ST. JOHN'S UNIVERSITY

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School of Risk Management, Insurance, and Actuarial Science

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SRM Working Paper Series
No. 1

October 2018

School of Risk Management, Insurance, and Actuarial Science
101 Astor Place | New York, NY 10003

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Version of October 18, 2018

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, particularly 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.

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Abstract

Many Americans claim Social Security benefits early, though this leaves them with lower benefits throughout retirement. We build a lifecycle model that closely tracks claiming patterns under current rules, and we use it to predict claiming delays if, by delaying benefits, people received a lump sum instead of an annuity. We predict that current early claimers would defer claiming by a year given actuarially fair lump sums, and the predictions conform with respondents' answers to a strategic survey about the lump sum. Moreover, many people would still defer claiming even for smaller lump sums.

Keywords: Retirement, annuity, delayed claiming, pension, early retirement, Social Security
JEL Codes: G11, G22, H55, J26, J32

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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 their old-age annuity payments as much as 75 percent. Despite the fact that lifelong benefits rise for delayed retirement, more than half of American retirees claim their benefits before their so-called "full retirement age" (of 66/67), and all but a handful claim before the latest possible claiming age of 70 (Social Security Administration 2017, Table 6. B5). High take-up rates for early benefits are surprising to some, inasmuch as many Americans have accumulated substantial wealth in defined contribution pensions (Poterba 2014) which they could live on while building higher Social Security benefits.[1] Moreover, delaying Social Security benefits to receive a higher inflation-adjusted lifetime annuity provides a better financial deal than is available on the private insurance market. Why retirees claim their benefits young, and what financial incentives might induce them to delay claiming without making them worse off, are topics of keen interest to policy reformers and deserving of additional research attention.[2]

This paper contributes to the literature on both lifecycle portfolio choice and Social Security claiming patterns. To this end, we develop and calibrate a structural model of saving, consumption, and claiming behavior using a novel survey that includes hypothetical questions

[1] Additionally, Goda, Shoven, Ramnath, and Slavov (2017) 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.

[2] Some prior studies have examined retirement or claiming patterns under current Social Security rules (e.g., Coile, Diamond, Gruber, and Jousten 2002; Gustman and Steinmeier 2005, 2015; Hubener, Maurer, and Mitchell 2016; Shoven and Slavov 2014; Yin 2015), and research examining workers' decisions to claim company pensions include Chalmers and Reuter (2012). The present paper, however, is the first to cast this decision in a fully calibrated life cycle model and test predictions out of sample.

permitting us to identify key preference parameters.[3] Our "strategic survey" questions are fielded in a nationally representative online survey of U.S. residents in the American Life Panel (ALP), where we ask people when they plan to claim benefits under the system's current rules. 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 peoples' claiming ages reported in the survey under the *status quo*. Next, we use our model to simulate how optimal claiming behavior would change if the same people were provided with a policy alternative which gave them their delayed benefits as a *lump sum*. These lump sums are designed to be actuarially fair, so that altering the form of payments has no impact on the Social Security system's solvency. We also compare our model predictions with how survey respondents say that they would change their claiming ages if offered the lump sum treatment, and the results are very close. In other words, our model of rational utility-maximizing consumers with realistic preference parameters not only matches claiming patterns under current Social Security rules, but it does a good job of predicting potential responses to the lump sum policy alternative. Of most interest is the finding that the lump sum incentive would result in delayed claiming, especially by those who claim early under the *status quo*. We conclude with a discussion of the welfare effects of this potential reform as well as a smaller lump sum that could improve the Social Security system's solvency.

This is not the first study to suggest that lump sum benefits could be substituted in place of the delayed Social Security retirement credit. Using a non-representative survey of 176 respondents at the San Francisco International Airport and Giants baseball stadium, Fetherstonhaugh and Ross (1999) asked people if they would defer claiming their Social Security

[3] A similar approach is taken by Ameriks, Caplin, Laufer, and van Nieuwerburgh (2011) who use responses to hypothetical survey questions to calibrate key preference parameters in their structural model of long-term care and bequests.

benefits from age 65 to 68 if doing so would result in increased lifelong benefits (an annual benefit of $10,000 for life from 65 onwards, versus $12,500 for life if claimed at age 68), versus a second case where the delay would result in the same lifelong annual benefit amount plus a lump sum payment (an annual benefit of $10,000 for life from 65, versus $10,000 for life if claimed at 68 plus a lump sum of $25,000). While those lump sum amounts were not actuarially fair, three-quarters of the respondents preferred the lump sum option. A different study asked a representative sample of Americans how they would respond to an actuarially fair lump sum (Maurer, Mitchell, Schimetschek, and Rogalla 2017a); in that survey, a large fraction of people responded that this would induce them to claim later, particularly among those who would take benefits early under the *status quo*. Nevertheless, that analysis did not build and calibrate a theoretical model of the claiming decision which could be used for policy analysis. Finally, a prior theoretical study (Chai, Maurer, Mitchell, and Rogalla 2013) developed a lifecycle model of rational consumers who might defer Social Security if offered a lump sum payment instead of higher lifetime benefits, but that analysis did not calibrate the model to empirical data as we do here nor compare simulated outcomes with strategic survey responses.[4]

Accordingly, in what follows we bring together these strands in the literature by developing a lifecycle model in which individuals optimally select their consumption, saving, work effort, and Social Security benefit claiming ages, and we calibrate it using key parameters generated from our strategic survey that allows us to identify key behavioral parameters. We begin with 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. We also discuss the

[4] There is also behavioral research evaluating whether providing prospective retirees with additional information could enhance people's understanding of Social Security claiming rules (Mastrobuoni, 2011; Liebman and Luttmer, 2015). Kostøl and Mogstad (2014) focus on individuals receiving disability benefits rather than regular retirement benefits as we do here. Other authors have examined alternative ways to encourage deferred retirement (Laitner and Silverman, 2012), but they did not evaluate the Social Security lump sum alternative we explore here.

implied returns attainable when delaying claiming benefits. The next section describes our life cycle model framework. Then we describe the survey from which we derive key preference parameters, and the following section compares model-predicted claiming behavior with the survey outcomes. Subsequently we show how the model replicates claiming age intensions under the lump sum alternative. Last, we study the sensitivity of claiming ages to the level of lump sum benefits and describes welfare outcomes, followed by concluding remarks.

Social Security Mechanics, Claiming Options, and their Financial Implications

In the United States, 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.[5]

Currently, eligible workers may claim their old-age benefits at any age between 62 and 70.[6] 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

[5] See also Social Security Administration (2017) and Shoven and Slavov (2012, 2014).

[6] 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.

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.

The current Social Security mechanics can be reframed as follows from the perspective of an individual age 62 contemplating whether to claim immediately or delay benefits: he can claim at age 62 and receive his reduced benefit for life, or he can delay claiming for one or more years, 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).[7] Delaying to age 70 would boost his annual benefit from the initial $10,000 to $17,714.

< *Table 1 here*>

An alternative policy that we examine in this paper would offer each worker a deferred benefit in the form of an actuarially fair lump sum for deferring claiming, plus his age 62 benefit from the later benefit start date onward.[8] For instance, under the *Lump Sum* approach, the example individual upon claiming would receive his baseline amount of $10,000 for life plus the cash value of his benefit increase. Using the Social Security system's parameters, the lump sum for delaying claiming to age 63 would amount to $11,556.[9] 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 life cycle perspective, therefore, deciding when to claim benefits is a financial decision where the individual forgoes current benefits in exchange for higher future benefits. To illustrate the implications of this choice, we again consider the example 62-year old

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

[8] A related proposal was recently offered by Rep. Sam Johnson, chairman of the US House Social Security Subcommittee; see Biggs (2016).

[9] This is calculated based on Social Security's 2013 Trustees Report mortality table for the 1951 birth cohort 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, 2014).

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.[10] By contrast, under the *Lump Sum* alternative, the foregone benefit at age 62 of $10,000 buys him a 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 is valuable under both scenarios.

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 the *Status Quo* regimes. This is because each person's valuation of the tradeoff will also depend on his preferences with respect to time, leisure, elasticity of intertemporal substitution, and risk tolerance, as well as his subjective survival expectations. Additionally, people could face liquidity constraints, so they might need to work longer to subsist during the delay period, reducing utility.[11] To this end, we must build a model and calibrate it to determine how individuals might respond to the opportunity to have the higher benefit from delaying claiming paid as a lump sum.

The Model

Next we develop a theoretical model of rational agents who optimally choose lifecycle consumption and work effort trajectories. In this section, we build a discrete-time lifecycle model for individuals maximizing Epstein-Zin (1989) utility over a composite good of consumption and

[10] This computation relies on Social Security's mortality table for the cohort 1951, converted to a unisex table (see footnote 9). For returns from delaying claiming using sex-specific mortality rates and assuming a FRA of 66, see Hubener, Maurer, and Mitchell (2016).
[11] For an empirical and theoretical analysis of how later claiming ages influence older workers' employment prior to retirement see, e.g., Hairault, Langot, and Sopraseuth (2010).

leisure.[12] Given their initial endowments of financial wealth, we posit that they optimally choose consumption, saving, and work effort trajectories, as well as the optimal claiming age for Social Security benefits under current rules. Individuals are modeled from age 62 ($t = 1$) to age 100 ($T = 39$), assuming that people have a time budget of 100 hours per week (Chai, Horneff, Maurer, and Mitchell 2011). Between ages 62 and 70, people 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.

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

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

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 reduced according to current US tax laws to yield net annual income NAI_t.[14]

[12] Such a preference specification is parsimonious in the number of parameters, contains the traditional CRRA function as a special case, and offers good properties when matching model outcomes to empirical data; see for example Inkmann, Lopes, and Michaelides (2011).

[13] Cocco, Gomes, and Maenhout (2005), among others, show that labor income exhibits a hump-shaped profile over the work life, 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) to derive NAI_t (see Internal Revenue Service 2014). 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).

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 stream of Social Security annuity payments (AB_k) for life plus a single lump sum (LSB_k) as of that age. This is calculated as:

$$AB_k = ABF_k \cdot PIA,$$

$$LSB_k = LSBF_k \cdot PIA, \qquad 2)$$

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, 2014). 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).

< Table 3 here >

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

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

s.t.

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

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

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:

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

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

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

where E_t is the expectation operator. The model distinguishes 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. The value function depends on a set of preference parameters including the preference for leisure α, the time preference rate β, the elasticity of intertemporal substitution ϕ, and the coefficient of relative risk aversion γ.[16] Calibrating these parameters is the objective of the next two sections.

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. As is conventional, we solve the optimization problem using backward induction over a discretized state space. Using the optimal life cycle policies, we then derive the expected model-based claiming behavior by

[16] Our preference specifications with separate parameters for the elasticity of intertemporal substitution ϕ and the coefficient of relative risk aversion γ allow us to disentangle the effects from consumption smoothing across states and time. This property of the utility function is valuable when deciding on whether to claim or delay Social Security benefits.

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.

Survey Evidence on Claiming Behavior

To evaluate how individuals evaluate alternative claiming patterns under Social Security, we built and fielded a survey using RAND's online American Life Panel (ALP). Our nationally representative sample consists of 2,428 respondents age 40-70, for whom we first compute each respondent's anticipated monthly Social Security benefit if he were to claim at each age from 62 to 70 based on his own earnings history and the *status quo* rules.[17] Using this individualized information, each respondent was then asked to report his expected claiming age (i.e., the *Status Quo* claiming age). Next, we presented each respondent with the benefit alternatives under the *Lump Sum* scenario, again tailored to his own earnings history, and then we asked him to report his expected claiming age under the new option. In the latter 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 his delayed retirement credit. In addition, our survey module gathered information on financial wealth, preferences, and risk attitudes.

The specific questions posed under the *Status Quo* set of rules were as follows:

> In the next few questions, we are going to ask you to make a number of choices about Social Security benefits. Please assume that all amounts shown are after tax (that is, you don't owe any tax on any of the amounts we will show you). Think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

[17] We generated PIA estimates for each respondent by asking a series of questions on the respondent's earnings history which was then fed into the benefit calculator on the Social Security's website.

For the sake of these questions, **assume that you are currently age 62 and single**[18]. You are thinking about when to claim your Social Security benefit.

The Social Security system allows you to claim your benefit anytime between age **62** and **70**. On average, the Social Security system will neither lose nor make money no matter when people claim their benefit. If you claim your benefit at age **62**, you will receive an estimated monthly amount of ${*SocSec62benest*}[19] for life.

Please answer the following questions about the choice you would make:

Now imagine you have the following choice:

Either

- You can claim your Social Security benefit at age **62** and receive that $ {*SocSec62benest*} monthly payment for life.

Or

- You can claim your Social Security benefit at a later age and receive a **higher monthly payment** from that age on for life.

Assume that you are free to choose your work effort (hours per week) until you claim your benefit. Based on this information, at what age would you plan to claim your Social Security benefit?

Having been informed about what his benefits would be under the current rules, each respondent then would click his mouse on a scale representing the array of claiming ages in monthly steps from age 62 to age 70. Upon clicking, he was then shown his selected claiming age as well as the corresponding monthly benefit payable for life from that age forward. He then had the opportunity to submit that response or change and submit a new response.[20]

Next we asked each respondent about his expected claiming age under the lump sum scenario. [21] For instance, in the *Lump Sum case*, if the individual deferred claiming from age 62,

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[18] That is, we specifically instructed respondents to assume that they were single, to limit the survey to primary old-age benefits.

[19] The variable {*SocSec62benest*} represents our estimate of each respondent's estimated lifelong monthly social security benefit when claimed at age 62. We calculated this by adjusting his PIA back to age 62 from his FRA, using the appropriate adjustment factors which depend on his year of birth (see http://www.ssa.gov/oact/quickcalc/earlyretire.html). If a respondent indicated he believed he would never receive Social Security because of a short earnings history (fewer than 10 years), we used HRS data to impute to him a PIA for someone with similar age, sex, and education, and marital status (as in Brown, Kapteyn, Luttmer, and Mitchell 2016). If the respondent indicated he thought that the system would not be around to pay him benefits, we asked him to assume it would, for the purpose of the analysis.

[20] For survey screenshots see Figures OA1-4 in Maurer, Mitchell, Rogalla, and Schimetschek (2017b).

[21] Specifically, the lump sum was calculated as the actuarial present value at the claiming age of the increase in lifelong monthly retirement benefits (based on cohort-specific FRA factors according to the current Social Security rules) over the lifetime benefits received when claiming at age 62 (or at the FRA in case of the *Delayed Lump Sum* scenario). Annuity factors used the mortality probabilities in the Social Security's Trustees Report (SSA 2013), transformed into unisex rates assuming 1,000 females for 1,050 males in every birth cohort (Bell, Bye, and Winters 2008). We converted yearly to monthly rates assuming a constant number of deaths per months (i.e. uniform

he would receive a lump sum at his later claiming date plus monthly benefits in the amount of his age-62 benefit from that date onward for life. The following questions elicited the desired claiming age under this alternative scenario:

> Next we would like to show you some different questions about Social Security claiming choices. As before, please assume that all amounts shown are after tax, and think of any dollar amount in terms of what a dollar buys you today. Again, on average, the Social Security system will neither lose nor make money no matter when benefits are claimed.
>
> Please continue to assume that you are currently age 62 and single. You are still thinking about when to claim your Social Security benefit.
>
> Now, imagine that you had the following choice:
> **Either**
> - You can claim your Social Security benefit at age **62** and receive that ${*SocSec62benest*} monthly payment for life.
>
> **Or**
> - You can claim your Social Security benefit at a later age and receive the same monthly payment of ${*SocSec62benest*} from that age on for life, **plus an additional lump sum payable at that later claiming age**.
>
> Assume that you are free to choose your work effort (hours per week) until you claim your benefit. Based on this information, at what age would you plan to claim your Social Security benefit?

Again, the respondent was shown his bespoke monthly benefit and lump sum amount corresponding to the claiming age selected, and then he could submit or change his selection.

Table 2 reports sample means and standard errors for claiming ages under the *Status Quo* and the *Lump Sum* alternative, along with summary data on survey respondents' financial wealth and PIAs. These values are presented for the full set of respondents, as well as for three subgroups of respondents disaggregated according to their *Status Quo* claiming ages: the *Early Claimers* indicating an expected claiming age below age 65 (N = 764); the *Normal Claimers* with an expected claiming age from 65 to 67 (N = 1074); and the *Late Claimers* who expected to claim after age 67 (N = 590). The expected Status Quo claiming age for the full sample averaged 65.7, a bit higher than current actual claiming ages: that is, the mean claiming age in 2016 for

distribution of deaths). The interest rate to discount future payments was set at 2.9% p.a. in accord with the Social Security's Trustees Report interest rate for the intermediate cost scenario (SSA 2013).

men (women) was 64.6 (64.5) as reported by the Social Security Administration (2017: Table 6.B5). This may be reasonable as our sample is relatively young and there has been a steady upward trend in claiming ages for the last two decades (Munnell and Chen 2015). Additionally, the high correlation between planned and realized claiming ages in the Health and Retirement Study reported by Brown, Kapteyn, Mitchell (2016) supports the view that our respondents' indicated claiming ages will align with their actual claiming behavior.

<Table 2 here>

Table 2 shows that *Early Claimers* have lower mean financial wealth and PIAs ($83,910 and $1,590) than do *Normal Claimers* ($94,710 and $1,690). Nevertheless, on average, early claimers have sufficient assets to support delayed consumption and deferred claiming for at least a few years under the *status quo,* if they wished to do so. Mean financial wealth and PIAs are not significant different between the *Late* and the *Normal Claimers.*

Table 2 also shows that the *Lump Sum* offering prompts deferred claiming among both *Early* and *Normal Claimers*. Specifically, *Early Claimers* reported a baseline mean expected claiming age of 62.72 under the *status quo*, but under the *lump sum* treatment, their mean claiming age would rise substantially, by about 1.2 years to age 63.89. Also for *Normal Claimers,* the mean claiming age rises, by about 0.4 years. Both of these increases in claiming ages are highly statistically significant. By contrast, *Late Claimers* indicate that they would claim earlier by about 0.7 years, from 69.43 to 68.74. In other words, in the survey, the *Lump Sum* policy would boost claiming ages for most individuals, but not for those intending to claim very close to age 70.

In sum, trading an annuity increase for a lump sum has the largest impact on delayed claiming for those who, under the current rules, would take their benefits before or at the Full

Retirement Age. Since more than half of Americans today claim their benefits prior to their "full retirement age," this type of lump sum policy would appear to be quite appealing to many.

Calibrating Preference Parameters to Match Status Quo Claiming Behavior

Next we use the strategic survey results to help us calibrate key preference parameters for leisure and time preference, risk aversion, and willingness to shift consumption across time. Two of the necessary parameters, risk attitudes and time preferences, are informed by responses to module questions. Specifically, we evaluate risk tolerance based on a standardized index using respondents' answers to six survey questions regarding their willingness to take risk (as in Maurer, Mitchell, Rogalla, and Schimetschek, 2017b). We are also able to distinguish more patient from less patient individuals: the former indicated they had relatively long planning horizons, while the latter indicated they had shorter horizons (i.e., some stated they used a 5+year planning period when making financial decisions, while others used fewer than five years). Impatient individuals also indicated they would immediately spend most of a $10,000 windfall if it were available.

There is an important degree of dispersion in baseline claiming ages: that is, claiming ages were higher for the more patient and risk-averse respondents, while the less patient and risk-preferring respondents opted for earlier claiming ages. In particular, the correlation coefficient between the *Status Quo* claiming age and the risk aversion index was positive and significant (0.143), implying that more risk averse individuals prefer to claim later, so to receive the additional longevity protection afforded by the higher Social Security benefit paid at later ages. The claiming age and the long-term planner indicator were also positively and significantly correlated (0.067), whereas the High Spending variable was negatively and statistically significantly correlated with the *Status Quo* claiming age (-0.091). In other words, impatient respondents were more likely to claim their benefits at earlier ages.

These directional correlations inform our choice of risk aversion and time preference parameters used in the calibration, since forcing a single, common risk aversion and time preference parameter on all respondents will not replicate the empirical distribution of claiming ages. For this reason, we assigned distinct risk and time preference parameters to each of the three claiming age subgroups identified above. 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 (e.g., Cocco, Gomes, and Maenhout 2005; Wachter and Yogo 2010; and Cocco and Gomes 2012).

We had less guidance to pin down leisure preference and intertemporal elasticity of substitution (IES) parameters using survey questions. For this reason, we used a moment-matching approach[22] to derive optimal parameter sets that match the model's predictions on claiming ages with the survey responses under the *Status Quo* scenario. 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 was chosen to minimize

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

the squared distance between the simulated model-based expected claiming age and the expected claiming age in the survey data under the status quo.

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 $\alpha = 2.2$ and $\phi = 0.1$ for *Early Claimers*; for *Normal Claimers* when the leisure preference and IES are $\alpha = 1.6$ and $\phi = 0.2$; and for *Late Claimers* the best fitting $\alpha = 1.6$ and $\phi = 0.7$.[23] 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 will generally have to work longer in order to finance consumption during the delay period. Accordingly, individuals who optimally claim late will exhibit lower leisure preferences. As discussed in the first section, claiming later is an investment that trades off current income and consumption in exchange for higher future income and consumption. Therefore, claiming later is

[23] Our IES estimates align reasonably well with those reported in the literature. For instance, an international meta-analysis by Havranek, Horvath, Irsova, and Rusnak (2015) reported a mean IES of 0.594 for the US across many studies though the coefficient is lower when analysis is limited to models using Epstein-Zin preferences (Havranek 2015). Our leisure preference parameter is also in line with prior studies such as Chai, Horneff, Maurer, and Mitchell (2011) who reported that α=1.3 described the aggregate claiming age distribution over time. Low (2005) used an effective leisure preference parameter of α=1.5, while Laitner and Silverman (2012) used α=1.78. In particular, Low (2005) used the specification $C^{0.4}L^{0.6}$ for the composite consumption and leisure function, and Laitner and Silverman (2012) used $C^{0.36}L^{0.64}$. As strictly monotonic transformations are order-preserving, these specifications correspond to $C^{1}L^{1.5}$ and $C^{1}L^{1.78}$, respectively.

optimal for those most willing to shift consumption ahead in time, which requires a higher intertemporal elasticity of substitution.

It is also of interest that there is a negative association between risk aversion and the other parameters. That it, those who are impatient, love leisure, and are not particularly responsive to the returns to delaying consumption, also prefer risk more. This is plausible in that mortality is the primary source of risk in our model; accordingly, the risk of living long can best be handled by delaying claiming to receive a higher deferred Social Security annuity.

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). As noted above, there was no clear-cut empirical relationship between wealth or benefit levels and expected claiming ages, but 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 given 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 to continue working and generally results in later claiming. The two effects appear to balance for *Early Claimers*, as model-based claiming ages are very similar for 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.

Predicted vs Empirical Claiming Behavior under the Lump Sum Policy

Having calibrated our model so that it matches *Status Quo* claiming age results in the survey, we next evaluate how the *Lump Sum* approach would change expected claiming ages using out-of-sample model predictions. These results can then be compared with survey responses. To this end, 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.[24] The life cycle paths for each individual in the ALP survey are simulated using that person's the optimal controls. Results are presented in Table 6, which reports 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 >

A key finding is that the model-generated claiming ages under the *lump sum* approach are remarkably similar to those reported by survey respondents when asked to predict their own claiming ages under the reform. It should be emphasized that the model calibration was based entirely on the *Status Quo* evidence and did not use the survey data for the *Lump Sum* scenario. In

[24] 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.

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 increase of 0.4 years, and for *Later Claimers* a decrease of 0.5 years. That is, the model underestimates the average expected claiming age increase for *Early Claimers* in the survey by less than 3 days, and for *Normal Claimers* by 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.

When we disaggregate results by wealth, the survey data reveal no significant impact of financial endowments on changes in 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. Accordingly, such households will 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.

We conclude this section with a brief analysis of the welfare implications of offering actuarially fair delayed claiming lump sums. To this end, we determine the windfall payment required under the *Status Quo* at age 62 that would provide the individual with the same lifetime utility as achieved under the Lump Sum scenario. That is, for each individual i, we are interested in ΔW_i such that $V_{1,i}^{LS}(W_{1,i}) = V_{1,i}^{SQ}(W_{1,i} + \Delta W_i)$, where V is the value function in Equation (5). Positive (negative) values of ΔW_i imply that the Lump Sum alternative provides a welfare gain (loss).

Across the full sample, the median change in welfare (in $000) is equal to 0.0, with a standard deviation of 23.1. Hence the policy reform overall is welfare neutral, though there is, of course, substantial heterogeneity across individuals. For example, there is a moderate median welfare gain of 1.28 for the 764 *Early Claimers*. Given their relatively high discount rate for future consumption and low aversion to the risk of outliving their liquid wealth, this subgroup values higher consumption early in retirement which can be supported by the delayed retirement lump sum payment. For the larger (1074) subgroup of *Normal Claimers*, there is a small median welfare loss of 0.5. The smallest (590) subgroup of *Late Claimers* experiences significant median welfare losses of 19.3, since with their low time discounting and high risk aversion, these individuals value stable old-age consumption patterns generated by increased annuitized income under the *Status Quo,* rather than by lump sum payments in exchange for delayed claiming of Social Security benefits.

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

Thus far, we have shown that our calibrated model implies an average delay in claiming Social Security benefits under the *Lump Sum* regime of just under half a year, yet increases amount to 1.2 years for current *Early Claimers*. We next turn to the question of how sensitive claiming decisions might be to the level of lump sum benefit offered. While the ALP survey only solicited new claiming ages assuming actuarially fair lump sums, we can use the calibrated lifecycle framework to predict changes in claiming in response to 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.[25]

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 less-generous lump sums are provided, this barely changes expected claiming ages for a reasonable range: only for levels below 93 percent of the actuarially fair value do we see any meaningful 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. Thereafter, if the level declined much more, there would be 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.

< *Figure 2 here*>

An interesting "tipping point" occurs when the lump sum amounts to around 87 percent of the actuarially fair level.[26] In this range, the expected claiming age drops to the average expected

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[25] Though we are not advocating this for Social Security, many retirement 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 over half of the US military officers offered them (and more than 90 percent of enlisted personnel). The City of Philadelphia has also considered lump sum buyouts worth about half of the annuity values to help solve the city's substantial pension underfunding problem (Ballantine, 2016). The *Lump Sum* Social Security option may be attractive at a less than actuarially fair level given substantial policy uncertainty regarding future Social Security (Luttmer and Samwick 2018). In fact, Brown, Kapteyn, Luttmer, and Mitchell (2016) asked people directly how much they would be willing to pay for $100 additional Social Security income, and the vast majority of respondents indicated values much below the actuarially fair amount.

[26] 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 over half of the US military officers offered them, and more than 90 percent of enlisted personnel.

Status Quo claiming age in our empirical survey (dotted line in Figure 2). Obviously a 13 percent reduction in the lump sum would have welfare effects, as it would reduce lifetime consumption. Nevertheless, the fact that people would delay claiming for a lump sum up to 13 percent below the fully actuarially equivalent indicates the range over which benefit claiming ages could be induced to rise.[27]

Conclusion

We have developed a lifecycle model in which individuals optimally select their consumption, saving, work and effort, which includes a rich variety of institutional details including taxes and Social Security rules regarding benefit claiming ages. We calibrate it using key parameters generated from a novel survey instrument that includes hypothetical questions permitting us to identify key behavioral parameters. This provides the basis for us to simulate expected retirement benefit claiming behaviors under current Social Security rules, and we show that our rational life cycle model closely replicates observed claiming outcomes. Specifically, this 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.

Next we use the model to simulate how people would alter their claiming behavior if a portion of their Social Security benefits – the part currently paid as an additional lifetime annuity beyond that payable at age 62 – were exchanged for an actuarially fair lump sum. Unlike studies

The City of Philadelphia has also considered lump sum buyouts worth about half of the annuity values to help solve the city's substantial pension underfunding problem (Ballantine, 2016). Moreover, the *Lump Sum* option may be attractive even at a less than actuarially fair level, given substantial policy uncertainty regarding future Social Security (Luttmer and Samwick 2018).

[27] An analysis conducted under the auspices of the AARP (Mitchell and Maurer 2017) using a microsimulation model implied that the Lump Sum would not alter the Social Security system's solvency markedly, nor would it change poverty rates. Moreover the low and middle income groups would accumulate higher nest eggs under the Lump Sum option. This is an interesting result inasmuch as lower-paid individuals are more likely to value the additional assets in retirement. Accordingly, the Lump Sum reform outlined here could have positive distributional consequences overall without costing the system more money.

that calibrate models to empirical data and subsequently conduct simulation analyses for policy purposes, we are able to compare the "out of sample" model predictions to what people say they would actually do, since our survey also elicited claiming changes in the event of such a reform. The Lump Sum reform would generate an increase in the average claiming age of 0.41 years if respondents were offered the actuarially fair lump sum, and interestingly, this simulated response is remarkably similar to the average increase of 0.39 years reported in the survey. Not only does the model predict the average claiming age response to lump sum incentives reasonably well on aggregate; it also does so for subgroups. In particular, it correctly predicts that those claiming early under the current rules would be the ones to claim by over a year later when offered the lump sum. As an additional policy exercise, we study the claiming age sensitivity to less generous lump sum amounts. We find that simulated claiming ages are still higher than under the *Status Quo* for lump sums worth about 13 percent less than the actuarially fair value. Thus our contribution is to develop and calibrate a theoretical life cycle model using experimental evidence, to predict out-of-sample responses to reforms similar to those actively being debated by US policymakers.

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 many to delay claiming by as much as a year, without needing to rely on benefit cuts to get them to do so.

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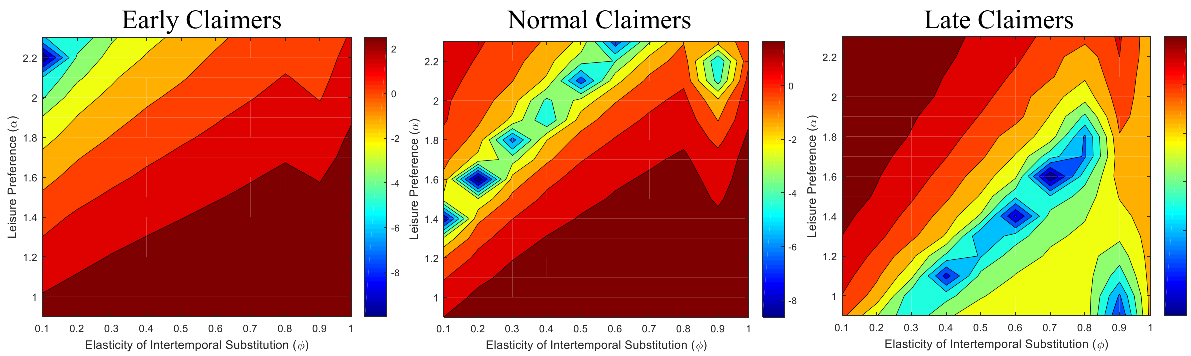
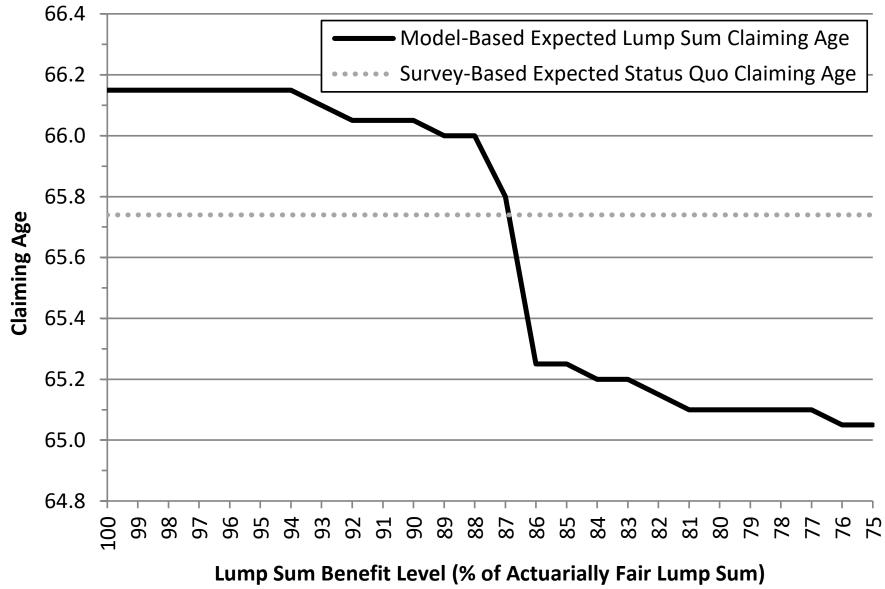
Figure 1: Preference Parameter Calibration: Minimizing the Divergence between Model and Empirical Claiming Ages



Notes: For each claiming age group, the figures report 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 an 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

	Benefit Streams				Implied Returns	
Claiming Age	*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 Social Security annual benefit at 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: Authors' calculation based on benefit adjustment factors reported in Social Security Administration (2017).

Table 2: ALP Survey Results (Means) for Claiming Age under the *Status Quo* and the *Lump Sum* Scenarios

	(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) 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. Since our wealth variable in the survey asked for household wealth categories, we derived continuous values by assigning a value of $250,000 to those respondents who answered "$250,000 or more," a value of $100,000 to those who answered "at least $100,000 but less than $250,000," a value of $50,000 to those who answered "at least $50,000 but less than $100,000," a value of $10,000 to those who answered "at least $10,000 but less than $50,000," a value of $1,000 to those who answered "at least $1,000 but less than $10,000," and a value of $500 to those who answered "less than $1,000." Couples' wealth is converted to single values by dividing by two. The sample size here is slightly reduced from that in Maurer, Mitchell, Rogalla, and Schimetschek (2017a) due to the omission of 23 cases (<1 percent) lacking wealth information; average claiming ages are the same. Standard errors in parentheses. 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 paid at claiming age k. Source: Authors' calculations based on benefit adjustment factors from Social Security Administration (2017).

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: Data vs. Model Predictions

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

	Full Sample			*Early Claimer*			*Normal Claimer*			*Late Claimer*		
	N	Data	Model	*N*	Data	Model	*N*	Data	Model	*N*	Data	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 full sample as well as by household characteristics. PIA = Primary Insurance Amount (median: $1,600). Standard errors in parentheses. Source: Authors' calculations.