefits (see Social Security Administration 2016).

[15] As there are no lump sum benefits in the *Status Quo*, $LSBF_k$ is zero in this scenario.

< Table 3 here >

Each period, after work effort and income are determined, the individual decides how to allocate his financial resources between consumption C_t and saving S_t:

$$C_t + S_t = \begin{cases} W_t + NAI_t & if \quad t + 61 < k \\ W_t + AB_k + LSB_k & if \quad t + 61 = k \\ W_t + AB_k & if \quad t + 61 > k, \end{cases} \tag{3}$$

s.t.

$$C_t > 0, \qquad S_t \geq 0.$$

Savings are invested in the capital market and generate a gross return R_{t+1}, which we set to 1.029 in line with our discount rate assumption. Hence, financial wealth in the subsequent period is given by:

$$W_{t+1} = S_t \cdot R_{t+1}. \tag{4}$$

As in Binsbergen, Fernández-Villaverde, Koijen, and Rubio-Ramírez (2012), among others, we posit that the individual seeks to maximize lifetime utility derived from the composite good of consumption C_t and leisure L_t, resulting in a recursively defined value function V_t as follows:

$$V_t = \left[(C_t \cdot L_t^{\alpha})^{1-\frac{1}{\phi}} + \beta \cdot p_{x,t}^{s} \cdot E_t\left(V_{t+1}^{1-\gamma}\right)^{\frac{1-\frac{1}{\phi}}{1-\gamma}} \right]^{\frac{1}{1-\frac{1}{\phi}}}, \tag{5}$$

where E_t is the expectation operator. The model differentiates between males and females by incorporating sex-specific subjective survival probabilities $p_{x,t}^{s}$ equal to those underlying the unisex rates used in calculating the lump sum benefit.[16]

The value function depends on a set of preference parameters including the preference for leisure α, the elasticity of intertemporal substitution ϕ, the time preference rate β, and the

[16] See footnote 7.

coefficient of relative risk aversion γ. Calibrating these parameters is the objective of the moment-matching exercise in the next section.

To maximize lifetime utility, the individual determines his optimal policies regarding consumption, leisure, and claiming age, all of which depend on the continuous state variables wealth and PIA, as well as on the discrete claiming age state variable. We solve the optimization problem using backward induction over a discretized state space. Using the optimal life cycle policies, we subsequently derive the expected model-based claiming behavior by conducting a forward simulation for each individual in our empirical survey based on the individual's sex, initial combination wealth W_1, and Primary Insurance Amount PIA.

5 Calibrating Preference Parameters to Match Status Quo Claiming Behavior

Using a moment-matching approach, we next calibrate key preference parameters for leisure and time preference, risk aversion, and willingness to shift consumption across time. Our goal is to ensure that our model generates optimal average claiming behaviors in line with the empirically-observed patterns under the *Status Quo* described in Section 3.

Two of the needed parameters, on risk attitudes and time preferences, are gathered using relevant questions from the ALP module. Specifically we measure risk tolerance based on respondents' answers to survey questions regarding their willingness to take risk (as in Maurer, Mitchell, Rogalla, and Schimetschek, 2016a, and Brown, Kapteyn, Luttmer, and Mitchell, 2016). We are also able to distinguish more patient from impatient individuals, since the former indicated they had relatively long (versus short) planning horizon (i.e., they focused on a 5+ versus an under-5 year planning period when making financial decisions). Impatient individuals also indicated they would immediately spend most of a $10,000 windfall if it were available.

There is also some dispersion in baseline claiming ages: that is, claiming ages were higher for the more patient and risk-averse respondents, while the less patient and riskpreferring respondents opted for younger claiming ages.[17] As a result, we concluded that forcing a common risk aversion and time preference parameter across all respondents would be inadequate to replicate the distribution of claiming ages in the data. Accordingly we assigned distinct risk and time preference parameters to each of the three claiming age subgroups introduced above.[18] In particular, *Early Claimers* were assigned a coefficient of relative risk aversion of $\gamma = 1.5$ and a time preference rate of $\beta = 0.9$. *Normal Claimers* were assigned a coefficient of relative risk aversion of $\gamma = 3$ and a time preference rate of $\beta = 0.93$. And *Late Claimers* were assigned parameter values of $\gamma = 5$ and $\beta = 0.96$. These values are in line with those typically used in the literature on optimal life cycle decision making.[19]

The ALP survey offers less guidance to help us pin down leisure preference and intertemporal elasticity of substitution (IES) parameters. For this reason, we used a moment-matching approach[20] to derive optimal parameter sets that match the model output on claiming ages with the survey data under the *Status Quo*. We constructed a set of 150 unique combinations of leisure preference and IES parameters by varying α in 15 steps of 0.1 over the interval $\alpha \in (0.9, \dots, 2.3)$ and ϕ in 10 steps of 0.1 over the interval $\phi \in (0.1, \dots, 1)$. For each of these 150 parameter combinations, we solved the life cycle optimization problem separately for *Early Claimers*, *Normal Claimers*, and *Late Claimers*. Then we determined expected claiming ages for each subgroup by simulating the life cycle paths for each individual in the ALP survey, based on the optimal controls for that person's claiming age subgroup. The optimal leisure preference/substitution elasticity pair for each subgroup minimized the squared distance

---

[17] Appendix Table A. 2 presents the results of a multivariate regression of expected claiming ages under the *Status Quo* on various controls. The risk aversion coefficient is positive and highly significant. The same holds for the coefficient on the long-term planner dummy, representing those who make financial plans for 5+ years. By contrast, our impatience dummy variable High Spending, which represents those who would immediately consume the better part of a windfall cash inflow, has a negative and statistically significant coefficient.

[18] While the survey did contain information regarding the general direction of the relation between claiming ages and risk/time preference, we cannot directly infer numeric values of the risk aversion and time preference parameters for use in the model.

[19] See, for instance Cocco, Gomes, and Maenhout (2005); Wachter and Yogo (2010); and Cocco and Gomes (2012).

[20] See for instance Love (2010); Inkmann, Lopes, and Michaelides (2011); and Kim, Maurer, and Mitchell (2016).

between the simulated model-based expected claiming age and the expected claiming age in the survey data.

Figure 1 displays the (log) values of the squared differences between the model-based and empirical expected claiming ages for all 150 combinations of the leisure preference and IES parameters, indicating the location of optimal sets in α-ϕ-space. We summarize the results in Table 4, with the optimal preference parameter sets for each claiming age group as well as the corresponding claiming age deviations between the model and the data.

< *Figure 1 and Table 4 here* >

In each panel of the Figure, darker regions indicate the parameter pairs generating the minimum (log) squared differences. The lifecycle model results best fit the survey data when the leisure preference and IES are set to $\alpha = 2.2$ and $\phi = 0.1$ for *Early Claimers*; for *Normal Claimers* when the leisure preference and IES are set to $\alpha = 2.2$ and $\phi = 0.1$; and for *Late Claimers* the best fitting $\alpha = 1.6$ and $\phi = 0.7$. In other words, as baseline claiming ages rise, leisure preferences generally fall and the IES increases. This is a plausible result, since those who delay claiming more will generally have to work longer in order to finance consumption during the delay period. Thus individuals who optimally claim late will tend to exhibit lower leisure preference. Claiming later is an investment that trades off current income and consumption in exchange for higher future income and consumption, as discussed in Section 2. Accordingly, claiming later is optimal for those more willing to shift consumption ahead in time, which requires a higher intertemporal elasticity of substitution.

Our IES estimates accord reasonably well with those reported in the literature. Hall (1988) concluded that the IES is below 0.2 and could potentially be zero. Attanasio and Weber (1995) derived a value of up to 0.67 based on CEX data, and Attanasio and Weber (1993) estimated a value of up to 0.78 based on cohort data from the FES. An international meta-analysis by Havranek, Horvath, Irsova, and Rusnak (2015) reported a mean IES of 0.594 for the US. As for leisure preference, we are also in line with prior studies using very different approaches. Chai, Horneff, Maurer, and Mitchell (2011) concluded that $\alpha = 1.3$ described the aggregate claim age distribution over time. Low (2005) used an effective leisure preference parameter of $\alpha = 1.5$, while the effective leisure preference in Cooley and Prescott (1995) and Laitner and Silverman (2012) was $\alpha = 1.78$.[21]

Having identified the optimal combination of α and ϕ, and, hence, having fully calibrated our life cycle model, we can now examine how well our utility-maximizing decision making framework tracks the *Status Quo* claiming age choices in our ALP module. To this end, Table 5 presents average empirical and model-derived *Status Quo* claiming ages, distinguished across *Early, Normal*, and *Late Claimers*. Results reveal an almost perfect match for all three claiming age groups. Empirical and model-based average claiming ages are identical to the first decimal, at age 62.7 for *Early*, 65.9 for *Normal*, and 69.4 for *Late Claimers*. Model results deviate from empirical observations by a mere 0.013 years for the *Early*, 0.034 years for the *Normal*, and by a negligible 0.005 years for the *Late Claimers*.

< Table 5 here >

We also provide results for subsets of persons differentiated by household wealth and PIA level (i.e., our model's state variables). Generally speaking, model predictions deviate a bit from the data, since as noted above, there was no clear-cut empirical relationship between wealth or benefit levels and expected claiming ages. The model, by contrast, predicts that expected claiming ages generally increase with wealth and retirement benefits. This is theoretically plausible, inasmuch as wealthier households can delay claiming Social Security benefits more and still maintain a certain level of consumption without necessarily having to work much more and forego too much leisure. Nevertheless, people with higher $PIAs$ also have a higher opportunity cost of early retirement, so having a higher PIA provides a larger incentive

[21] Specifically, Low (2005) used the specification $C^{0.4}L^{0.6}$ for his composite good of consumption and leisure, while Cooley and Prescott (1995) and Laitner and Silverman (2012) used $C^{0.36}L^{0.64}$. As strictly monotonic transformations are order-preserving, these specifications correspond to $C^1L^{1.5}$ and $C^1L^{1.78}$, respectively.

to continue working and generally results in later claiming. The two effects appear to balance for *Early Claimers*, as model-based claiming ages hardly differ between those with high and low benefits. Given their relatively high leisure preference, members of this subgroup are less susceptible to work incentives. As a result, theoretical results are close to empirical claiming age observations.

6 Responses to the Lump Sum Approach: Predicted vs Empirical Claiming Patterns

Having calibrated our model so that it matches *Status Quo* claiming age results in the survey, we next study how the *Lump Sum* approach changes expected claiming ages in our model, and then we compare the theoretical responses to survey responses. Accordingly, we again solve the life cycle optimization problem for *Early*, *Normal*, and *Late Claimers* using the optimal preference parameters in Table 4, but now we replace the *Status Quo* Social Security regime with the *Lump Sum* setup.[22] We simulate the life cycle paths for each individual in our ALP survey using the optimal controls for that person's claiming age subgroup. Findings appear in Table 6 which presents the average differences between expected *Status Quo* and expected *Lump Sum* claiming ages for both the empirical and model-based datasets. We also provide results for subsamples differentiated by household wealth and PIA levels.

< Table 6 here >

The most interesting finding is that the model-generated claiming ages under the lump sum approach are remarkably similar to those reported by survey respondents asked to predict their claiming ages under the reform. It should be emphasized that the model calibration was based solely on the *Status Quo* evidence and did not use the survey data for the *Lump Sum* scenario. In other words this is a true "out of sample prediction." For *Early Claimers*, our model predicts a lump sum-induced claiming age increase of 1.2 years, for *Normal Claimers* an

---

[22] Technically, switching the model from the *Status Quo* to the *Lump Sum* setup only requires using the ABF_k and $LSBF_k$ factors from the *Lump Sum* column instead of the *Status Quo* column in Table 3.

increase of 0.4 years, and for *Later Claimers* a decrease of 0.5 years. Accordingly, the model underestimates the average expected claiming age increase for *Early Claimers* in the survey by a miniscule 0.008 years (i.e. less than 3 days), and for *Normal Claimers* by a mere 0.061 years (i.e. about 3 weeks). Only for *Late Claimers* is there a slightly larger difference between the model's prediction and the survey data, with the model underestimating the survey decline in claiming by 0.2 years. Aggregating over the three subgroups, the model predicts an overall rise in the expected claiming age of 0.41 years, quite close to the 0.39 years in our survey data.

If we disaggregate by household wealth, the survey data reveal no significant impact of financial endowments on how lump sum incentives affect claiming ages. By contrast, our model predicts that wealthier *Early Claimers* would delay claiming more than their poorer counterparts. Given their low IES, being able to smooth consumption is especially valuable for this subgroup. Therefore these households find the substantial lump sum payments appealing in exchange for longer delays only when they have sufficient own wealth to balance pre- and post-claiming consumption. For example, those with low wealth will delay claiming by only an additional 0.1 year when offered the lump sum, while those with wealth exceeding $100,000 are projected to delay claiming by an additional 2.4 years. Among the *Late Claimers*, those with the most wealth have the smallest increment in claiming ages.

The level of retirement benefits has a significant impact only for the *Late Claimers* in terms of the empirically observed lump sum-induced claiming age change. Nevertheless, the model predicts an overall positive relation between the PIA and the claiming age delay across all groups.

7 Claiming Behavior under Less-Than-Actuarially-Fair Lump Sum Benefits

Thus far, we have found that both the ALP survey and the model-based analysis imply about a 0.4 year average delay in claiming Social Security benefits under the *Lump Sum* regime. This raises the question as to how sensitive claiming decisions might be to the level of lump sum benefit offered. Our empirical survey did not explore that question, as it only solicited new claiming ages assuming actuarially fair lump sums.[23] Yet the fact that our lifecycle framework can reliably predict aggregate claiming behavior under lump sum incentives suggests the usefulness of a model-based policy experiment to shed more light on alternative lump sum values. To do so, we undertake a final set of lifecycle optimizations and simulations using the preference parameters in Table 4, but now we determine claiming age changes for lump sum benefits set below the actuarially fair levels.

Results appear in Figure 2 which depicts model-projected average *Lump Sum* claiming ages for lump sums ranging from 100% to 75% of the actuarially fair amount. Interestingly, as we move gradually toward less generous lump sums, expected claiming ages are barely affected. Only for levels below 93 percent of the actuarially fair value do we see any important changes in expected claiming ages: for instance if the lump sum were 90 percent of its actuarially fair level, average claiming ages would fall by about 1.5 months (relative to the fair lump sum outcome). Once the level falls below 90 percent, there is a substantial decline in optimal expected claiming ages. For instance, at 80 percent, the average claiming age is about 65.1, or one year earlier than with the fair lump sum. From there, it gradually decreases further as the lump sum continues to fall.

< *Figure 2 here*>

An interesting tipping point appears to arise at a lump sum worth between 85 and 90 percent of the actuarially fair level.[24] In this range, the expected claiming age drops sharply to 65.7, which was the average expected *Status Quo* claiming age in our empirical survey (dotted line in Figure 2). Obviously such a reduction would have welfare effects, as it would reduce

---

[23] Brown, Kapteyn, Luttmer, and Mitchell (2016) undertook a different experiment asking people directly how much they would be willing to pay for $100 more in Social Security income, and the vast majority of respondents indicated values much below the actuarially fair amount.

[24] Though we are not advocating this for Social Security, many pension systems have offered less than fair lump sums. For instance Warner and Pleeter (2001) found that lump sums worth only half of the offered annuity values were preferred by more than half of the US military officers who were offered them, and more than 90 percent of enlisted personnel. The City of Philadelphia is currently considering lump sum buyouts worth about half of the annuity values, to help solve the city's huge pension underfunding problem (Ballantine, 2016).

lifetime consumption. Yet the finding that people would delay claiming for a lump sum less than the fully actuarially equivalent indicates the range over which retirement ages might be induced to rise above those seen currently.

8 Conclusion

We have developed a lifecycle model in which individuals optimally select their consumption, saving, work effort, and Social Security benefit claiming ages. Next we calibrated it to generate expected retirement benefit claiming behaviors under current Social Security rules that match claiming patterns found in a nationally representative survey fielded through RAND's American Life Panel. We then used this model to simulate how people might change their claiming behavior if part of their Social Security benefits – the portion currently paid as an additional lifelong annuity– were to be exchanged for an actuarially fair lump sum. Unlike studies that calibrate models to empirical data and subsequently conduct simulation analyses for policy purposes, we can compare the "out of sample" model predictions to what people say they would actually do, since our survey also elicited new claiming ages given such a reform.

The empirical study on claiming age decisions in our representative sample of 2,428 Americans age 40-70 produced an average expected claiming age of 65.74 under current Social Security rules. Our lifecycle model calibrated using these data closely replicated average claiming patterns under the *Status Quo*: in fact our matching exercise produces simulated average claiming ages under the current rules averaging 65.75, which deviate from the survey result by only 3.6 days. We then used the model to predict an increase in the average claiming age of 0.41 years if respondents were offered the actuarially fair lump sum, close to the average increase of 0.39 years reported in the survey. Not only did the model predict the average claiming age response to lump sum incentives reasonably well on an aggregate level, it also did so for subgroups. In particular, it correctly predicted that those claiming early under the current rules would be the ones with the largest rise in claiming ages when offered the lump sum, and that those currently claiming late would react to the policy change reducing their claiming ages. Last, we studied the claiming age sensitivity to less generous lump sum amounts. We found that, for lump sums worth not less than 85-90% of the actuarially fair value, simulated claiming ages still remain higher than under the Status Quo. Thus our contribution was to develop and calibrate a theoretical life cycle model using experimental evidence to predict out-of-sample responses to such reforms.

Early retirement is commonly acknowledged as a risk factor that endangers financial wellbeing at advanced ages, and reforms have been proposed to alleviate the problem including mandating higher retirement ages or cutting early retirement benefits. As an alternative, we have explored whether and how lump sum incentives might encourage later claiming. Our calibrated model confirms that offering people actuarially fair lump sums could incentivize them to delay claiming by reasonable amounts, without needing to rely on benefit cuts to get them to do so.

References

Attanasio, O.P.; Weber, G. (1993). Consumption Growth, the Interest Rate and Aggregation. *Review of Economic Studies* 60 (3), 631-649.

Attanasio, O.P.; Weber, G. (1995). Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey. *Journal of Political Economy* 103(6), 1121-1157.

Ballantine, T. (2016). Philadelphia Explores Pension Buyouts. *Pension360 Newsletter*. May. http://pension360.org/philadelphia-explores-pension-buyouts/

Bell, F.; Bye, K.M.; Winters, A. (2008). Unisex Life Expectancies at Birth and Age 65. Actuarial Note 2008.2 SSOACT.

Binsbergen, J.H. van; Fernández-Villaverde, J.; Koijen, R.S.J.; Rubio-Ramírez, J. (2012). The Term Structure of Interest Rates in a DSGE Model with Recursive Preferences. *Journal of Monetary Economics* 59(7), 634-648.

Brown, J.; Kapteyn, A.; Luttmer, E.; Mitchell, O.S. (2016). Cognitive Constraints on Valuing Annuities. *Journal of the European Economic Association* (forthcoming).

Chai, J.; Horneff, W.; Maurer, R.; Mitchell, O.S. (2011). Optimal Portfolio Choice Over the Life Cycle with Flexible Work, Endogenous Retirement, and Lifetime Payouts. *Review of Finance* 15(4), 875-907.

Chai, J.; Maurer, R; Mitchell, O.S.; Rogalla, R. (2013). Exchanging Delayed Social Security Benefits for Lump Sums: Could This Incentivize Longer Work Careers? NBER Working Paper No. 19032.

Chalmers, J.; Reuter, J. (2012). How Do Retirees Value Life Annuities? Evidence from Public Employees. *Review of Financial Studies.* 25 (8): 2601-2634.

Cocco, J.F.; Gomes, F.J. (2012). Longevity Risk, Retirement Savings, and Financial Innovation. *Journal of Financial Economics* 103(3), 507-529.

Cocco, J.F.; Gomes, F.J.; Maenhout, P.J. (2005). Consumption and Portfolio Choice over the Life Cycle. *Review of Financial Studies* 18(2), 491-533.

Coile, C.; Diamond, P.; Gruber, J; Jousten, A. (2002): Delays in Claiming Social Security Benefits. *Journal of Public Economics*, 84(3): 357–385.

Cooley, T.; Prescott, E. (1995). Economic Growth and Business Cycles. In: Cooley, T. (ed). *Frontiers of Business Cycle Research*. Princeton University Press, Princeton, NJ, pp. 1-38.

Epstein, L.; Zin, S. (1989). Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns: A Theoretical Framework. *Econometrica* 57(4), 937-969.

Fetherstonhaugh, D.; Ross, L. (1999). Framing Effects and Income Flow Preferences in Decisions about Social Security. In Aaron, H.J. (ed). *Behavioral Dimensions of Retirement Economics.* Washington DC.: Brookings Institution Press, 187-209.

Goda, G.; Ramnath, S.; Shoven, J.B.; and Slavov, S.N. (2015). The Financial Feasibility of Delaying Social Security: Evidence from Administrative Tax Data. NBER Working Paper 2154. September.

Gustman, A.L.; Steinmeier, T.L. (2005). The Social Security Early Entitlement Age in a Structural Model of Retirement and Wealth. *Journal of Public Economics,* 89 (1-2): 441-463.

Gustman, A.L.; Steinmeier, T.L. (2015). Effects of Social Security Policies on Benefit Claiming, Retirement and Saving. *Journal of Public Economics*, 129: 51-62.

Hall, R.E. (1988). Intertemporal Substitution in Consumption. *Journal of Political Economy* 96(2), 339-357.

Havranek, T.; Horvath, R.; Irsova, Zuzana; Rusnak, M. (2015). Cross-Country Heterogeneity in Intertemporal Substitution. *Journal of International Economics* 96(1), 100-118.

Hubener, A.; Maurer, R.; Mitchell, O.S. (2016a). How Family Status and Social Security Claiming Options Shape Optimal Life Cycle Portfolios. *Review of Financial Studies* 29(4), 937-978.

Hubener, A.; Maurer, R.; Mitchell, O.S. (2016b). How Family Status and Social Security Claiming Options Shape Optimal Life Cycle Portfolios. Supplemental Material. *Review of Financial Studies* 29(4), 937-978.

Inkmann, J; Lopes, P; Michaelides, A. (2011). How Deep is the Annuity Market Participation Puzzle? *Review of Financial Studies* 24(1), 279-319.

Internal Revenue Service. (2014). *2014 Federal Tax Rates, Personal Exemptions, and Standard Deductions*. www.irs.com/articles/2014-federal-tax-rates-personal-exemptions-and-standard-deductions.

Kim, H.H.; Maurer, R.; Mitchell, O.S. (2016). Time is Money: Rational Life Cycle Inertia and the Delegation of Investment Management. *Journal of Financial Economics* 121(2), 427-447.

Laitner, J.; Silverman, D. (2012). Consumption, Retirement and Social Security: Evaluating the Efficiency of Reform that Encourages Longer Careers. *Journal of Public Economics* 96(7-8), 615-634.

Love, D.A. (2010). The Effects of Marital Status and Children on Savings and Portfolio Choice. *Review of Financial Studies* 23(1), 385-432.

Low, H.W. (2005). Self-Insurance in a Life-Cycle Model of Labour Supply and Savings. *Review of Economic Dynamics* 8(4), 945-975.

Maurer, R.; Mitchell, O.S.; Rogalla, R.; Schimetschek, T. (2016a). Will They Take the Money and Work? An Empirical Analysis of People's Willingness to Delay Claiming Social Security Benefits for a Lump Sum. *Journal of Risk and Insurance* (forthcoming).

Maurer, R.; Mitchell, O.S.; Rogalla, R.; Schimetschek, T. (2016b). Online Appendix of "Will They Take the Money and Work? An Empirical Analysis of People's Willingness to Delay Claiming Social Security Benefits for a Lump Sum." http://onlinelibrary.wiley.com/store/10.1111/jori.12173/asset/supinfo/jori12173-sup-0001-SupData-S1.pdf?v=1&s=d9442c910e0038d0546f014dd0251e11cbecc67c.

Orszag, P.R. (2001). Should a Lump-Sum Payment Replace Social Security Delayed Retirement Credit Issue Brief No. 6 April 2001, Center for Retirement Research at Boston College.

Shoven, J.B.; Slavov, S.N. (2012). The Decision to Delay Social Security Benefits: Theory and Evidence. NBER Working Paper No. 17866.

Shoven, J.B.; Slavov, S.N. (2014). Does It Pay to Delay Social Security? *Journal of Pension Economics and Finance* 13(2), 121-144.

Social Security Administration. (2013). *Trustees Report*. www.ssa.gov/OACT/TR/2013.

Social Security Administration. (2014a). *Trustees Report*. www.ssa.gov/OACT/TR/2014.

Social Security Administration. (2014b). *Annual Statistical Supplement to the Social Security Bulletin*. www.ssa.gov/policy/docs/statcomps/supplement/2014.

Social Security Administration. (2015). *Annual Statistical Supplement to the Social Security Bulletin, 2015* (Table 6.B5).

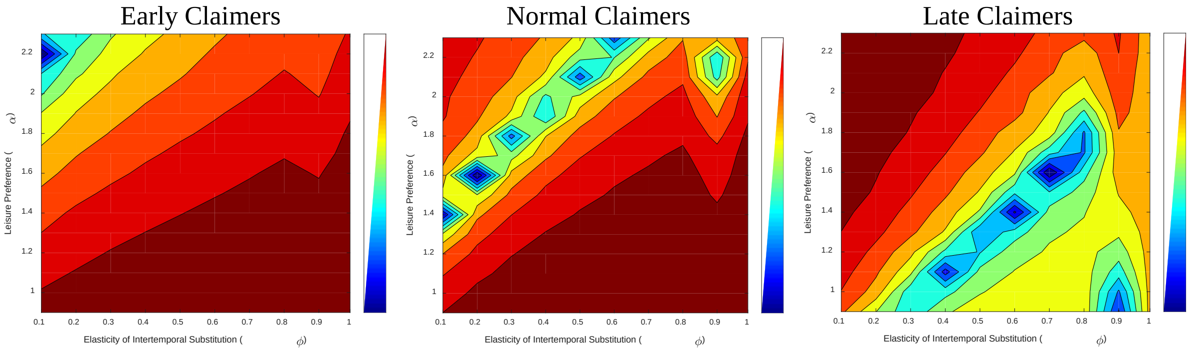
Social Security Administration. (2016). *Benefits Planner: Income Taxes and Your Social Security Benefits*. www.ssa.gov/planners/taxes.html.

Wachter, J.A.; Yogo, M. (2010). Why Do Household Portfolio Shares Rise in Wealth? *Review of Financial Studies* 23(11), 3929-3965.

Warner, J. T.; Pleeter, S. (2001). The Personal Discount Rate: Evidence from Military Downsizing Programs. *American Economic Review.* 91(1): 33-53.

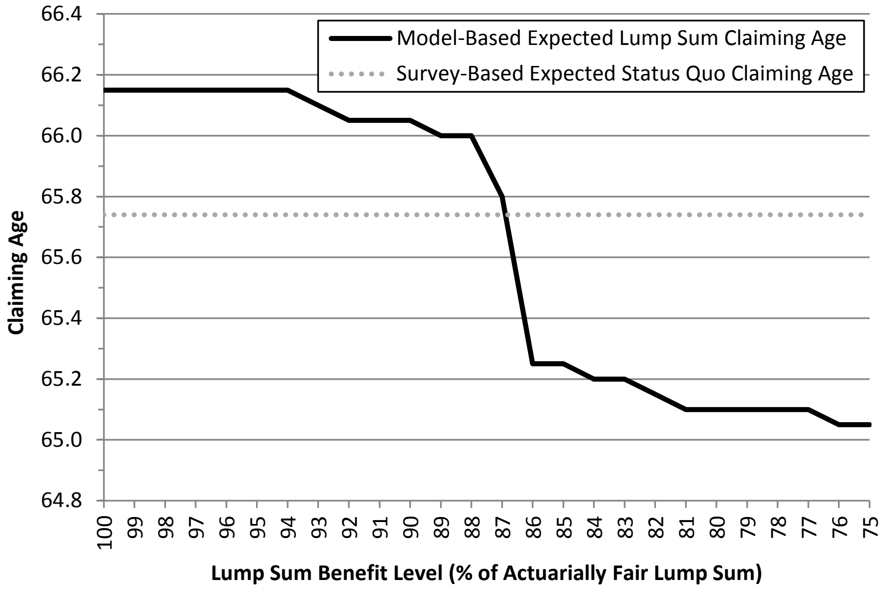
Yin, N. (2015). Partial Benefits in the Social Security Disability Insurance Program. *Journal of Risk and Insurance*, 82(2): 463-504.

Figure 1: Preference Parameter Calibration: Minimizing the Divergence between Model and Empirical Claiming Ages



Notes:The figures report, for each claiming age group, the logs of squared differences between model-predicted and empirically measured *Status Quo* claiming ages using alternative parameter combinations of leisure preference (α) and elasticity of intertemporal substitution (ϕ). Darker colors indicate smaller differences. Early Claimers had baseline claiming ages below age 65; Normal Claimers had baseline claiming ages from 65 to 67; and Late Claimers had baseline claiming ages over age 67. The minimum log squared difference for Early Claimers is -13.3 for the combination $\phi = 0.1$ and $\alpha = 2.2$; the minimum log squared difference for Normal Claimers is -6.8 for the combination $\phi = 0.2$ and $\alpha = 1.6$; and the minimum log squared difference for Late Claimers is -10.6 for the combination $\phi = 0.7$ and $\alpha = 1.6$. Source: Authors' calculations.

Figure 2: Claiming Ages under Less-Than-Actuarially-Fair Lump Sums



Notes: This figure depicts alternate average expected claiming ages for alternative values of the *Lump Sum* benefit. The value of 100% refers to a actuarially fair lump sum, under which the average claiming age is 66.13. The survey-based average expected claiming age under the *Status Quo* is 65.74. Source: Authors' calculations.

Table 1: Illustrative Example: Benefit Streams and Delayed Claiming Returns to Alternative Claiming Ages

Claiming Age	Benefit Streams				Implied Returns	
	Status Quo	*Lump Sum* Alternative			*Status Quo*	*Lump Sum* Alternative
	Annuity	Annuity		Lump Sum		
62	10,000	10,000	+	0	-	-
63	10,714	10,000	+	11,556	4.0	15.6
64	11,429	10,000	+	22,539	2.5	4.6
65	12,381	10,000	+	36,593	5.1	12.5
66	13,333	10,000	+	49,853	4.0	7.0
67	14,286	10,000	+	62,308	3.0	4.1
68	15,429	10,000	+	76,635	3.9	6.0
69	16,571	10,000	+	89,970	2.7	3.8
70	17,714	10,000	+	102,300	1.7	2.3

Notes: Under the *Status Quo*, the annuity paid is the lifetime annual benefit from Social Security for alternative claiming ages for an illustrative individual having an age 62 annual benefit of $10,000. The Implied Return represents the expected internal rate of return (subject to survival to claiming age) of delaying claiming for one additional year. Under the *Lump Sum* Alternative, the annuity represents the lifetime annual benefit payable from Social Security for alternative claiming ages for the same illustrative individual. The Lump Sum column represents the one-time benefit payable at the delayed claiming age. The *Implied Returns* columns represent the one-period return of delaying an additional year under the Status Quo or the Lump Sum alternative. Source: Author's calculation based on benefit adjustment factors reported in Social Security Administration (2014b).

Table 2: ALP Survey Results (Means) for Claiming Age and Work Effort under the Status Quo and the Lump Sum Scenario

	(1) Full Sample	(2) Early Claimer	(3) Normal Claimer	(4) Late Claimer	p-Value (3) – (2)	p-Value (4) – (2)	p-Value (4) – (3)
Claiming Age (in years)							
(a) Status Quo	65.74	62.72	65.87	69.43			
	(0.054)	(0.038)	(0.027)	(0.034)			
(b) Lump Sum	66.13	63.89	66.29	68.74			
	(0.052)	(0.071)	(0.051)	(0.073)			
(b) – (a)	0.39	1.17	0.42	– 0.69	0.000	0.000	0.000
p-Value (b) – (a)	0.000	0.000	0.000	0.000			
Wealth (in $000)	90.75	83.91	94.71	92.40	0.025	0.130	0.665
	(2.082)	(3.616)	(3.158)	(4.288)			
PIA (in $000)	1.65	1.59	1.69	1.66	0.000	0.025	0.487
	(0.012)	(0.022)	(0.018)	(0.026)			
N	*2,428*	*764*	*1074*	*590*			

Notes: This table displays mean claiming ages (in years) and full-time work effort (in years after age 62) under the *Status Quo* and *Lump Sum* scenarios, as well as means of respondents' wealth and Primary Insurance Amounts (PIA) for the 2,428 respondents in the ALP survey. We also show results for *Early Claimers* who claimed under the *Status Quo* before age 65; *Normal Claimers* claiming from age 65 to 67; and *Late Claimers* claiming after age 67. Standard errors in parentheses. More discussion of data construction is provided in Maurer, Mitchell, Rogalla, and Schimetschek (2016a). Source: Authors' calculations.

Table 3: Annuity and Lump Sum Benefit Adjustment Factors

Claiming Age	*Status Quo*		*Lump Sum*	
k	ABF_k	$LSBF_k$	ABF_k	$LSBF_k$
62	0.700	0	0.7	0.000
63	0.750	0	0.7	0.809
64	0.800	0	0.7	1.578
65	0.867	0	0.7	2.562
66	0.933	0	0.7	3.490
67	1.000	0	0.7	4.362
68	1.080	0	0.7	5.364
69	1.160	0	0.7	6.298
70	1.240	0	0.7	7.161

Notes: This table provides the key parameters used to compute actuarially fair Lump Sums under the Social Security rules. The Annuity Benefit Factor (ABF_k) represents the lifelong annual retirement benefit as a multiple of the annualized Primary Insurance Amount (PIA) for claiming age k. The Lump Sum Benefit Factor ($LSBF_k$) represents the lump sum retirement benefit as a multiple of the annualized Primary Insurance Amount (PIA) paid at claiming age k. Source: Authors' calculations based on benefit adjustment factors from Social Security Administration (2014b).

Table 4: Model Parametrization and Status Quo Claiming Ages

	Early Claimers	*Normal Claimers*	*Late Claimers*
Predetermined Model Parameters			
Risk Aversion (γ)	1.5	3	5
Time Preference (β)	0.9	0.93	0.96
Fitted Model Parameters			
Leisure Preference (α)	2.2	1.6	1.6
IES (ϕ)	0.1	0.2	0.7
Quality of Fit			
Δ Mean SQ Claiming Age (in years)	0.013	0.034	0.005

Notes: This table summarizes the model parameters used in simulation. The term **Δ** Mean SQ Claiming Age refers to the difference between the empirically-observed and model-predicted average expected *Status Quo* (SQ) claiming age. *Early Claimers* are those who claimed under the *Status Quo* before age 65; *Normal Claimers* claiming from age 65 to 67; and *Late Claimers* claiming after age 67. Source: Authors' calculations.

Table 5: Status Quo Claiming Ages: Empirical Observations vs. Model Predictions

	Full Sample			*Early Claimer*			*Normal Claimer*			*Late Claimer*		
	N	Empirical	Model	*N*	Empirical	Model	*N*	Empirical	Model	*N*	Empirical	Model
Total	*2428*	65.7 (0.054)	65.8 (0.066)	*764*	62.7 (0.038)	62.7 (0.051)	*1074*	65.9 (0.027)	65.9 (0.083)	*590*	69.4 (0.034)	69.4 (0.065)
Household Wealth												
Wealth < 50 K	*1113*	65.6 (0.081)	64.4 (0.095)	*372*	62.7 (0.053)	62.1 (0.022)	*470*	65.8 (0.04)	63.7 (0.098)	*271*	69.4 (0.05)	68.9 (0.131)
Wealth 50 - 100K	*277*	65.9 (0.154)	65.7 (0.181)	*86*	63.0 (0.128)	62.3 (0.074)	*126*	66.0 (0.084)	65.9 (0.156)	*65*	69.4 (0.105)	69.6 (0.105)
Wealth 100K+	*1038*	65.8 (0.082)	67.2 (0.088)	*306*	62.7 (0.058)	63.6 (0.103)	*478*	65.9 (0.041)	68.0 (0.07)	*254*	69.4 (0.052)	69.9 (0.022)
Benefit Level												
PIA < Median	*1214*	65.6 (0.077)	64.7 (0.091)	*406*	62.7 (0.052)	62.6 (0.074)	*512*	65.8 (0.039)	64.1 (0.106)	*296*	69.4 (0.048)	68.8 (0.122)
PIA >= Median	*1214*	65.9 (0.075)	66.8 (0.088)	*358*	62.8 (0.055)	62.8 (0.068)	*562*	66.0 (0.037)	67.5 (0.077)	*294*	69.4 (0.048)	70.0 (0)

Notes: Average empirically observed and model-predicted claiming ages (in years) for *Early Claimers* (who claimed under the *Status Quo* before age 65), *Normal Claimers* (who claimed age 65-67), and *Late Claimers* (who claimed after age 67). PIA = Primary Insurance Amount (median: $1,600). Standard errors in parentheses. Source: Authors' calculations.

Table 6: Claiming Age Differences between the Lump Sum and the Status Quo Scenarios: Empirical Observations vs. Model Predictions

	Full Sample			*Early Claimer*			*Normal Claimer*			*Late Claimer*		
	N	Empirical	Model	*N*	Empirical	Model	*N*	Empirical	Model	*N*	Empirical	Model
Total	*2428*	0.4	0.4	*764*	1.2	1.2	*1074*	0.4	0.4	*590*	-0.7	-0.5
		(0.037)	(0.027)		(0.068)	(0.055)		(0.047)	(0.033)		(0.071)	(0.034)
Household Wealth												
Wealth < 50 K	*1113*	0.4	0.1	*372*	1.2	0.1	*470*	0.3	0.5	*271*	-0.7	-0.6
		(0.055)	(0.035)		(0.099)	(0.025)		(0.074)	(0.065)		(0.098)	(0.061)
Wealth 50 - 100K	*277*	0.4	0.4	*86*	1.2	1.3	*126*	0.5	0.3	*65*	-0.6	-0.5
		(0.101)	(0.062)		(0.178)	(0.093)		(0.123)	(0.068)		(0.211)	(0.082)
Wealth 100K+	*1038*	0.4	0.7	*306*	1.2	2.4	*478*	0.5	0.2	*254*	-0.7	-0.3
		(0.058)	(0.045)		(0.11)	(0.085)		(0.07)	(0.027)		(0.115)	(0.029)
Benefit Level												
PIA < Median	*1214*	0.4	0.2	*406*	1.3	1.0	*512*	0.4	0.1	*296*	-0.9	-0.9
		(0.057)	(0.034)		(0.1)	(0.067)		(0.07)	(0.023)		(0.111)	(0.051)
PIA >= Median	*1214*	0.4	0.6	*358*	1.1	1.4	*562*	0.4	0.5	*294*	-0.5	0.0
		(0.048)	(0.04)		(0.091)	(0.086)		(0.064)	(0.057)		(0.086)	(0.007)

Notes: Average empirically observed and model-predicted claiming ages (in years) for *Early Claimers* are those who claimed under the *Status Quo* before age 65; *Normal Claimers* claiming from age 65 to 67; and *Late Claimers* claiming after age 67, for the total sample and by household characteristics. PIA = Primary Insurance Amount (median: $1,600). Standard errors in parentheses. Source: Authors' calculations.

Appendix Tables

Table A 1: Variable Descriptions for American Life Panel Online Survey

Variable Name	Variable Description	Mean	Median
Claiming Age Status Quo	Claiming Age in Status Quo Scenario	65.7	65.2
Claiming Age Lump Sum	Claiming Age in Lump Sum Scenario	66.1	66.0
Diff LSSQ	Difference between claiming age in Lump Sum and Status Quo scenario	0.4	0
Work Hours Status Quo	Weekly work hours in Status Quo scenario (0 for Claiming Age Status Quo = 62)	24.5	30
Total Work Status Quo	Years of full-time work in Status Quo scenario (0 for Claiming Age Status Quo = 62)	2.9	2.7
Work Hours Lump Sum	Weekly work hours in Lump Sum scenario (0 for Claiming Age Lump Sum = 62)	24.8	26.5
Total Work Lump Sum	Years of full-time work in Lump Sum scenario (0 for Claiming Age Lump Sum = 62)	3.0	2.9
Diff LSSQ Work	Difference (in months) between of full-time work in Lump Sum and Status Quo scenario	1.4	0
Male	= 1 if respondent is male; 0 else	0.41	0
Married	= 1 if respondent is married; 0 else	0.60	1
Age	Respondent's age	55.6	56
Education (yrs)	Respondent's years of education	14.6	14
Optimistic Life Expectancy	= 1 if respondent's subjective life expectancy is higher than his objective probability of living to target age [80, 85]; see Maurer/Mitchell/Rogalla/Schimetschek (2016a) for details	0.33	0
Wealth 50-100K	= 1 if respondent's financial wealth is between $50,000 and $100,000; 0 else	0.11	0
Wealth 100K+	= 1 if respondent's financial wealth is above $100,000; 0 else	0.43	0
Other Annuity	= 1 if respondent is/will be receiving any pension other than Social Security now/in future; 0 else	0.51	1
Benefit at Age 62	Respondent's estimated monthly Social Security benefit at age 62 ($'000)	1.195	1.159
Long Tenure (10y+)	= 1 if respondent worked for pay more than 10 yrs; 0 else	0.93	1
High Debt	= 1 if respondent would use 50%+ of additional $10,000 to pay off credit card/other debt; 0 else	0.37	0
Risk Aversion	Standardized risk aversion index (mean 0, std 1), see Maurer/Mitchell/Rogalla/Schimetschek (2016a, b) for details	0	-0.010
Long Term Planner	= 1 if respondent makes financial plans for next 5 yrs and more; 0 else	0.40	0
Risky Investing	= 1 if respondent would invest 50%+ in stocks/real estate, 0 else	0.89	1
High Expected Return	= 1 if respondent expects investment return of 7%+; 0 else	0.12	0
High Spending	= 1 if respondent would use 50%+ of additional $10,000 to spend; 0 else	0.15	0
Financial Literacy	Percentage of financial literacy questions answered correctly	0.75	1
High Political Trust	= 1 if respondent is somewhat/very confident in the Social Security's sustainability; 0 else	0.55	1

Notes: For additional details see Maurer, Mitchell, Rogalla, and Schimetschek (2016a). Source: Authors' calculations.

Table A 2: OLS Regression of Expected Status Quo Claiming Age on Controls

Male	0.0322
	(0.115)
Married	-0.339***
	(0.112)
Age	-0.0399***
	(0.00705)
Education (yrs)	0.138***
	(0.0227)
Optimistic Life Expectancy	1.009***
	(0.114)
Wealth 50-100K	0.0799
	(0.173)
Wealth 100K+	-0.000383
	(0.139)
Other Annuity	-0.551***
	(0.109)
Benefit at Age 62	-8.52e-05
	(0.000146)
Long Tenure (10y+)	0.188
	(0.234)
High Debt	0.0936
	(0.112)
Risk Aversion	0.227***
	(0.0550)
Long Term Planner	0.230**
	(0.110)
Risky Investing	0.304*
	(0.175)
High Expected Return	0.225
	(0.164)
High Spending	-0.517***
	(0.156)
Financial Literacy	0.473**
	(0.188)
High Political Trust	-0.132
	(0.108)
Constant	65.37***
	(0.524)
Observations	2,428
R-squared	0.119

Notes: The dependent variable is the expected *Status Quo* claiming age. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Missing values controls included. Source: Authors' calculations.