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SOCIAL SECURITY CLAIMING INTENTIONS: PSYCHOLOGICAL OWNERSHIP, LOSS AVERSION, AND INFORMATION DISPLAYS

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ABSTRACT

For many Americans the question of when to claim Social Security benefits is one of the most consequential financial decisions they will ever face. While acknowledging that individuals differ in terms of optimal timing for starting Social Security benefits, many economists argue that an average person would benefit from delaying claiming as long as they could. Yet this is not what average Americans do. Many more Americans claim as soon as possible, at age 62, rather than as late as possible, at age 70. Why? This paper focuses on individual differences in beliefs and values that influence Social Security claiming intentions. As expected from economic theory, individual differences in life expectations and degree of patience for later larger payouts relate to claiming intentions. In addition, however, we also find that individual differences in psychological ownership of one's Social Security benefits and individual differences in degree of loss aversion are both significant predictors of Social Security claiming intentions. Further, we find that an "enriched" information display manipulation (nudge) that emphasizes longer-term consequences of late claiming leads to earlier, not later, claiming intentions, and that the size of this effect is related to individual differences in the degree of loss aversion.

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Abstract

For many Americans the question of when to claim Social Security benefits is one of the most consequential financial decisions they will ever face. While acknowledging that individuals differ in terms of optimal timing for starting Social Security benefits, many economists argue that an average person would benefit from delaying claiming as long as they could. Yet this is not what average Americans do. Many more Americans claim as soon as possible, at age 62, rather than as late as possible, at age 70. Why? This paper focuses on individual differences in beliefs and values that influence Social Security claiming intentions. As expected from economic theory, individual differences in life expectations and degree of patience for later larger payouts relate to claiming intentions. In addition, however, we also find that individual differences in psychological ownership of one's Social Security benefits and individual differences in degree of loss aversion are both significant predictors of Social Security claiming intentions. Further, we find that an "enriched" information display manipulation (nudge) that emphasizes longer-term consequences of late claiming leads to earlier, not later, claiming intentions, and that the size of this effect is related to individual differences in degree of loss aversion.

Introduction

The average American worker in his or her early 60s, having completed thirty or more years of employment, faces one of the most challenging financial decisions of a lifetime: when, between ages 62 and 70, to start claiming Social Security Administration (SSA) retirement benefits. This is an important decision; the average retiree in America receives a majority of their retirement income from Social Security benefits and 40% of Americans aged 55 to 64 have no retirement savings at all, making them almost entirely dependent on SSA income (Porell and Bond, 2020). Given its importance, there has been significant research on what people should do and when they should optimally claim. While individual differences and life uncertainties are well recognized, much of the advice has been to delay Social Security claiming as long as possible (i.e., until age 70). However, this is not what most Americans do. Instead, more than half claim before their Full Retirement Age (FRA) of 66-67, and far fewer claim later. Why?

This paper reports on research conducted over the past decade aimed at better understanding the psychology of the Social Security claiming decision. In particular, we focus on two psychological variables, sense of ownership of one's Social Security benefits and relative concern with losses versus gains (loss aversion), and how individual differences in those two measures relate to differences in Social Security claiming intentions. In addition, we explore how other individual difference factors, such as subjective life expectations, time discounting (degree of patience), and a variety of other demographic and belief differences, relate to Social Security claiming intentions. [1]

[1] The research reported in this paper was all conducted prior to the outbreak of the COVID-19 pandemic. The impacts on Social Security claiming from the pandemic are still unknown, although the fall 2020 SSA Trustees report documents no increase in early retirement claiming or disability claiming and suggests that effects will be minor over their 75 year projection period, with most effects recovered by 2023.

After building an understanding of why people differ in claiming intentions, and why most prefer to claim earlier rather than later, we also explore what might be done to "nudge" individuals (Thaler and Sunstein, 2009) towards delaying claiming, or more generally towards better decisions given their individual situations. In doing so, we take into account psychological heterogeneity by exploring how the effectiveness of a nudge, such as changing how information is displayed, may interact with individual psychological differences like degree of loss aversion.[2]

To preview some of the major results to be reported, we find the following: The stronger one's sense of psychological ownership of one's Social Security benefits, the sooner one intends to claim. The more loss averse one is, the earlier he or she intends to claim. Also, as might be expected, longer subjective life expectations and greater patience to receive greater rewards are both predictive of an individual's later claiming intentions. Further, the relationship between life expectations and claiming intentions is stronger if the life expectation questions posed to an individual are framed in a "live-to" rather than a "die-by" format. An experimental manipulation that provides cumulative payout information in addition to monthly payment differences, which has been previously shown to encourage increased intention to purchase a life annuity (Shu, Zeithammer, and Payne 2016), has the opposite effect on Social Security claiming intentions as it does with annuity choices. The impact of this cumulative payout table presentation is amplified for those individuals with greater degrees of loss aversion.

[2] While large-scale attempts to change claiming ages through legislation are possible (e.g., changing the early claiming age from 62 to 64), the nudge approach advocated by Thaler and Sunstein (2009) is less heavy handed and avoids restrictions to freedom of choice. This is especially valuable in the case of SSA claiming where individual differences play such an important role in determining what is most optimal per individual. That is, while we will focus on interventions to encourage delayed claiming, we recognize this is not the goal for everyone.

We begin with some background on the Social Security claiming decision and why many people advocate that most, but not all, retirees should delay claiming. While the Social Security claiming decision may be one of the most important financial decisions that most Americans make, and it has been given significant attention in economic research, very little psychological research has been conducted on this topic. We review this existing literature and then propose a set of psychological measures that will allow us to extend our understanding of this crucial financial decision.

The Claiming Decision

For individuals born after 1960, the full retirement age (FRA) for claiming SSA benefits is age 67. Claiming after age 67 can be defined as claiming later, with greater relative monthly payouts, while claiming before age 67 is defined as claiming earlier, with lesser relative payouts that start sooner. More explicitly, for people born in 1960 or later, they will receive about 70% of their FRA payout if they claim early at age 62, and about 124% if they claim later at age 70. The estimated return per year of delay was originally set so that all the claiming options are close to equal in cumulative payout value assuming average longevity[3]. If, however, an individual expects to die earlier than average, then cumulative payouts can be higher by claiming earlier; the opposite is true if one claims later and lives beyond the average life expectancy (see Figure 1). The average retiree in America receives about 60% to 79% of their retirement income from Social Security benefits (Social Security Administration, 2016) and this percentage increases with age. The Social Security claiming decision is also essentially irrevocable, thus limiting one's ability to learn from the experience. Finally, it is a complex decision under uncertainty

[3] A recent paper by Slavov (2023) argues that delaying claiming has now become financially better due to more generous credits to delay, improvements in mortality, and historically low real interest rates.

with both multiple choice points (any month between age 62 and age 70) and multiple possible outcomes, contingent on how long you, or you and your spouse, live. [4]

There are two core features of the Social Security program that are worth noting. First, larger Social Security benefits in one's later years are designed to provide protection against "longevity risk", or the risk of outliving one's retirement assets, and having to reduce consumption levels. In that regard, delaying Social Security benefits beyond age 62 and purchasing a life annuity can both be seen as obtaining insurance against longevity risk (Brown 2007); individuals who delay claiming their benefits are essentially purchasing an inflation-indexed life annuity, which is expensive and difficult to obtain in the annuity marketplace. Risk-averse individuals who are worried about longevity risk should find delaying claiming particularly attractive. We will address the equivalence of delaying Social Security claiming and purchasing a life annuity later in this paper; our data that suggests that this equivalence may not be as true psychologically as economic theory often assumes.

A second important note about the American Social Security system is that it is an "unfunded" pay-as-you-go system in which payouts to current retirees come primarily from the payroll tax contributions of current workers rather than from their own personal contributions made during their working years. We mention this aspect of the system because of its relevance to the sense of psychological ownership that is emphasized in this research. Historically, the Social Security retirement system was designed to give people a "sense of participation in the program and responsibility for it" (Leff 1983 pg 375; see also DeWitt 2005). This strategy of

[4] We focus on individual judgments in this paper but recognize that decisions about post-retirement income management are frequently joint decisions and should reflect probabilities about those joint events. See the Social Security Administration's June 2018 document for more information on spousal retirement benefits.

direct involvement of workers in the system was in contrast to the design of social security systems found in other countries that paid benefits from general tax revenues.

While the claiming decision is a personal choice that should reflect the unique constraints and expectations of the individual, research on the overall pattern of choices does yield some general advice on how people could improve their decisions. Economists who have examined Social Security claiming argue that many Americans generally would be financially better off by delaying claiming (Shoven and Slavov, 2014; Slavov 2023), given the design of Social Security benefits, low interest rates, and near-average life expectations. They also argue that households may be better off spending down 401(k) assets first and deferring Social Security as long as possible (Shoven and Slavov, 2014). It has even been argued that delaying Social Security benefits for a year or more is better, in terms of retirement income over time, than saving 1% more for retirement over 30 years (Goda, Ramnath, Shoven, and Slavov 2018).

Most of the normative economic analyses of what people should do are built upon some form of the classic life-cycle model for financial decision-making under uncertainty over multiple time periods (see, for example, Christensen, Kallestrup-Lamb, and Kennan 2022). Life-cycle models incorporate individual life expectations as the major uncertainty, individual time discounting (degree of patience), and sometimes individual risk attitudes (i.e. degree of willingness to accept more variation in outcomes in exchange for greater returns or the reverse). People who expect to live longer are assumed to be more likely to delay claiming, as are people who are more patient. Also, people who are more risk-averse, i.e. wish to minimize the variability in their future incomes, are generally assumed to be more likely to delay claiming in order to smooth out their consumption levels in their later years (Coile, Diamond, Gruber, and Jousten 2002). Recent work by Bairoliya and McKiernan (2021) has argued that individual

heterogeneity measures, especially with regard to life cycle models, can explain around 30% of the variation in claiming decisions.

Despite this advice to delay claiming, people do not claim later than their FRA. Instead, there seems to be a strong tendency to claim as early as possible.[5] This has been referred to as the Social Security claiming puzzle (Hardy and Hazelrigg, 2007). In one set of data (Social Security Administration, 2016), for instance, approximately 40% of men, and 47% of women were reported to claim at age 62. At the other end of the continuum, only about 3% or men and 4% of women claim at age 70. From the same data, approximately 17% (averaged across men and women) are reported to claim at their FRA (Full Retirement Age). If one adds in people who claim at ages 63 and 64, the percent of males claiming early raises to about 55%, and the percent of females claiming early raises to 63%. For comparison, the approximate total percentages for claiming later than FRA is only about 10-11%. While these levels do shift slightly from year to year (for example, from 3.4% claiming late in 2009 to 11% in 2019, per Duggan, Dushi, Jeong and Li, 2021), it is clear that there are consistently spikes in claiming at age 62 (the modal response) and at the FRA, with many fewer people claiming later than FRA.

Psychological Explanations for Early Claiming

While there are clearly good personal reasons for claiming early, such as poor health and/or an expected shorter lifespan, or financial constraints due to no other source of retirement income, it has been argued that claiming earlier versus claiming later likely reflects psychological variables as well as economic factors. That is, even after accounting for reasonable economic relevant factors, many people claim earlier than would be expected. As argued by

[5] It is important to note that when to retire, and when to start claiming, are separable decisions. One can retire earlier but start claiming later, using other funds to cover one's expenses. One can also continue to work but claim early, although with tax implications.

Knoll (2011) and Shu and Shu (2018), psychological aspects of retirement related decisions need to be considered. We now briefly review the current findings on psychological explanations for claiming decisions and tests of interventions (nudges) that attempt to affect those decisions.

Brown, Kapteyn, and Mitchell (2013) showed that Social Security benefit claiming decisions are strongly affected by how the claiming decision was presented (framed). The strongest effect was found with a "breakeven frame" which calculates the number of years people need to live to come out ahead versus claiming a year later. That frame, which was based on the breakeven age analysis that had been regularly used by the SSA prior to 2008 and is still informally used today, was found to be the most impactful in changing intended claiming age; it shifted people towards claiming earlier by about 15 months earlier compared to other frames.

A related later paper by Brown, Kapteyn, Luttmer, and Mitchell (2017) found a difference in the valuation of a Social Security benefit stream of income using ether a willingness-to-accept of a lump sum payment in exchange for a reduction in Social Security income or a willingness-to-pay of a lump sum payment in exchange for an increase in future Social Security income. People seem to value Social Security benefits much more when asked to accept a lump sum (WTA) than when asked for a willingness-to-pay (WTP) response. This pattern of inconsistent response mode responses for WTP and WTA is predictable given prior work on the endowment effect (e.g., Kahneman, Knetsch, and Thaler 1991) where WTA of sellers (owners) is reliably higher than WTP of buyers. One additional feature of the Brown et al. (2017) paper is that they report that the degree of response mode difference is greater for those with less education, numerical abilities, and financial literacy, suggesting there may be individual differences in cognitive constraints.

Another study of relevance to the present paper is Knoll, Appelt, Johnson, and Westfall (2015). They emphasize the intertemporal choice aspects of the Social Security claiming decision. As a base-line test, they presented over a thousand (1292) people with a monthly income graph (e.g. $750 per month if one claims at age 62 up to $1320 per month if one claims at age 70) and asked them when indicate at what age they would prefer to claim benefits. They report that nearly half their respondents preferred to claim before their FRA. They attributed this behavior, at least in part, to a "present bias" in terms of accepting less money but getting it sooner. In a follow-up study, they tried to change claiming intentions by changing how the information was presented. None of the information presentations they studied significantly influenced preferred claiming. They suggest, based on their results, that using graphical representations may not be an effective way to communicate retirement benefits information. A third study finds that a more process-oriented intervention that asked people to consider reasons for claiming later before considering reasons for claiming earlier leads to an average delay in preferred claiming age of about 9 months. They argue that even this seemingly small increase in delaying Social Security benefits would have substantial financial effect over time, such as if someone lived to age 85 or 100. Their results are replicated and extended in Greenberg, Hershfield, Shu, and Spiller (2023) which tests thirteen different interventions on the claiming decision and finds increased delay for interventions that suggested that delayed claiming may be the right choice (i.e., injunctive norms, information about the commonality of regret), those that highlighted the financial benefits (i.e., gains framing, focus on benefits to the future self), and those that require guide preference construction through self-reflection (i.e., focus on right-tail longevity, reason generation). While the observed impact on average intended claiming age of such interventions tends to be less than a year, as noted by Knoll et al. (2015), these "small"

effects can have significant cumulative effects on retirement income over a lifetime, often adding up to more than a year's extra income. In a recent paper, Altig, Kotlikoff, and Ye (2022) estimate the median loss in the present value of household lifetime discretionary spending from non-optimal claiming to be around $182,370 and suggest that better optimization could increase lifetime spending by as much as 26%.

While there clearly have been some important initial investigations, it is also clear that research on claiming behavior, particularly from a psychological perspective, is limited. Nonetheless, one common theme in the studies reviewed above is heterogeneity in responses. In this paper, we seek to more deeply understand that heterogeneity by closely examining the relationships, if any, between various measures of individual differences and expressed preferences for claiming. Our approach of measuring individual differences on psychological constructs (measures) of interest and testing the degree of correlation between those differences and some behaviors of interest is a standard approach in psychological research (e.g., measuring degree of achievement motivation and its correlation with selection of performance tasks, per Atkinson and Raynor, 1974). More recently, Grune-Yanoff (2016) has argued for the need for insight into the processes or mechanism underlying policy prescriptions for various types of "nudges." A better understanding of the why of behavior can help identify when a proposed intervention might hurt as well as help.

Our Approach

We now turn to an overview of the surveys used in this paper that seek to further explore psychological factors that are associated with later versus earlier claiming preferences. We examine the relationships, if any, between various measures of individual differences and expressed claiming intentions as a method to gain insights into the "whys" of later versus earlier

Social Security claiming. We then explore how claiming preferences may be influenced across respondents by interventions (nudges) such as information displays and question framing and ordering. Finally, we explore the interactions that may exist between individual differences and task variables, as suggested by Appelt, Milch, Handgraaf, and Weber (2011).

In the next section of the paper, we first focus on the common elements across the various surveys that we have conducted over a five-year period. For instance, all the surveys ask claiming preferences, psychological ownership questions, loss aversion questions, and life expectations, as well as demographic variables like age, gender, retirement savings, etc. The three psychological measures we explore are of theoretical importance in understanding claiming behavior as we discuss below. We then identify some of the variations across studies, with a particular focus on variations related to interventions designed to change claiming intentions. Again, we stress that later claiming is frequently advocated, but it is not (and should not be) the goal for all retirees. The optimal course of action for the decumulation (spending down) phase of retirement, e.g., when to claim, should show much greater differences across individuals than may be the case for the saving up phase of retirement.

Psychological Sense of Ownership. Psychological ownership has been defined by Pierce, Kostova and Dirks (2001) as being characterized by the feeling that something is "mine". Importantly, it is not necessary to have legal ownership of an object for these effects to occur; anticipatory possession or pseudo-endowment can have similar psychological effects to legal ownership, even when the individual does not have legal possession of the object (Ariely and Simonson 2003; Hoch and Loewenstein 1991). Carmon, Wertenbroch, and Zeelenberg (2003) demonstrated that "pre-factual ownership" of an option can be affected by manipulations like the

amount of deliberation spent on the decision. For more on the concept of psychological ownership and its role in consumer behavior, see Peck and Shu (2018).

We propose that a measure of psychological (or perceived) ownership can be used to capture these feelings of ownership toward SSA benefits, and that individuals with a higher perception of ownership for their benefits will be more likely to want to claim benefits early. An example question is the agreement (on a 1-"Strongly Disagree" to 7-"Strongly Agree" scale) with the statement: "The Social Security benefits that I will receive come from the money that I contributed." Another example question is "I deserve the payments I contributed over my working life." The full set of three questions used in the studies reported here is provided in Figure 2, along with the average response to each item across all of our reported studies. To preview our results, greater levels of psychological ownership of one's Social Security benefits is repeatedly found to be associated with less willingness (intention) to delay claiming.

Loss Aversion. It has long been argued that risk aversion, regularly defined as the dislike of variance in outcomes (wealth levels), should influence Social Security claiming decisions and related decisions involving life annuities or the preference for lump sum payouts from pensions, consistent with the life cycle model mentioned above. In general, it has been assumed that greater risk aversion should lead to a greater preference to delay claiming, all else being equal, because a delayed claiming strategy reduces the possibility of having much less wealth if one lives longer (i.e., variance in outcomes is reduced).

Loss aversion is different from risk aversion. Loss aversion is the idea that losses loom larger than corresponding gains in decision making, e.g., for most people the fear of losing $100 is more intense than the hope of gaining $150. Kahneman (2011) views the concept of loss aversion as "the most significant contribution of psychology to behavioral economics (p. 300)."

Zank (2010), whose theoretical work on loss aversion underlies our empirical work on individual differences in loss aversion, discusses loss aversion (gain seeking) as looking at losses (gains) with a "magnifying glass." The magnifying glass is applied to loss outcomes if a person is loss averse. Conversely, the magnifying glass is applied to gain outcomes if a person is gain seeking.

The concept of loss aversion has existed in several literatures but was given prominence by Tversky and Kahneman in the development of their Prospect Theory of decisions under risk (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992), a comprehensive and widely accepted descriptive theory of risky decision making. A meta-analysis of loss aversion in risky contexts is provided by Walasek, Mullett, and Stewart (2018). While there are clear differences in the degree of loss aversion reported by different studies, which utilize a variety of methods to assess loss aversion, the findings consistently shows that there exists substantial heterogeneity in levels of loss aversion. This is not surprising; Kahneman (2011) argues that "some people are much more loss averse than others" (p. 284). Kahneman also acknowledges that while most people are loss averse, some people may find the hope of gaining an amount $X more intense than the fear of losing that same amount -$X. That is, some people may exhibit a gain seeking focus in their decisions.

By definition, loss aversion only applies if the outcomes of a decision are perceived by the decision maker to include both gains and losses. Gain and loss outcomes are seen as being coded (perceived) by the decision maker relative to some reference value (target or aspiration level). Outcomes or payouts above a referent value will be coded as gains while outcomes below a referent value will be coded as a loss. While there is debate about this issue, outcomes equal to the reference level are typically viewed as being coded as a gain (Tversky and Kahneman, 1992).

As noted by many researchers, "evidence abounds from both the laboratory and the field

that preferences are reference dependent" (p.93, Baillon, Bleichrodt, and Spinu, 2020), with outcomes evaluated as gains and losses from the referent. However, there is debate about the extent to which referent values are context independent (e.g., your current level or wealth or status quo), are context dependent (i.e., varying by the particular choice set being considered), or even option dependent (e.g., defined separately for each option in a choice set). This has relevance for the usefulness of measures of loss aversion in explaining Social Security claiming behavior. In one sense, there are no losses to be experienced in the context of Social Security claiming since all choice options generate positive amounts (gains) of additional money (wealth). So where can the sensation of loss arise? Consider the scenario of a retiree who has decided to delay claiming until age 70 but learns in his late 60's of a serious health issue that could cause him to die very soon. Obviously, this retiree has much more to consider than the Social Security decision at that point, but any consideration of the foregone Social Security benefits will likely cause them to be coded as losses. Extending this scenario, any retiree past the age of 61 who thinks about the tradeoffs of claiming is likely to recognize the possibility of forgone gains (perceived losses) if claiming is delayed and life ends sooner than expected. This retiree's general degree of loss aversion may thus be predictive of Social Security claiming behavior, consistent with our findings in these studies.

Sense of ownership and loss aversion are the two psychological constructs emphasized in this paper. However, another construct measured in all of our studies was subjective life expectations.

Subjective Life Expectations. How long one expects to live is perhaps the major uncertainty related to an individual's Social Security claiming decision. In general, it has been argued that longer life expectations should make delayed claiming more appealing. Thus, in all

our studies respondents were asked to provide forecasts for their own longevity. Subjective life expectations are regularly collected from individuals in surveys such as the Health and Retirement Study (HRS), which has traditionally used questions about respondents' perception of their likelihood of living to ages 75 and 85. Responses are found to be mostly internally consistent (Hurd and McGarry 1995) and predictive of actual individual differences in survival (Hurd and McGarry 2002, Perozek 2008). Unlike many other surveys of retirement decision making, we explicitly ask our respondents to provide 3 to 4 forecasts for different ages from 65 up to 95 (or 75 to 95). This was done for several reasons. First, we expected that forecasting ages above 85 would make one's possible longevity more salient, and that asking for more forecasts would make the uncertainty about this longevity more salient. Second, having multiple forecast points allows us to estimate a more precise longevity estimate (details on our estimation procedure are provided below).

In collecting subjective life expectations, we test two process interventions: 1) asking people to explicitly assess their own subjective life expectations before versus after expressing claiming age intentions, and 2) framing the life expectation question in two different ways (live-to vs. die-by). To preview the results, we find that, as might be expected, asking life expectations before asking for claiming intentions led to an increase in later claiming, although the overall tendency is still toward earlier claiming. We also find that the relationship between assessed life expectations and claiming intentions is much stronger if the life expectations are assessed using a "live-to" frame rather than a "die-by" frame.

Psychological ownership, loss aversion, and life expectations are the key individual difference variables that we emphasize. However, to be consistent with various life-cycle models, we also measured individual differences in patience (time discounting) in three out of

our four surveys. Overall, we do find that individual differences in time discounting do relate, as might be expected, to Social Security claiming intentions. That is, the more patient one is, the later are one's claiming intentions.

Results

Overview of studies

In the results below, we present data from four different studies as a combined meta-analysis. We begin by describing the methods and design for each of the studies and outlining the similarities and differences within the independent and dependent variables. We then complete a comprehensive analysis of the combined data to show the proposed effects of both individual differences in our primary measures (psychological ownership, loss aversion, and subjective life expectations). Intertemporal patience, a fourth individual difference measure will also be presented along with other demographic measures. Information presentation manipulations, along with other experimental manipulations will then be discussed. Analyses of each separate study, all of which are consistent with the meta-analysis findings, are provided in the Appendix.

Dependent variables. The main dependent variable of interest is each respondent's claiming intention. The dependent variables were held relatively constant across studies; for claiming, participants were asked to imagine they were currently in their early sixties and to indicate at which age they expected to claim their Social Security benefits on a set of radial buttons indicating ages 62, 64, 66, 68, 70, and "I don't know." The focus in this paper is on the responses that indicated a claiming age intention. While most of our studies used a 5-point scale, as indicated above, a few additional studies expanded that scale to be a 9-point scale with ages 63, 65, 67, and 69 added.

One analysis issue is whether to treat the responses as linear or just ordinal, and if ordinal whether or not to focus on later claiming responses (i.e. ages above the FRA age range) versus earlier claiming intentions. We choose to treat responses as ordinal in our main analyses as well as provide the results of binary logistic regressions with the focus on the probability of a later claiming intention. Analyses using linear regressions are reported in the Appendix. The pattern of results are highly consistent regardless of which analysis approach is selected.

Another data analysis issue was whether or not to include age 66 respondents in the denominator of later (e.g. ages 70 and 68) versus earlier claiming intentions (e.g. agers 62 and 64, and age 66). Because age 66 (the FRA) is the middle response of the intentions scale, and because there are reasons to believe that FRA may reflect perceived norms or an uncertain default selection (Shoven, Slavov, and Wise 2017), we conducted binary logistic regressions with and without the age 66 responses included. While the total number of responses are less without the age 66 responses included, the measures of model fit are better, and the effect sizes tend to be larger, without the age 66 responses. For completeness, however, we report data analyses both with and without age 66.

Independent Variables. As described above, we focus on three primary psychological measures in all of our studies: psychological ownership of benefits, loss aversion, and subjective life expectations. To incorporate individual differences in ownership perceptions, our studies include specialized psychological ownership measures. The full set of three questions used in the studies reported here is provided in Figure 2, along with the average response to each item. Again, to preview our findings, we consistently find that individuals who strongly agree with statements about Social Security benefits being “theirs” are more likely to claim early.

Our approach to measuring loss aversion builds off a model-free definition of loss aversion offered by Zank (2010), and earlier by Brooks and Zank (2005). It utilizes a set of ten choices among three-outcome mixed gambles and derives a measure of the "loss magnification ratio" based on a series of paired comparison choices between such gambles. It differs from the Prospect Theory measure for aversion to losses proposed in Kahneman (2011, p. 284) which is based on 50:50 gambles and acceptance versus rejection of a gamble. We convert the series of choices made by study participants, with randomization of gamble pairs, into a "loss magnification ratio" (LMR) which estimates the degree to which the emotional pain of losses outweighs the pleasure of gains from each gamble. For example, an individual who chooses a gamble (45% of $400; 10% of $0; 45% of -$400) over another gamble (45% of $800; 10% of $0; 45% of -$600) is exhibiting a loss aversion ratio of at least 2.0, since they are turning down a gain of $400 to avoid a potential additional loss of $200. Examples of the sets of pairs of gamble choices used can be found in Figure 3. For more background, and different validity tests of this behavior-based measure of loss aversion, see Payne, Shu, Webb, and Sagara (2015). The LMR measure also appears to be robust to the exact probabilities used; we obtain similar results for this LMR measure with different outcome probabilities, i.e., 1/3 for all the three outcomes rather than .45, .10, and .45. The ability to have different but equal probabilities for the extreme gain and loss outcomes is one of the advantages of using three or more outcome gambles.

To help ensure that the survey responses reflected at least minimal levels of attention, the responses for each person to the loss aversion choice problems were tested for first-order stochastic dominance. That is, we tested, for instance, whether people would indicate a preference the greater win amount gamble ($800, $0, -$600) over the lesser loss gamble ($400, $0, -$400), but would then indicate a preference for the lesser loss gamble ($400, $0, -$400) over

an improved greater win gamble ($900, $0, -$600), violating stochastic dominance since the latter gain gamble dominates the former gain gamble. If a respondent had more than just one such incoherent choice pattern, he or she was not included in the data set. Again previewing results, we find consistently across studies that an individual's LMR is negatively related to his or her expressed preference for delaying claiming. In other words, more loss averse individuals intend to claim earlier. This result also indicates that loss aversion differs directionally in its impact on claiming than the typically assumed risk aversion.

To measure subjective life expectations, we ask individuals in our studies to make a subjective estimate of their life expectations for different ages: e.g., 65, 75, 85, and 95 years. For an example of the slider response scale used, see Figure 4.[6] The probability responses used in our studies are then tested for coherence, i.e. the probability of living to age 75 must be equal to or greater than the expressed probability of living to age 95. Respondents who violate this type of basic coherence in responses requirement are dropped from further analyses since this indicates a lack of attention. Together with an initial attention check, the coherence in probabilities tests and the loss aversion coherence tests provide multiple checks on the attention paid by the respondents. For all the respondents who provided coherent subjective judgments, a Weibull distribution was fitted to their responses and the age corresponding to the median (50%) probability was determined. These median probability life expectancy estimates were then used in our analyses. See Payne et al. (2013) for more on these pre-analysis procedures.

Finally, while it is not a primary focus of our work, we use in several of our studies a measure of intertemporal discounting based on a set of four questions adapted from Schreiber

[6] A similar scale is used by Heimer et al. (2019), who show that using subjective assessments of mortality, as compared to actuarial mortality numbers, improves the fit of a life-cycle model to actual consumption and savings by between 50% and 90%.

and Weber (2013); these questions are provided in Figure 5, along with the proportion of individuals who select each option. Individuals receive a score of 0 to 4, with higher values indicating more patience for the future. Schreiber and Weber, in a large online survey, document that this discounting measure is predictive of willingness to annuitize a lump sum. They are able to show that time inconsistent preferences can explain an age effect for annuities, in which younger respondents report more interest in annuitization than older respondents (an effect also found in Brown et al. 2016). We expect the individual measure of intertemporal patience to be an important determinant of early versus late Social Security claiming, and thus we include it in three of the four studies to be reviewed. Our studies find, consistent with theoretical predictions, that individuals with higher patience are more willing to delay claiming benefits.

Information presentation interventions. In addition to incorporating the individual behavioral measures outlined above, we also use our studies to examine potential choice architecture interventions that vary how information is presented (i.e., information nudges per Sunstein, 2016). In our studies we first examine how presenting cumulative payout information affects decumulation decisions, and second, whether there are interactions between frames and individual differences that influence these decisions.

To test how cumulative tables affect Social Security claiming decisions more clearly, the current project manipulates the availability of cumulative payout information for study participants. In particular, we take the monthly amounts and simply do the math with the already available information to show the cumulative payouts expected if one lives to certain ages and claims at different ages. The purpose of this intervention (a form of decision architecture change or information nudge) is to see whether information presentation might influence intentions on when to claim. This intervention is unique in the claiming literature in that it expands the set of

years that are considered in the delay decision beyond a single breakeven age. This type of intervention has been found to have significant effects on annuity choice, with information on cumulative payoffs increasing both overall liking for annuities and valuation of particular annuity attributes, relative to presentations that focus only on monthly income (Shu, Zeithammer, and Payne 2016). For most retirees, guaranteed income from an annuity during retirement improves their financial outcomes (Brown 2007), suggesting that this intervention has an overall positive impact. Different forms of information presentation would be expected to have significant impacts on Social Security claiming to the extent that such an intention is the result of constructive processing.

Note also that this proposed intervention differs from prior framing work by Brown, Kapteyn, and Mitchell (2011) and Liebman and Luttmer (2012) in several significant ways. First, our intervention more directly incorporates issues of life expectations, including self-generated judgments which are affected by how questions are framed. Second, we expect that effects of information presentation will differ according to individual differences in loss aversion and perceived ownership, which we directly measure.

Results Overview. As a preview of our results, we find the following main effects: First, we find that individual differences in psychological ownership of benefits significantly affect expectations of claiming. Participants who are one standard deviation higher on 3-item, 7-point measure of ownership intend to claim approximately six months earlier than those who are one standard deviation lower. Second, individual measures of loss aversion do significantly affect predicted claiming age, with a one standard deviation increase on our loss magnification ratio scale having an effect of decreasing intended claiming age by around four months. Third, as

expected, differences in life expectations are highly significant, with a one standard deviation increase in subjective life expectation (an extra 12.6 years) translating to a 60% higher chance of later claiming. Fourth, as might also be expected, we find that assessed differences in time discounting (intertemporal patience) impacts claiming, with more patient individuals more attracted to later claiming. These last two results are consistent with the traditional lifecycle model of retirement decision making. We also find significant effects of several other individual measures, including perceptions of SSA solvency, age, and gender, although the overall predictive power of these individual differences is lower than psychological differences in beliefs and values. Furthermore, adding the individual difference psychological variables significantly improved the fit of models aimed at predicting claiming intentions beyond the fit provided by the more traditional demographic variables studied.

Given that these individual measures of psychological ownership, loss aversion, subjective life expectation, and intertemporal patience are all significant drivers of claiming preferences, we also wished to investigate whether manipulations of information presentation can change interest in early versus late claiming, and how those changes in information presentation may interact with individual differences. In part this interest in the potential of changes in information architectures reflects a suggestion made by Kunreuther, Pauly, and McMorrow (2013) in the context of life annuities as an insurance product for protecting against longevity risk. They argue, “the most obvious solution is to provide better and more convincing information on the attractive properties of annuities and the very high return you get on your annuity investment if you live to a ripe old age” (p. 142). The idea is that one might overcome myopic thinking in annuity decisions by making future high returns more salient. Indeed, prior research finds that such an information nudge (Sunstein, 2016) does make life annuities more

attractive (Shu et al., 2016). Since later claiming can be thought of as a form of annuitization (Brown, 2007), the same logic regarding making long-term returns more salient would also seem to apply to claiming decision, making later claiming more attractive. Instead, we find that tables of cumulative payouts for later ages tend to encourage *earlier* claiming, contrary to their effects on annuities. Further, we find evidence suggesting that higher levels of loss aversion interact with the presence of the cumulative payout table to decrease intended claiming age.

Data Collection

In the empirical results below, we present the data from four different studies conducted over a period of five years as a combined meta-analysis. We begin by describing the methods and design for each of the studies and outlining the similarities and differences within the independent and dependent variables. We then complete a comprehensive analysis of the combined data to show the proposed effects of both individual differences in our primary measures (life expectations, intertemporal patience, loss aversion, and perceived ownership) and information presentation manipulations. Analyses of each separate study, all of which are consistent with the meta-analysis findings, are provided in the Appendix, as are additional analyses for alternate approaches to the dependent variables of interest.

All of our online surveys use national panels provided by data collection firm Qualtrics. The Qualtrics survey panels, while convenience samples, provide a distribution of American adults whose demographics fit reasonably well with national averages (see Table 2 for demographics per study). [7] Participants are recruited and screened by the firm and are paid a

[7] Our surveys results are similar to HRS data on key questions; for example, our online populations typically report an average subjective probability of being alive at age 75 of between 63% and 70%, while

fixed amount for their participation. During the studies, participants are further screened by relevant demographic variables (for example, by age) and retained in the sample according to their successful completion of an attention check (see Oppenheimer, Meyvis, and Davidenko 2009). Some subjects were excluded from further analysis due to violations of coherency for the life expectation task or invalid responses (such as all 0%) for life expectations or for violations of coherence in the loss aversion test. After testing for a minimal level of attention to the survey questions, a combined total of N=3,988 across four studies were retained for further analysis. During the main study procedure, participants read some background information about Social Security and then began with either the subjective life expectations task or the main claiming intention question (our primary dependent variable); order of these two steps was randomized in Studies 1, 3, and 4 (see Table 1). While there was one study in which both "live to" or "die by" framing was tested in the life expectations questions, only the live-to framing subjects are retained for our analyses to allow more straightforward comparison across studies. After the life expectations measure and claiming intentions DV, participants completed the measures of psychological ownership, loss aversion, and intertemporal patience. All studies also included demographic questions about age, gender, and amount of retirement savings.[8] All studies also included a likelihood question about whether SSA benefits will exist during the respondent's retirement (SSA solvency, measured with a 0% to 100% scale).

Elder (2007) reports an average subjective probability of being alive at age 75 of 65% among HRS respondents using a probability scale.

[8] Subjective health status was also asked in Studies 2 and 3, and numeracy was asked in Study 2. Since these measures were not used in all studies they are not included as controls in the analysis in the main area of the paper. However, study-specific analyses with and without these additional variables are included in the Appendix.

Results

A combined analysis for the four surveys

Our results proceed in several steps. We begin by summarizing the data across the main variables of interest, including a comparison of the means of the main independent variables for each claiming age (the primary DV). We then move into statistical tests by looking at the dependent variable of claiming, combining the data from all four studies using ordered logistic regressions with the five outcome values of 62, 64, 66, 68, and 70. We also run variations of these analyses with claiming at the FRA of 66 excluded since there is survey evidence to suggest that claiming at age 66 may be seen as a "social norm" or an uncertain default rather than the result of any form of calculated response (Shoven, Slavov, and Wise, 2017). A choice of claiming age at 66 could also reflect a default bias among respondents, in which uncertain individuals choose the option that is in the middle of the scale. Both approaches to the analyses, with and without age 66, are included as a robustness check. Any study participants who responded to the claiming question with "I don't know" are removed from the analyses.

In our ordered logit analyses, the effects of demographics and related measures (age, gender, savings, and SSA solvency) are examined first as a baseline analysis. We then move on to consideration of how our primary factors of interest – psychological ownership, loss aversion, subjective life expectations, and intertemporal patience – affect the claiming decisions. We will see whether inclusion of these measures in our regressions improves the models, and how large the effect of each measure is on preferences for claiming. We will then investigate whether our primary study manipulation of including a cumulative payoff information table also affects these decisions, and whether this manipulation interacts with the individual differences.

As a robustness check, we also analyze the claiming data by collapsing responses into early versus late claiming and using a logit. Here, early claiming is defined as choosing intended claiming ages of 62 or 64, and late claiming is defined as choosing intended claiming ages of 68 or 70. We will run a standard logit on the dependent variable of late claiming to gain a better understanding of who the individuals are who are willing to delay later than FRA. These models will proceed in the same order as the ordered logit for the full range of claiming ages. The simpler binary logit model also has the advantage of easier interpretation in terms of changes to the probabilities of later claiming.

All analyses reported here are for data from the four studies combined; additional analysis for each study run independently is available in the appendix. One remarkable result is the consistency of basic results across the four studies conducted over several years. While variables in individual studies sometimes reach conventional significance levels, and sometimes do not, the effects are in consistent directions and of similar magnitude.

Summary Statistics

Tables 3a and 3b present the summary statistics for the various dependent variables and predictor variables across all four studies. The median preferred age for claiming was 64 for the sample that does not include the FRA (age 66) and I don't know responses (N=2,500). Including the FRA responses, the median age for claiming was 66 (N=3,448). Not surprisingly, the tenth percentile for claiming was at age 62 (the earlier claimers) and the ninetieth percentile for claiming was at age 70 (the later claimers). Figure 6 provides a histogram of the claiming age dependent variable. From this figure, it is clear that age 62 (early claiming) receives a substantial proportion of the choices (25.3%); another large spike is at the FRA, age 66 (28.8%). Note that this distribution does represent later average claiming than the true distribution of historical

claiming choices made by retirees yet is similar to intended claiming measures from other related work; for example, Shoven et al (2017) report 23% of their respondents intend to claim later, and Knoll et al (2015) report 29% who intend to claim at ages 68-70. The difference between intended claiming and actual claiming has also been documented by Brown, Kapteyn, and Mitchell (2013) who show, nonetheless, that individuals followed over time in the Health and Retirement Survey (HRS) report intentions to claim that are significantly correlated with actual claiming age, with correlation coefficients in the range of .46 to above .6 depending on wave of HRS.

With only five categories of responses for the claiming age dependent variable, we are also able to present the summary measures for each age separately. Table 4 provides this information using the raw values of the independent variables. While we will perform statistical testing of these relationships in the next section, some trends in the averages of the independent variables per intended claiming age are noticeable. For example, individuals who report intending to claim at 62, relative to late claiming at age 70, are older (average age 50.8 versus 48.3), have lower life expectations (life expectancy of 81.4 years versus 90.5 years, a difference of 9 years), are less patient (average score 1.16 versus 1.61), have higher loss aversion (average score 2.8 versus 2.5), and have higher feelings of ownership toward their benefits (average score 5.7 versus 5.26). However, they do not appear to meaningfully differ in demographics measures like savings that might be expected to affect benefit claiming age decisions.

Next, we take a closer look at the distribution properties for our four main individual difference variables, both to ensure normality and provide a picture of the ranges of each measure.

Psychological Ownership. Using the 1 to 7 scale averaged from the 3-item ownership measure, the median score was 5.67, and the average score was 5.47. The lowest 10% indicated ownership scores of 4 out of 7, while the highest 90% indicated scores of 6.67. Thus, it seems that a full range of psychological ownership values was exercised by respondents. The scores on the three individual measures were also interesting; as seen in Figure 2, the strongest agreement (average of 5.5) was with the question, "The Social Security benefits that I receive will come from the money I contributed," a statement that is incorrect in literal interpretation since Social Security is designed as a pay-as-you-go system in which current benefit payments come from the contributions of current workers. Those with higher feelings of ownership toward their SSA benefits are expected to express the desire to claim the money earlier (Shu 2018).

Loss Aversion. The median loss aversion magnification ratio (LMR) for all respondents was 2.5, consistent with prior research on typical ranges for loss aversion magnitudes (Tversky and Kahneman 1991). The mean LMR was 2.69. However, there was substantial individual differences in expressed LMR. The median lower LMR associated with the lowest 10% of the respondents was 1.0 (a neutral balance of gain seeking vs. loss aversion). The higher LMR for the highest 90% of the respondents was 5, the highest value on our measure. In general, women expressed greater levels of loss magnification ratios (median = 3) than men (median = 2.5). Within this sample, the loss aversion magnification ratios did not differ as a function of the age of the respondent. With SSA benefits, higher loss aversion, in contrast to the often assumed relationship for risk aversion, would suggest earlier claiming since individuals may be worried about not receiving maximum benefits before passing away.

Life Expectations. The median of the life expectation estimates for the nearly four thousand responses was 84.1 years, and the mean was 84.9 years, obtained using a subjective life

expectation measure with a "probability of live to" framing (Payne et al 2013). Given that this mean reflects a sample containing both males and females, and an average current age of 49 for all respondents, it is close to what would be predicted from Social Security longevity tables (81.3 years per SSA 2015 tables). For more on comparisons between subjective estimates of longevity using this method for assessment, see Payne et al. (2013). The prior results by Payne et al. (2013) do indicate some biases in responses, e.g., some optimism in terms of living to age 85 or longer, but also correspondence to actuarial data, e.g., women do expect to live longer than men. For the lower quintile, the median age (the 10^{th} percentile) was 69.5. For the upper quintile, the median expected live-to age (90th percentile) was 100.2.

Intertemporal Patience. The median impatience score on the 0-3 scale was 1, and the average score was 1.4. The 10% and 90% values were 0 and 3, respectively. Per the set of intertemporal patience questions shown in Figure 5, 0 is less patient, while 3 is the most patient. A score of 0 implies an individual 10-month discount rate below .80 (large discounting of future outcomes) while a score of 3 suggests an individual discount rate above .97 (very little discounting of future outcomes). The average score obtained by our participants, 1.4, would be in line with the average individual having a 10-month discount rate between .92 and .97. Per standard models of lifetime consumption, more patient individuals, measured here as individuals with higher scores, should indicate a desire to claim later.

Looking at each of these measures as a group, Table 5 shows the correlation between these four main individual difference variables and other demographic variables collected in the studies. There are significant correlations between age and a variety of other measures (savings, SSA solvency, intertemporal patience, and psychological ownership) as well as between gender and several other measures (SSA solvency, life expectations, loss aversion, and psychological

ownership). However, it is important to note that the four individual difference measures are not significantly correlated with each other with the exception of intertemporal patience and subjective life expectations (positive correlation of .073). The independence of the four measures provides reassurance that they can be jointly included in our regression models.

Estimating Models of Claiming Intentions

All analyses reported in this section are for data from the four studies combined; additional analysis per study is available in the appendix. Starting with raw claiming age, recall that the dependent measure allowed participants to indicate an intended Social Security claiming age of either 62, 64, 66, 68, 70, or "I don't know." The "I don't know" responses are removed from further analysis, leaving 3,448 respondents out of our overall sample of 3,570, and the intended claiming age measure is treated as an ordered categorical dependent variable for our regressions. A second set of analyses is provided with the FRA (age 66) responses also removed. We begin with only demographic factors, and then proceed by adding individual differences and finally interventions (specifically, the display of a cumulative payout table) into the models. All independent variables are z-scored to make effect size comparisons easier. Table 6a focuses on the models with z-scored variables, with the claiming age 66 answers included in the data, and with dummy variables per study (i.e., indicator variables per study) included as controls. Table 6b repeats these models with the claiming age 66 respondents removed. Additional tables in the appendix relax each of these assumptions and show the estimations run in alternative models; it is notable that the basic results remain similar regardless of choice of model.

The first column (Model 1) of Table 6a provides the results for an ordered logit regression of our claiming age intention dependent variable, including age 66, against age, gender (1 = female), savings, and perceptions of SSA solvency, all z-scored (except gender).

Investigating how the demographic information, and reported retirement savings and SS solvency, for our participants affect their claiming intentions, we see results in the expected directions. Older respondents indicate a desire to claim earlier than younger respondents (βage = -.188) and women intend to claim earlier than men (βgender = -.169). Individuals with higher amounts of retirement savings indicate an intention to claim later (βsavings = .108). When combined across studies, perceptions of SSA solvency do not affect claiming intentions in this model, although small effects have been found in individual studies and in the combined data once other independent variables are included, with individuals who think the SSA will not continue to be solvent often expressing a desire to claim earlier. These effects all hold with and without the controls for individual studies. Table 6b repeats this analysis with the age 66 respondents removed from the data set. The same pattern of significant results persists in both analyses with and without age 66, including the size of the coefficients for each variable, showing the robustness of these effects.

We next turn to the more psychological individual difference measures: subjective life expectations, intertemporal patience, loss aversion, and psychological ownership of benefits. Results from models with these variables included are in Model 2 and Model 3 of Tables 6a and 6b.[9] In these models, we find the following: Longer subjective life expectations lead to later claiming (βexpage = .416 in Model 3), as would be expected. This coefficient can be interpreted as a one standard deviation increase in subjective life expectations (an extra 12.6 years) leading to a 60% chance of being in the next higher category of claiming age. Higher intertemporal patience also leads to later claiming (βint = .324), as would also be expected. Thus, the two

[9] Note that intertemporal patience was not collected in Study 1. Column 2 of each table provides the results without intertemporal patience included, and column 3 includes intertemporal patience but the sample size is reduced (Studies 2 through 4 only).

individual difference measures that are part of the standard life-cycle model have the expected patterns of results. Besides adding evidence to the importance of these variables to Social Security claiming, these findings also provide some evidence of the validity of the survey responses. We now turn to the more psychological variables that are not traditionally part of life-cycle models.

It has been argued that greater risk aversion should increase the preference for later claiming since it smooths out income over retirement years (Coile et al 2002). However, we find the opposite relationship for our behavior-based measure of loss aversion. As we predicted, individuals who score more highly on our loss magnification ratio measure (i.e., were more loss averse) express more desire to claim early ($\beta LMR = -.111$). At the extremes, a person with a loss aversion coefficient one standard deviation higher than the average will be likely to claim almost 4 months *earlier* than someone with one standard deviation below the average.

Individuals who feel stronger ownership toward their Social Security contributions and benefits also intend to claim earlier ($\beta po = -.256$). At the extremes, an individual with a high level of psychological ownership towards their benefits (i.e., a z-score of 1) will be likely to claim more than 6 months earlier than someone with a low level of ownership (a z-score of -1). Using an equivalence to life expectations, a one standard deviation increase in perceived ownership is equivalent to 7.75 less years in life expectation in its effects on claiming intentions.

One aspect of our analyses to note is regarding model fit, as reported both via pseudo-R^2 and Bayesian Information Criterion (BIC). In both Tables 6a and 6b, moving from only using the demographic measures in Model 1 to including our main psychological variables of interest in Models 2 and 3 increases the pseudo-R2 and reduces the BIC significantly, suggesting a better model fit when these psychological measures are included. In addition, we note that the model fit

improves when the age 66 respondents are excluded in Table 6b relative to Table 6a, supporting the concern that individuals who answer with an intended claiming age of 66 may be arbitrarily choosing the FRA and/or the middle of the scale as a default response.

Analyzing Intended Late Claimers

For robustness and easier interpretation, we also look at a simplified version of this claiming measure: an indicator for late claiming intentions. Individuals are categorized as late claimants if they indicate a claiming age of either 68 or 70, and early claimants if they indicate a claiming age of either 62 or 64. Per Table 4, of the 3,448 participants whose responses can be categorized, 30% indicate a desire to claim at 68 or 70, well after reaching their Full Retirement Age (FRA). Since late claiming is a binary variable, these models are run as logistic regressions, and the resulting coefficients represent the effects on the log-odds of late claiming. To clearly separate the behavior of late claimants from early claimants, individuals who indicated an intended claiming age of 66 are not included in the analysis. In other words, this analysis answers the specific question of which respondents are more likely to delay.

Looking at the logistic regression results for late claiming in Table 7, the four psychological variables of interest are again highly significant when they are included in the analysis (Models 2-4), with or without study controls. A higher subjective life expectation and higher intertemporal patience each increase the probability of claiming late, while higher loss aversion and higher perceived ownership both decrease the probability of claiming late. Here, we can interpret the coefficients as increasing the probability of late claiming; for example, a one standard deviation change in life expectations (equivalent to an extra 12.6 years of longevity) increases the probability of claiming after the full retirement age (FRA) of 66 by 61%.

Thus far, our analysis finds that the standard demographic variables work as expected. Younger aged respondents, men, and those with higher levels of savings intend to claim later. However, we also find that adding key individual difference measures – subjective life expectations and intertemporal patience from life cycle models, and loss aversion and psychological ownership from the psychology literature - greatly improve the fit of the models. Each of these variables has a large and significant effect on intended claiming age in the direction predicted by research. These effects are consistent across multiple analysis approaches and within each of our studies when analyzed separately. We next look at the impact of an intervention on the claiming decision, to see whether providing individuals with information about cumulative payouts over time may affect the desire to claim early versus late.

Intervention for Changing Claiming Intentions

The information manipulation tested in our studies took the form of a table that showed the cumulative financial benefit of claiming at different ages. The table does not provide individuals with any new information; it simply "adds up" the monthly values into cumulative amounts. Examples of the claiming decision asked in each study, with and without a cumulative payout table, are shown in Figure 7a (no payout table) and Figure 7b (with the payout table). We test the effect of this table on claiming age in Models 4 and 5 in Tables 6a and 6b. Overall, the effect of adding cumulative payout information on claiming intentions was <u>negative</u>, not positive ($\beta_{table} = -.255$ in Model 5, Table 6a). In other words, seeing the cumulative payout information generally caused individuals in our studies to indicate an earlier claiming age relative to individuals who only received monthly payment amounts. Again, using an equivalence to life expectations, the presence of a cumulative payout table on claiming intentions was as if the average life expectation was reduced by 6.6 years. This was surprising given that previous work

has found that presenting cumulative payout information for annuity choice tasks can lead to higher interest in annuities (Shu et al. 2016); the current results show that the influence of this information intervention on annuities does not carry over to individuals' claiming decisions. If anything, the results are in the opposite direction, suggesting that delaying claiming and purchasing a life annuity may not be psychologically viewed as equivalent types of decumulation decisions. We return to this point in the general discussion.

An additional question is whether the cumulative payout table intervention may interact with any of the individual differences we measured as drivers of the claiming decision. In particular, we thought the table may interact with the loss magnification ratio (LMR), our measure of loss aversion. Individuals who are particularly loss averse may be sensitive to missing out on the payments that come from starting their retirement benefits early, and/or could be concerned about missing out on later payments if they were to die early and not get what they perceive as their full benefits amount. Model 6 in Tables 6a and 6b show the results of an updated ordered logit analysis with this interaction included. The size and direction of the negative coefficient for the cumulative payout table is unchanged, but the negative effect of LMR is replaced by a negative interaction effect (β = -.146) between LMR and the cumulative table, suggesting that the effects of individual-level loss aversion are most powerful when the cumulative table is also present. Again, we note that the model fit statistics of pseudo-R2 and BIC are improved by including the cumulative table indicator variable and/or the table*loss aversion interaction in the model.

To look more closely at the interaction between individual loss aversion and the cumulative payout table interaction, we ran a floodlight analysis (Spiller et al 2013) for different levels of loss aversion as measured in our data by the loss magnification ratio (LMR). Figure 8

shows the result of this floodlight analysis. The overall effect of the interaction, per Model 6 in Table 6a, is that higher levels of loss aversion interact with the presence of the cumulative payout table to decrease intended claiming age. This is also apparent in Figure 8; the overall difference in intended claiming age for participants who did and did not see the cumulative payout table is insignificant. However, for individuals with high levels of loss aversion, the difference for seeing the table versus not seeing the table is quite significant (mean claiming age of 65.5. for those not seeing the table vs. mean of 64.8 for those who saw the table). The Johnson-Neyman point for the level of loss aversion at which the difference between seeing the table versus not seeing the table becomes significant is at a LMR between 1 and 2. Since most studies of loss aversion put the average at around 2, these results suggest that a majority of individuals would be affected by the table intervention, in the direction of claiming earlier.

General Discussion

Richard Thaler has noted that, "We've made good progress on the accumulation phase of retirement saving, but the decumulation phase hasn't received nearly enough attention." He also argued that the "spending-down phase is even harder for individuals to solve" than the retirement saving phase (Powell 2015). Part of the reason that the decumulation phase of retirement is so hard to solve is that it requires the consideration of multiple uncertainties, and it is often difficult to resolve value tradeoffs that will unfold over the retirement journey. Each individual, perhaps jointly with his or her significant other, must solve the decumulation phase of retirement based on his or her individual beliefs, expected longevity, and individual values.

We are not the first to consider decumulation decisions from an individual differences perspective; however, the program of study reported in this paper has focused on multiple individual differences in beliefs and values, and the relationships between those individual

differences and preferences for when to claim one's Social Security benefits based on the responses of thousands of individuals to surveys conducted over a multi-year period of time. This program of research also explores how the decision on when to claim might be influenced by simple changes in information presentation (informational nudges), and how these display changes might interact with measured individual differences.

Summary of findings for claiming

Our studies on Social Security claiming do find that subjective life expectations, intertemporal patience, loss aversion, and psychological ownership, when measured at the individual level, are all significant and consistent predictors of preference for early versus late claiming. The empirical finding that individual level heterogeneity in loss aversion predicts claiming preferences supports theories proposed by other researchers on this topic. As noted by Brown (2007), individuals who delay claiming their Social Security benefits beyond age 62 are essentially purchasing an inflation-indexed annuity for the future; however, consumers sometimes view the purchase of an immediate annuity as "gambling on their lives." Similarly, Brown, Kapteyn, and Mitchell (2016) argue that the claiming decision can be seen as "a risky bet on one's length of life." We agree with this framing and additionally note that it is seen as a risky bet that includes perceived losses in addition to potential gains. Extending this idea, Hu and Scott (2007, p.8) suggest examining annuity choice from the perspective of more behavioral models such Cumulative Prospect Theory (Tversky and Kahneman, 1992) under the argument that CPT is a better behavioral model than the classic expected utility model. Our findings support the argument that incorporating loss aversion into models of claiming decisions may improve those models predictive power.

There are several implications of using loss aversion, rather than risk aversion, to explain decumulation preferences. First, the significant effects of loss aversion suggest that individuals see the claiming decision as a mixed gamble with both gain outcomes and loss outcomes, rather than as uncertainty about a stream of gains (wealth levels). Second, a very substantial behavioral literature exists on manipulations that moderate loss aversion in a wide variety of tasks; by thinking about the Social Security claiming decision in a loss aversion context, we can begin looking for ways to apply those findings to creating information interventions that influence the claiming decision. Since benefits may be perceived as already "owned" by the individual, the decision of when to claim begins to resemble decisions within an endowment effect framework, where currently held (owned) options are more highly valued that the same option when not owned. The standard explanation for the endowment effect is loss aversion, in which the owner sees giving up the option as a loss and therefore demands higher compensation. If Social Security benefits are also perceived to be owned by a potential claimant, the decision to delay looks like a potential loss (relative to either the breakeven value and/or death before any benefits are received). Thus, individuals who are high in loss aversion should be less likely to be willing to delay claiming.

We also found that psychological ownership (e.g., "I deserve the payments I contributed over my working life") can be a strong driver of financial decisions such as Social Security claiming. These feelings of ownership for benefits are purely a psychological construct, pointing to the importance of including such constructs in our models of financial decisions. Psychological ownership has also been documented as an important input for other types of financial decisions, such as taking on debt and accepting government benefits (Sharma, Tully, and Cryder 2021; De La Rosa, Tully, Sharma, Giannella, and Rino 2021). The significant effects

of loss aversion and psychological ownership on predicted claiming age found in this paper are consistent with recent research on life annuity preferences that finds a relationship between individual differences in loss aversion and fairness (Shu, Zeithammer, and Payne 2018). A significant relationship between loss aversion and psychological ownership further connects the claiming decision to research on the endowment effect.

In terms of information presentation interventions, we were surprised to find that the information presentation approach that successfully increases preference for annuities (Shu, Zeithammer, and Payne 2016) does not successfully carry over to individuals' intentions to delay claiming. In fact, cumulative payout information appears to encourage earlier claiming intentions rather than later claiming, the opposite of its effect on annuities. The difference between the annuity purchase decision and the Social Security claiming decision may be related to the issue of psychological ownership; with an annuity, the choice is one of purchase, while with claiming, the choice is of exercising an already held (owned) option. The influence of the cumulative table in the annuity environment may increase the perceived value of the annuity and thus make it more preferred as a purchase. However, in the claiming environment, the cumulative table may remind the individual of the high value of the option they already hold, making them more impatient for receiving it.

Implications for decumulation research more generally

Much of the prior research on the decumulation phase of retirement has treated the Social Security claiming decision and the decision to purchase some form of life annuity as generally equivalent forms of guaranteeing income over one's lifetime (Brown 2007). An interesting set of insights regarding the similarity of the claiming choice and an annuity choice emerges by considering the results of research on each type of task. We observe that the individual

differences measures are often much stronger predictors of claiming behavior than of annuity preferences, and secondly, and perhaps more importantly, that information interventions that affect claiming decisions have opposite effects on annuity decisions. Together, these results imply that the decision to take an annuity is quite different psychologically than the decision of when to claim Social Security benefits. This is an important point because many of the recent efforts in understanding, and influencing, Social Security claiming behavior have used annuity choices structured to mimic Social Security benefits as experimental materials. The differences we document suggest that it is not just the size of the payouts that matter, but the type of product, and the perceptions of current ownership toward those payouts, central to the decision process.

Finally, this paper has implications for the work on interventions to assist individuals in making these important decumulation decisions more generally. The question of what makes a successful intervention for improving outcomes in the context of decumulation depends heavily on the characteristics of the individual, including not just "rational" differences in life expectations but also individual differences such as loss aversion. In a domain like claiming where preferences may be constructed at the time of decision and individual differences in beliefs and values are so important, it may be more valuable to focus on process interventions rather than one-size-fits-all nudges (along those lines, see Knoll et al 2015 and Greenberg et al 2022). In more recent research, we have tested how making recommendations for other retirees affects one's own claiming intentions (Greenberg, Payne, Shu, Hershfield, and Spiller 2023); that work both replicates the individual difference findings described here and considers how they interact with the intervention. A broader investigation into different types of interventions, and their interactions with individual characteristics, is an important next step in this stream of research.

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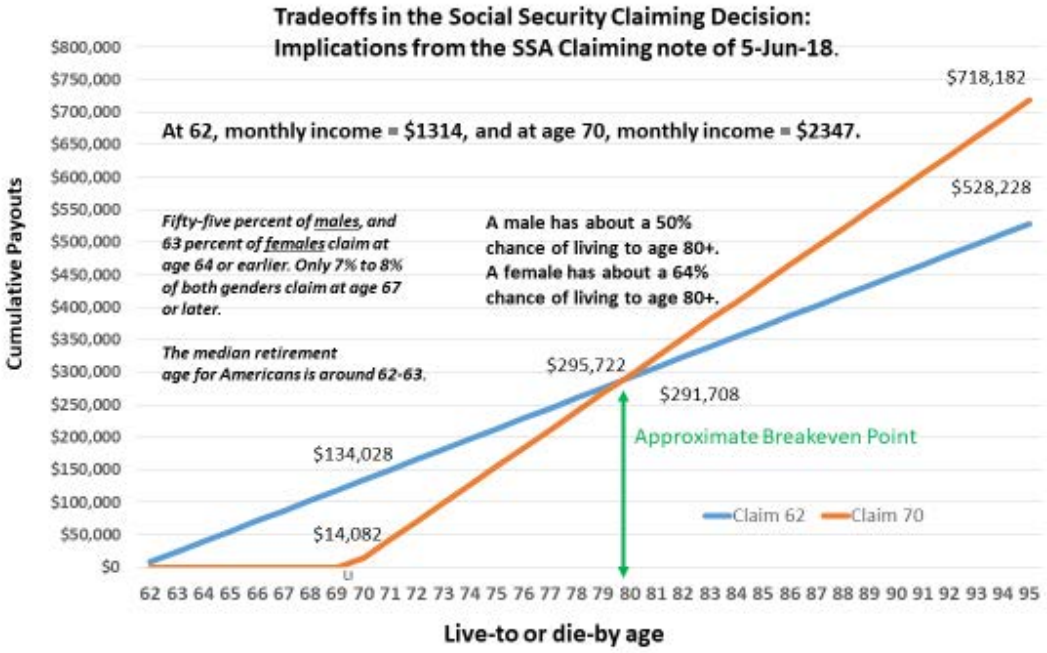
Figure 1[10]

The graph below is drawn using numbers from the June, 2018 note from the Social Security Administration on when to start receiving retirement benefits. The monthly benefits when claiming at age 62 are assumed to be $1,314 for a person with lower employment income. The monthly benefits when claiming at age 70 are assumed to be $2,347. For many Americans, the average monthly benefit is around $2000. Amounts starting at 6 months within a year for both claiming at age 62 and claiming at age 70 are assumed. Note that if one lives to age 90 or longer, one will be better off by approximately $128,000 in cumulative payouts by delaying claiming from the earliest date possible (age 62) to the latest age possible (age 70). For a couple at age 62 to purchase an equivalent amount of sustained income lasting to age 90 that would equal this difference, this would require about $120,000 in additional retirement savings, which is a bit more than the total median 401 (k) savings for Americans nearing retirement. (See Bronshtein, Scott, Shoven, and Slavov, 2018, p. 8, for the annuity conversion numbers used.)



[10] This figure below is similar to the "real-world" figures produced by J. P. Morgan and others (see J. P. Morgan, Social Security timing and trade-offs, 2015, exhibits 3a and 3b.

Figure 2: Psychological Ownership of Benefits Questions

Strongly Disagree	Disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly Agree
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Questions	**Means**
I feel that I have earned these retirement benefits.	6.5
The Social Security benefits that I will receive come from the money that I contributed.	5.5
Delaying claiming of my benefits might mean that I won't get all my money back.	4.4

Figure 3: Examples of Loss Aversion Gamble Sets

Choice of Gamble 2 from set 1, implies a Loss Magnification Ratio (LMR) ≥ 1.0, a choice of Gamble 1 from set 2, implies a LMR ≥ 1.5, a choice of Gamble 2 from the third set, implies a LMR ≤ 2.5. Note, a choice of Gamble 2 from choice set 1, a choice of Gamble 2 from choice set 2, and then a choice of Gamble 1 from choice set 3 would violate stochastic dominance.

	45%	**10%**	**45%**
Gamble 1	$600	$0	-$600
Gamble 2	$400	$0	-$400

	45%	**10%**	**45%**
Gamble 1	$400	$0	-$400
Gamble 2	$700	$0	-$600

	45%	**10%**	**45%**
Gamble 1	-$400	$0	$400
Gamble 2	-$600	$0	$900

Figure 4: Example Life Expectancy Questions

Note, a test of attention used was to check that the expressed probabilities for living to an older age, e.g. 85 could not be greater than the expressed probabilities for living to a younger age, e.g. 75.

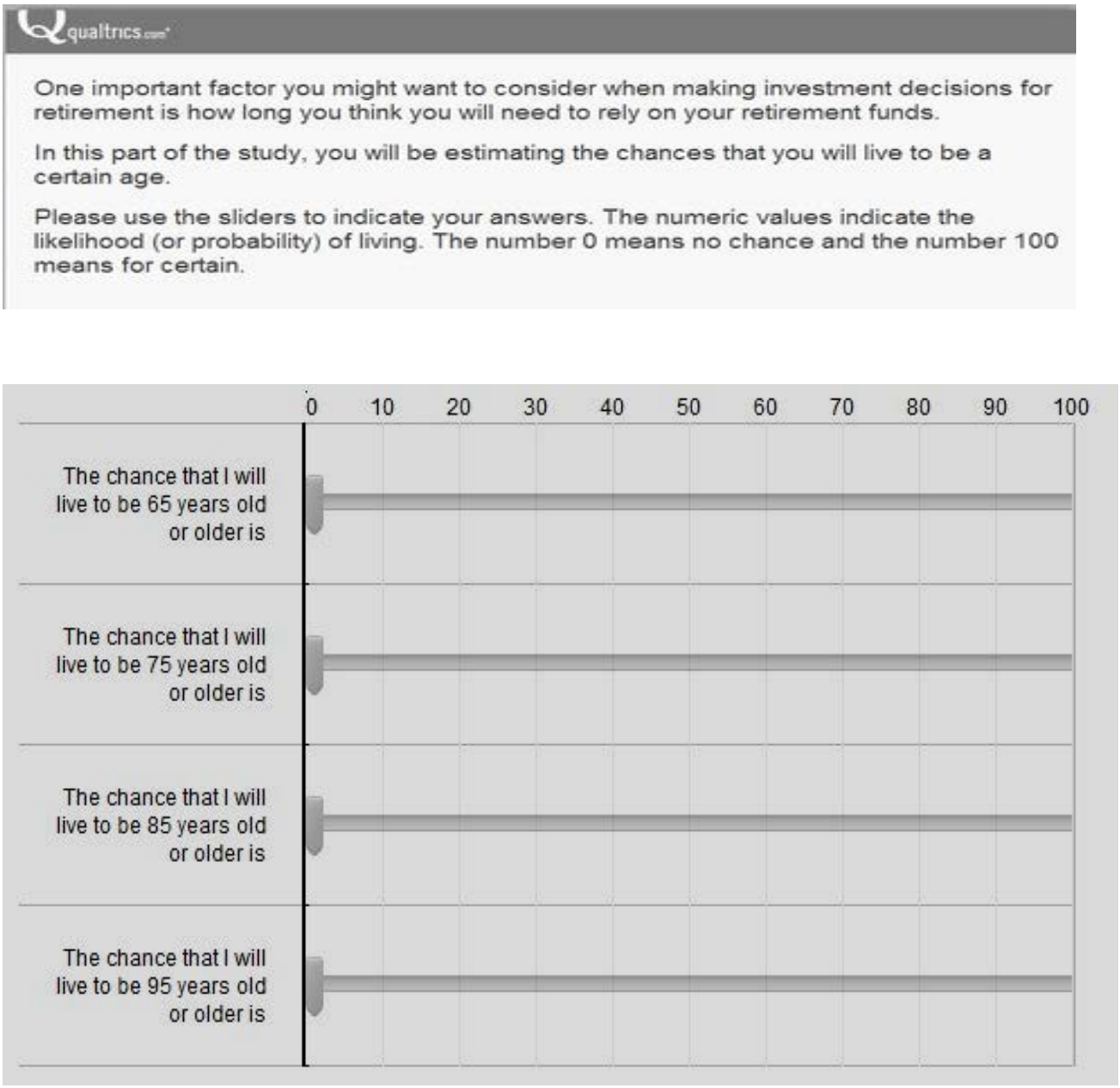


Figure 5: Example of Intertemporal Patience Questions

Item 1		**% chosen**
Option A	you receive $1,410 immediately	87%
Option B	you receive $1,448 in 10 months	13%

Item 2		**% chosen**
Option A	you receive $1,410 immediately	59%
Option B	you receive $1,538 in 10 months	41%

Item 3		**% chosen**
Option A	you receive $1,410 immediately	22%
Option B	you receive $1,770 in 10 months	78%

Figure 6: Histogram of Claiming Ages, all studies

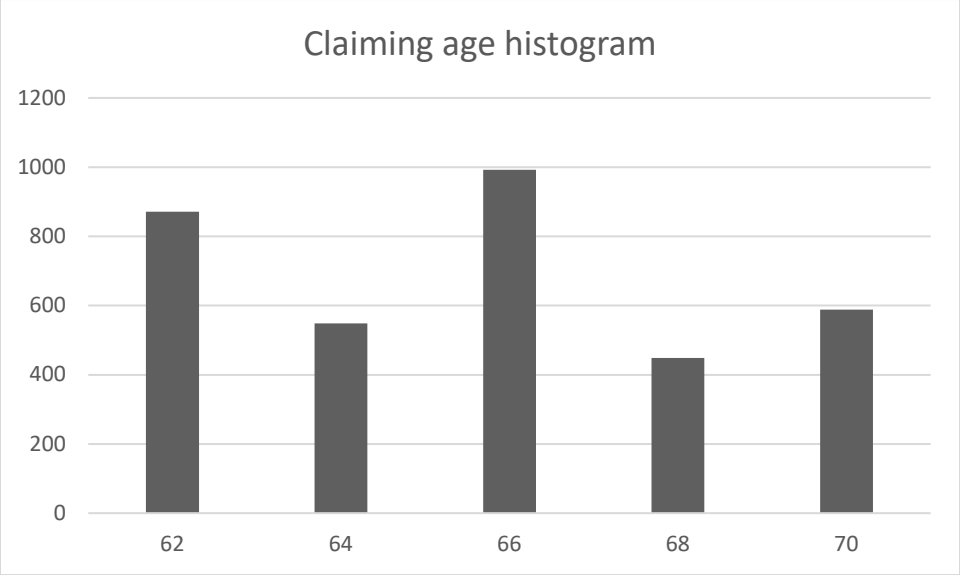


Figure 7a: Example Claiming Tasks without cumulative payout table

Suppose you are approaching age 62 and nearing retirement. Based on the information provided below, at what age would you prefer to start claiming your retirement benefits?
Again, there are no right or wrong answers. We are only interested in your preference.

Starting Year	Payment
62	$1,339/month
64	$1,544/month
66	$1,793/month
68	$1,960/month
70	$2,395/month

Figure 7b: Claiming task with cumulative table. Same basic instructions and choice

Cumulative amount paid to you by different age if you live to that age

Starting Year and Payment	70	75	80	85	90	95
62 ($1,339/month)	$112,476	$192,816	$273,156	$353,496	$433,836	$514,176
64 ($1,544/month)	$92,640	$185,280	$277,920	$370,560	$463,200	$555,840
66 ($1,793/month)	$64,548	$172,128	$279,708	$387,288	$494,868	$602,448
68 ($1,960/month)	$23,520	$141,120	$258,720	$376,320	$493,920	$611,520
70 ($2,395/month)	$0	$114,960	$258,660	$402,360	$546,060	$689,760

Figure 8: Floodlight Analysis of Loss Aversion and Payout Table Interaction

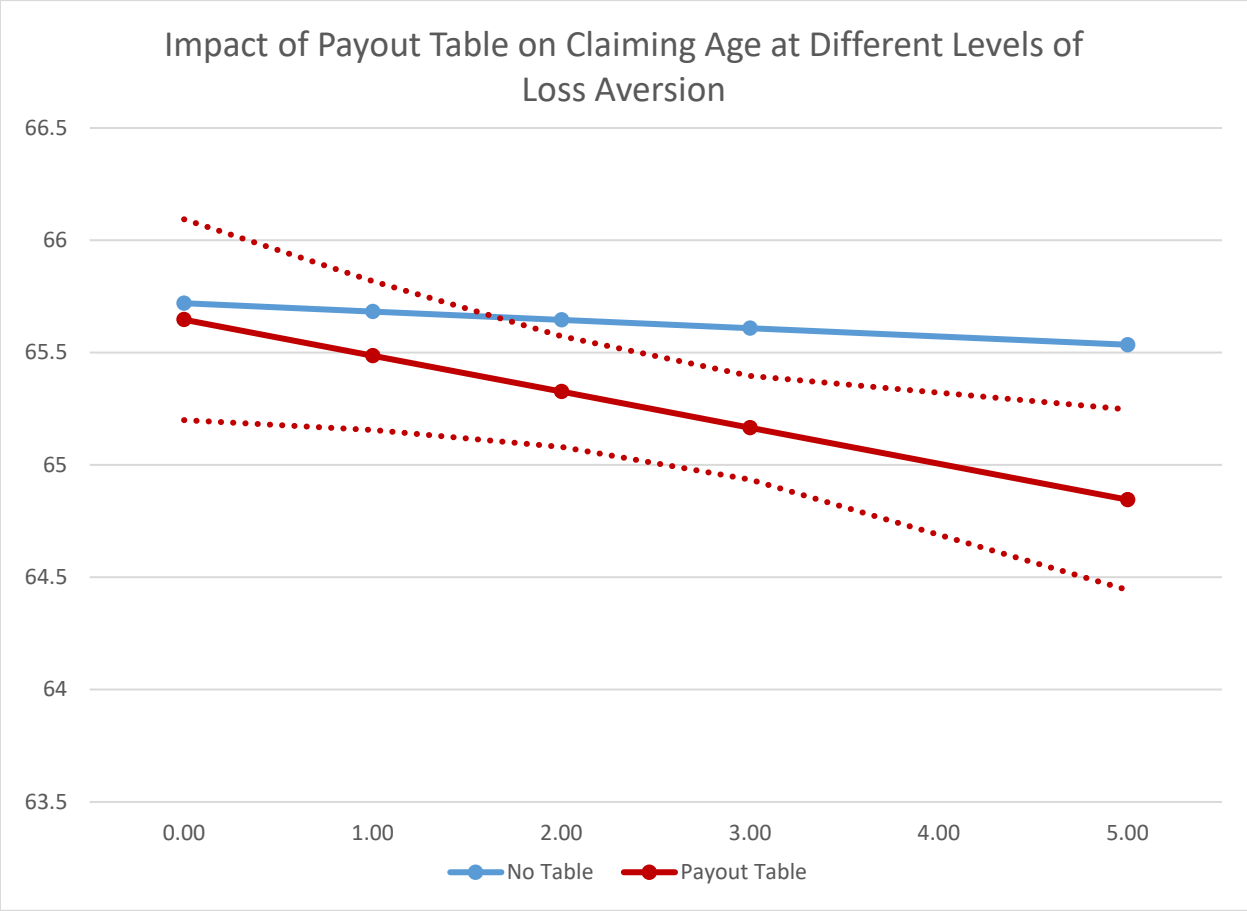


Table 1: Measures and Manipulations per Study

	Study 1 Base	**Study 2 + Patience**	**Study 3 + Annuity**	**Study 4 + Annuity & Framing**
Demographic Measures				
Age	✓	✓	✓	✓
Gender	✓	✓	✓	✓
Numeracy	✓			
Health	✓	✓		
SSA solvency	✓	✓	✓	✓
Retirement savings	✓		✓	✓
Psychological Measures				
Subjective life exp.	✓	✓	✓	✓
Intertemporal patience		✓	✓	✓
Loss magnify. Ratio (LMR)	✓	✓	✓	✓
Psychological ownership	✓	✓	✓	✓
Manipulations				
Payout information table	✓	✓	✓	✓
Format of payout table				**?**
Live to / die by life framing				✓
Order of life expectations	✓		✓	✓
Other	✓	✓		
Dependent Variables				
Claiming age (62 to 70)	✓	✓	✓	✓
Annuity likelihood			✓	✓
Respondents	(n=1238)	(n=1113)	(n=806)	(n=831)

Table 2: Participant demographics from four studies

	Study 1 (n=1238)	**Study 2 (n=1113)**	**Study 3 (n=806)**	**Study 4 (n=413)**	**All data (n=3570)**
Source	Qualtrics	Qualtrics	Qualtrics	Qualtrics	
Age	min 30, max 60, mean 41.9	min 40, max 65, mean 53	min 40, max 65, mean 54	min 38, max 60, mean 49.9	min 30, max 65, mean 49
Gender	49.8% female, 50.2% male	49.7% female, 50.3% male	72.6% male , 27.4% female	51.1% male, 48.9% female	55.4% male, 44.6% female
Numeracy	min 0, max 8, mean 3.30				
Health	min 1, max 7, mean 4.98	min 1, max 7, mean 5.34			
SSA solvency	min 0, max 100, mean 53.5	min 0, max 100, mean 71.0	min 0, max 100, mean 70.9	min 0, max 100, mean 67.2	min 0, max 100, mean 64.5
Retirement savings	min 2.5k, max 875k, median 12.5k	min 2.5k, max 1.5m, median 37.5k	min 2.5k, max 1.5m, median 37.5k	min 2.5k, max 1.5m, median 12.5k	min 2.5k, max 1.5m, median 12.5k
Subjective life expec.	min 46, max 120, mean 86.6	min 48.6, max 120, mean 85.7	min 47.5, max 120, mean 85.1	min 48.3, max 120, mean 77.3	min 45.8, max 120, mean 84.9
Intertemporal patience		min 0, max 3, mean 1.32	min 0, max 3, mean 1.45	min 0, max 3, mean 1.30	min 0, max 3, mean 1.36
Loss magnification ratio (LMR)	min 0, max 5, mean 2.71	min 0, max 5, mean 2.64	min 0, max 5, mean 2.71	min 0, max 5, mean 2.72	min 0, max 5, mean 2.69
Psychological ownership	min 1, max 7, mean 5.25	min 1, max 7, mean 5.47	min 1, max 7, mean 5.71	min 1, max 7, mean 5.63	min 1, max 7, mean 5.47

Table 3a: summary values, all studies, n=3570

Measure	Median	Mean	Std Dev	10%tile	90%tile
Claiming age	66	65.61	2.79	62	70
Life expectancy	84.1	84.9	12.6	69.5	100.2
Intertemporal patience	1	1.36	.97	0	3
Loss Magnification Ratio	2.5	2.69	1.55	1	5
Ownership	5.67	5.47	1.10	4	6.7

Table 3b: summary values, all studies, claiming age 66 excluded, n=2500

Measure	Median	Mean	Std Dev	10%tile	90%tile
Claiming age	64	65.46	3.29	62	70
Life expectancy	84.1	85.0	13.1	68.8	101.2
Intertemporal patience	1	1.36	.98	0	3
Loss Magnification Ratio	2.5	2.69	1.56	1	5
Ownership	5.67	5.46	1.13	4	6.7

Table 4: Average values per claiming age response, all studies

Means per claiming age
(non-standardized values)

	62	64	66	68	70	all	range
Observations	871	548	992	449	588	3448	
age	50.8	48.0	49	48.1	48.3	49.0	30-65
gender	0.48	0.45	0.46	0.4	0.43	0.45	0-1
SSA solvency	68.3	63.8	64.7	61.8	63.3	64.5	0-100
savings	4.7	4.5	5.1	4.9	5	4.9	0-14
Life expectancy	81.4	83.0	84.6	87.4	90.5	84.9	46-120
Inttemp patience	1.16	1.25	1.37	1.56	1.61	1.4	0-3
LMR	2.8	2.8	2.67	2.6	2.5	2.7	0-5
ownership	5.7	5.5	5.5	5.3	5.26	5.5	1-7

Table 5: Correlation matrix for Measured Variables

	Age	Gender	Savings	SSA Solvency	Life Expectancy	Intertemporal Patience	Loss Aversion
Age	1.0						
Gender	-0.041	1.0					
Savings	0.199*	-0.008	1.0				
SSA Solvency	0.451*	0.051*	0.123*	1.0			
Life Expectancy	0.001	-.111*	0.079*	0.113*	1.0		
Intertemporal Patience	0.100*	-0.012	0.104*	0.053	0.073*	1.0	
Loss Aversion	-0.010	-0.114*	-0.030	-0.049*	-0.031	-0.008	1.0
Psychological Ownership	0.118*	-0.073*	-0.014	-0.059*	-0.027	-0.048	0.003

Table 6a: Ordered logit regression results, claiming age DV, all variables and manipulations

Notes: age 66 included, no die-by respondents included

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Demographics						
Age	-.188*** (0.04)	-.154*** (0.04)	-.291*** (0.06)	-.151*** (0.04)	-.285*** (0.06)	-.279*** (0.06)
Gender (female=1)	-.169** (0.06)	-.096 (0.06)	-.035 (0.08)	-.092 (0.06	-.027 (0.08)	-.027 (0.08)
Savings	.108*** (0.03)	.064* (0.03)	.029 (0.04)	.063 (0.03)	.027 (0.04)	.025 (0.04)
SSA solvency	-.046 (0.03)	-.129*** (0.04)	-.122* (0.05)	-.130*** (0.04)	-.125** (0.05)	-.130** (0.05)
Psychological						
Life expectancy		.467*** (0.03)	.416*** (0.04)	.465*** (0.03)	.413*** (0.04)	.413*** (0.04)
Intertemporal patience			.324*** (0.04)		.323*** (0.04)	.321*** (0.04)
Loss aversion (LMR)		-.092** (0.03)	-.111** (0.04)	-.094** (0.03)	-.114** (0.04)	-.035 (0.06)
Psychological ownership		-.211*** (0.03)	-.256*** (0.04)	-.211*** (0.03)	-.256*** (0.04)	-.257*** (0.04)
Manipulations						
Payout table				-.217** (0.09)	-.255*** (0.08)	-.254*** (0.08)
Table * LMR						-.146* (0.08)
Study controls	Yes	Yes	Yes	Yes	Yes	Yes
Num obs	3448	3438	2161	3438	2161	2161
Pseudo-R2	.008	.0314	.0446	.0323	.0461	.0466
BIC	10797.9	10542.8	6531.5	10540.4	6528.9	6533.3

Notes: Standardized coefficients from ordered logistic regression. All independent variables except gender are z-scored prior to estimation; dependent variable is claiming age of 62, 64, 66, 68, or 70. Standard errors are in parentheses.

*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table 6b: Ordered logit regression results, claiming age DV, all variables and manipulations, claiming age 66 respondents excluded

Notes: no age 66 included, no die-by respondents included

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Demographics						
Age	-.253*** (0.05)	-.233*** (0.05)	-.410*** (0.07)	-.230*** (0.05)	-.403*** (0.07)	-.399*** (0.05)
Gender (female=1)	-.168* (0.08)	-.081 (0.08)	.039 (0.10)	-.074 (0.08)	.054 (0.10)	.048 (0.10)
Savings	.113** (0.04)	.059 (0.04)	.003 (0.05)	.061 (0.04)	.004 (0.05)	.002 (0.05)
SSA solvency	-.053 (0.04)	-.136** (0.04)	-.114 (0.06)	-.137** (0.04)	-.119* (0.06)	-.125** (0.06)
Psychological						
Life expectancy		.507*** (0.04)	.439*** (0.05)	.507*** (0.04)	.440*** (0.05)	.440*** (0.05)
Intertemporal patience			.356*** (0.05)		.355*** (0.05)	.353*** (0.05)
Loss aversion (LMR)		-.106** (0.04)	-.129** (0.05)	-.108** (0.04)	-.128** (0.05)	-.040 (0.07)
Psychological ownership		-.238*** (0.04)	-.283*** (0.05)	-.237*** (0.04)	-.284*** (0.05)	-.285*** (0.05)
Manipulations						
Payout table				-.317** (0.08)	-.371*** (0.10)	-.367*** (0.10)
Table * LMR						-.162* (0.10)
Study controls	Yes	Yes	Yes	Yes	Yes	Yes
Num obs	2456	2448	1540	2448	1540	1540
Pseudo-R2	.0133	.0473	.0665	.0496	.0699	.0706
BIC	6646.5	6426.1	3952.3	6418.9	3945.2	3949.8

Notes: Standardized coefficients from ordered logistic regression. All independent variables except gender are z-scored prior to estimation; dependent variable is claiming age of 62, 64, 68, or 70. Standard errors are in parentheses.

*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table 7: Logit results for late claiming, all variables and manipulations

Notes: age 66 not included, no die-by respondents included

	Model 1	Model 2	Model 3	Model 4
Demographics				
Age	-.138** (0.04)	-.074 (0.05)	-.255** (0.08)	-.315*** (0.08)
Gender (female=1)	-.203* (0.08)	-.139 (0.09)	.017 (0.11)	.055 (0.12)
Savings	.131** (0.04)	.077 (0.04)	.038 (0.05)	.046 (0.05)
SSA solvency	-.086 (0.04)	-.174*** (0.05)	-.235*** (0.07)	-.213** (0.07)
Psychological				
Life expectancy		.537*** (0.04)	.515*** (0.06)	.467*** (0.06)
Intertemporal patience			.409*** (0.06)	.413*** (0.06)
Loss aversion (LMR)		-.135** (0.04)	-.166** (0.06)	-.168** (0.06)
Psychological ownership		-.251*** (0.04)	-.335*** (0.06)	-.333*** (0.06)
Study controls	No	No	No	Yes
Num obs	2500	2492	1584	1584
Pseudo-R2	.010	.073	.111	.117
BIC	3425.0	3223.1	1975.6	1977.1

Notes: Standardized log-odds coefficients from logistic regressions. All independent variables except gender are z-scored prior to estimation; dependent variable is a 0/1 for late claiming (i.e., claiming age of 68 or 70). Standard errors are in parentheses.

*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Appendix

Table A1: Ordered logit regression results, claiming age DV, all variables and manipulations

Notes: age 66 included, no die-by respondents included

	Study 1	Study 2	Study 3	Study 4
Demographics				
Age	-.067 (0.06)	-.186* (0.09)	-.376*** (0.10)	-.346* (0.14)
Gender (female=1)	-.212* (0.11)	.032 (0.12)	.139 (0.15)	-.345 (0.18)
Savings	.088 (0.06)	.055 (0.06)	.055 (0.06)	-.082* (0.09)
SSA solvency	-.112* (0.05)	-.174* (0.07)	-.191* (0.08)	-.057 (0.11)
Psychological				
Life expectancy	.519*** (0.06)	.560*** (0.07)	.390*** (0.07)	.111 (0.11)
Intertemporal patience		.258*** (0.06)	.391*** (0.07)	.349*** (0.09)
Loss aversion (LMR)	-.071 (0.05)	-.095 (0.06)	-.168* (0.07)	-.034 * (0.09)
Psychological ownership	-.099 (0.05)	-.190** (0.06)	-.343*** (0.07)	-.210* (0.09)
Study controls	Yes	Yes	Yes	Yes
Num obs	1184	993	761	407
Pseudo-R2	.0277	.0435	.0607	.0295
BIC	3717.118	3057.856	2311.667	1253.270

Notes: Standardized coefficients from ordered logistic regression. All independent variables except gender are z-scored prior to estimation; dependent variable is claiming age of 62, 64, 66, 68, or 70. Standard errors are in parentheses.

*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table A2: Ordered logit regression results, claiming age DV, all variables and manipulations

Notes: age 66 included, no die-by respondents included

	Study 1	Study 2	Study 3	Study 4
Demographics				
Age	-.094 (0.07)	-.274** (0.10)	-.482*** (0.12)	-.564*** (0.18)
Gender (female=1)	-.257* (0.13)	.155 (0.15)	.126 (0.18)	-.139 (0.23)
Savings	-.129* (0.06)	-.172 (0.09)	-.182 (0.10)	-.134 (0.11)
SSA solvency	-.129* (0.06)	-.172 (0.09)	-.182 (0.10)	-.134 (0.11)
Psychological				
Life expectancy	.577*** (0.07)	.627*** (0.08)	.399*** (0.08)	.047*** (0.13)
Intertemporal patience		.289*** (0.08)	.379*** (0.08)	.439*** (0.11)
Loss aversion (LMR)	-.087 (0.06)	-.063 (0.07)	-.210* (0.08)	-.093 (0.11)
Psychological ownership	-.123* (0.06)	-.202** (0.07)	-.355*** (0.08)	-.299** (0.10)
Study controls	Yes	Yes	Yes	Yes
Num obs	843	687	570	283
Pseudo-R2	.0428	.0655	.0859	.0555
BIC	2288.952	1832.049	1457.915	738.718

Notes: Standardized coefficients from ordered logistic regression. All independent variables except gender are z-scored prior to estimation; dependent variable is claiming age of 62, 64, 66, 68, or 70. Standard errors are in parentheses.

*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table A3: Ordered Least Squares regression results, claiming age DV, all variables and manipulations

Notes: age 66 included, no die-by respondents included

	Model 1	Model 2	Model 3	Model 4	Model 5
Demographics					
Age	-.284*** (0.06)	-.238*** (0.06)	-.442*** (0.08)	-.232*** (0.06)	-.433*** (0.08)
Gender (female=1)	-.246* (0.10)	-.134 (0.09)	-.018 (0.12)	-.128 (0.09)	-.007 (0.12)
Savings	.157** (0.05)	.086 (0.05)	.029 (0.06)	.084 (0.05)	.027 (0.06)
SSA solvency	-.064 (0.05)	-.175*** (0.05)	-.160* (0.07)	-.177*** (0.05)	-.165* (0.07)
Psychological					
Life expectancy		.669*** (0.05)	.583*** (0.06)	.666*** (0.05)	.578*** (0.06)
Intertemporal patience			.452*** (0.06)		.450*** (0.06)
Loss aversion (LMR)		-.138** (0.05)	-.160** (0.06)	-.140** (0.05)	-.163** (0.06)
Psychological ownership		-0.309*** (0.05)	-0.358*** (0.06)	-0.307*** (0.05)	-0.357*** (0.06)
Manipulations					
Payout table				-.342*** (0.10)	-.405*** (0.12)
Study controls	Yes	Yes	Yes	Yes	Yes
Num obs	3448	3438	2161	3438	2161
Adjusted-R2	.022	.089	.123	.092	.127
BIC	16839.709	16566.159	10354.849	16562.355	10350.169

Notes: Standardized coefficients from ordered logistic regression. All independent variables except gender are z-scored prior to estimation; dependent variable is claiming age of 62, 64, 66, 68, or 70. Standard errors are in parentheses.

*** Significant at the 1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table A4: Ordered logit regression results, claiming age DV, all variables and manipulations

Notes: age 66 included, no die-by respondents included

	Model 1	Model 2	Model 3	Model 4	Model 5
Demographics					
Age	-.303*** (0.08)	-.285*** (0.06)	-.285*** (0.06)	-.285*** (0.06)	-.279*** (0.06)
Gender (female=1)	-.028 (0.08)	-.028 (0.08)	-.026 (0.08)	-.028 (0.08)	-.027 (0.08)
Savings	.027 (0.04)	.027 (0.04)	.027 (0.04)	.026 (0.04)	.025 (0.04)
SSA solvency	-.125* (0.05)	-.125* (0.05)	-.125* (0.05)	-.125* (0.05)	-.130** (0.05)
Psychological					
Life expectancy	0.413*** (0.04)	0.431*** (0.06)	0.414*** (0.04)	0.413*** (0.04)	.413*** (0.04)
Intertemporal patience	0.323*** (0.04)	0.323*** (0.04)	0.367*** (0.06)	.322*** (0.04)	.321*** (0.04)
Loss aversion (LMR)	-.115** (0.04)	-.114** (0.04)	-.115** (0.04)	-0.114** (0.04)	-.035 (0.06)
Psychological ownership (P.O.)	-.256*** (0.04)	-0.256*** (0.04)	-0.255*** (0.04)	-0.284*** (0.06)	-.257*** (0.04)
Manipulations					
Payout table	-.268** (0.09)	-.256** (0.08)	-.255** (0.08)	-.260** (0.08)	-.254*** (0.08)
Table * Age	.033 (0.10)				
Table * Life Exp		-.030 (0.08)			
Table * Patience			-.079 (0.08)		
Table * P.O.				.048 (0.08)	
Table * LMR					-.146* (0.08)
Study controls	Yes	Yes	Yes	Yes	Yes
Num obs	2161	2161	2161	2161	2161
Pseudo-R2	.0461	.0461	.0462	.0461	.0466
BIC	6536.545	6536.519	6535.676	6536.318	6533.3

Notes: Standardized coefficients from ordered logistic regression. All independent variables except gender are z-scored prior to estimation; dependent variable is claiming age of 62, 64, 66, 68, or 70. Standard errors are in parentheses.

*** Significant at the 1 percent level

** Significant at the 5 percent level
* Significant at the 10 percent level