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To: U.S. Department of Labor

From: Prof. Jeffrey R. Brown, Ph.D.

Subject: Comment on “Definition of the term "Fiduciary"; Conflict of Interest Rule—Retirement Investment Advice.” RIN 1210-AB32

Date: July 21, 2015

Ladies and Gentlemen:

I write today to offer a brief comment on the proposed fiduciary standards referenced above. I am the William G. Karnes Professor at the University of Illinois at Urbana-Champaign, the Associate Director of the Retirement Research Center at the National Bureau of Economic Research, a member of the 2015 Social Security Technical Panel on Methods and Assumptions, and a Trustee for TIAA. However, the opinions I express here are mine alone and should not be construed as representing any of the organizations with which I am affiliated. I base this comment on the knowledge and experience I have accumulated over my career as an academic researcher and a participant in various industry and public policy activities related to retirement income security for all Americans.

Overall, I am supportive of the effort to impose a best interest standard on a broader set of players in the financial services and retirement industries. I have long felt that the discrepancy in treatment between the qualified plan market and the retail market is an issue that warrants further attention. Although I am supportive of the spirit of the proposal, however, I am worried that the details of this proposal may inadvertently harm the retirement income security of individuals planning for retirement. It is this possibility for unintended adverse consequences in the area of lifetime income products on which I would like to focus.

Much of my research has documented the value that guaranteed lifetime income products can create for individuals by providing a tool for insuring against longevity risk. I have been very appreciative and supportive of the steps taken by the current Administration to remove barriers to including lifetime income options as part of qualified plans. My current research agenda is focused on the difficulties that individuals have in making optimal decisions around retirement planning, especially in understanding the role of annuities in guaranteeing lifetime income. This research

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suggests that millions of Americans are under-utilizing lifetime income products and thus exposing themselves to excessive longevity risk. Overcoming these complex behavioral and psychological barriers to annuitization requires a multi-faceted approach, including changes in the way retirement options are framed. An implication of these findings is that the typical consumer is unlikely to take advantage of guaranteed lifetime income options unless we structure the retirement planning space in a way to encourage it (via plan architecture, nudges, consumer education, and advice). I am attaching a few of my papers in this area that outline some of the ways in which consumers struggle with this issue.

My concern with the details of the proposed regulations is that the new rules will make it very expensive and difficult for financial advisors and insurance companies to be able to overcome these behavioral and psychological biases. The old adage that lifetime income products are "sold, not bought" may be very true in this context. Overcoming these barriers does not come easily or free – it requires financial services companies, advisers, plan sponsors and others to spend time working with clients to help them understand the tremendous value that lifetime income products can create for them. Raising the cost of this activity and increasing the fiduciary burden of those involved in this process could hurt these efforts. It would be a shame if a policy intended to help improve retirement security ended up hurting it by driving advisers and others out of the business of promoting annuities and other guaranteed lifetime income products.

In summary, I am supportive of the intent of these proposed regulations, but I would urge extreme caution in designing and implementing these rules. Policymakers, industry, and academics have made steady progress in recent years on better understanding consumer needs in the area of lifetime income and starting to develop communication tools and products to help guide people onto paths that are likely to lead to better retirement outcomes. We must be very careful not to shut down this innovation by well-intentioned but poorly designed rules.

Thanks for this opportunity to provide input into this process.

Sincerely,

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Enclosures

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Why Don't People Insure Late-Life Consumption? A Framing Explanation of the Under-Annuitization Puzzle

By Jeffrey R. Brown, Jeffrey R. Kling, Sendhil Mullainathan, and Marian V. Wrobel*

According to standard economic models, a risk-averse consumer who faces uncertainty about length of life should place a high value on life annuities that provide guaranteed income for life. Yet numerous studies show that few consumers voluntarily annuitize their retirement savings. As public and private pension systems around the world continue the shift from traditional defined benefit plans, which typically pay benefits for life, to defined contribution structures, which rarely require annuitization, retirees find themselves increasingly exposed to longevity risk—the risk of being unable to sustain their consumption should they live longer than expected.

Numerous papers have attempted to resolve the puzzle of why so few individuals purchase life annuities despite the large individual welfare gains predicted by economic models (for a review of this literature, see Jeffrey R. Brown 2007). Studies have explored the role of high prices and asymmetric information, high fractions of wealth already annuitized by public pension plans, bequest motives and other forms of risk sharing within families, the option value of delayed annuitization, and incomplete annuity markets, including the absence of inflation protection, the inability to insure against medical expenditure or other consumption shocks, and the limited ability to access the equity premium while annuitizing. By combining a number of these factors, it is possible to rationalize very low demand in some specific contexts.

As a whole, however, the literature has failed to find a sufficiently general explanation of consumer aversion to annuities. Many proposed "solutions" simply create new puzzles. For example, family risk-sharing implies that annuity demand should increase upon the death of one spouse, yet we do not observe this. Nor do we observe significantly different annuitization propensities between those who self-proclaim strong bequest motives and those who do not. Several hypotheses suggest that annuitization is optimal only at more advanced ages, yet we do not observe a substantial fraction of the population annuitizing at older ages. Additionally, the industry has created life annuities that overcome many of the product-based objections (e.g., inflation-protected annuities, annuities with payout streams linked to equity returns, policy riders that provide benefits for long-term care expenses), and yet few consumers buy these products.

Rather than attempting to rationalize the lack of annuity demand, this paper explores the idea that aversion to annuities is not a fully rational phenomenon. A large literature has documented behavioral biases in a wide range of activities that are important steps in the process of planning for retirement, including whether to participate in employer sponsored pension plans, how much to save, and how to allocate one's portfolio. To the extent that individuals exhibit biases in the wealth accumulation aspects of planning for retirement, it seems natural that similar biases might also extend to the wealth decumulation stage of retirement planning.

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I. The Framing Hypothesis

This paper suggests that a psychologically richer model of consumer behavior can explain under-annuitization. Since the development of prospect theory, economists have increasingly understood the importance of framing in economic decisions (Amos Tversky and Daniel Kahneman 1981). While loss/gain asymmetry—the differential responses when a choice is framed as a loss than when it is framed as a gain—is the most commonly discussed example, framing is a more general phenomenon. Put simply, experimental findings suggest that choices are not based solely on material consequences, but instead are filtered through the particular *frame* that individuals use to interpret the choices.

To understand our model of framing, it is useful to start with the standard, fully rational model. Suppose an individual planning for retirement maximizes the discounted sum of each period's utility of consumption: $\sum_{t=0}^{T}\delta^{t}u(c_t)$, where $u(c_t)$ is concave, $\delta < 1$ is the discount factor, and T (time of death) is a stochastic variable. In this setting, annuities provide valuable insurance by transferring resources from states where resources have no value (death) to states where resources provide utility through consumption. This is most easily seen in the two-period case where the individual has probability q of dying. If this individual invests wealth W in a simple bond with a return R, he can consume $W(1 + R)$ in the second period. If, in contrast, he buys an actuarially fair life annuity, he is able to consume $W(1 + R)/(1 - q)$ if he lives, which, by assumption, is all he cares about. To understand why the annuity allows for higher consumption, imagine all individuals pool their wealth at time 1 and share it among all survivors at time 2; this generates a mortality premium.

The model above implicitly has two components: an investment component, in which the individual decides how much to invest in each asset, and a consumption component, in which she decides how to spend the money from that investment. We propose that instead of viewing the problem through the *consumption frame* (focusing on the end result of what can be spent over time), many consumers adopt an *investment frame* (focusing on the intermediate results of return and risk features when choosing assets and not considering the consequences for consumption). This assumption is closely related to the notion of choice bracketing and mental accounting (Richard H. Thaler 1985; Daniel Read, George Loewenstein, and Matthew Rabin 1999). Consumers effectively isolate one choice (how to invest) from others (how to consume) and focus on specific features of this choice, rather than viewing it as part of a broader, integrated set of choices. Specifically, suppose that individuals consider the rate of return and the variance of payouts, a natural frame for someone investigating alternative approaches to investing for retirement. In the example above, a bond has return R and poses no risk, since it pays the same irrespective of state. On the other hand, the annuity has a return $(1 + R)/(1 - q)$ with probability $1 - q$, and return 0 with probability q. If the annuity is actuarially fairly priced and individuals have rational expectations about mortality, then the annuity has expected return R. Yet despite having the same return, the annuity appears *riskier* than the bond. *This reversal is key to our hypothesis*: *under the consumption frame, the annuity is attractive because it serves as a form of insurance. In contrast, under the narrow investment frame, the annuity is viewed as being riskier than a bond because its return depends on a random variable T.*

Practically, this framework suggests that the unattractive feature of the annuity in the investment frame will be the potential for the investment to lose money. This matches the qualitative intuition that practitioners provide: people react negatively to the possibility that they could lose money. Indeed, if an individual dies immediately after annuity purchase, he could lose his entire principal. Although not necessary for our analysis, loss aversion can strengthen this fear, as noted by Wei-Yin Hu and Jason S. Scott (2007). The possibility of loss is particularly problematic because the annuity does not offer a higher expected return to offset this extra "risk." This insight is also consistent with industry market research that has found that many consumers think of annuities as a "gamble" rather than as insurance. In fact, the annuity is even less attractive: life annuity payouts are typically less than actuarially fair due to administrative costs and adverse selection, meaning that the higher risk is bundled with a lower return. In addition, the risk of adverse selection also necessitates that most annuity contracts are essentially irreversible, resulting in illiquidity.

To summarize, we argue that when choosing how to invest their money, individuals focus too narrowly on risk and return. The annuity, when viewed in this narrow investment frame, looks risky and unattractive. In the next section we test this hypothesis.

II. Testing the Framing Hypothesis

In this paper, we provide a preliminary test of the framing hypothesis. We created descriptions of potential scenarios to be presented to potential consumers, some of which represent annuities and some of which represent competing non-annuitized products (such as a savings account). The essence of the test is that some of the subjects are presented these products in an investment frame, which emphasizes the depersonalized return on an account by using words such as "invest" and "earnings," describing periods in terms of years, mentioning the value of the initial investment ($100,000 in every case), and alluding to the account value at other points in the description. The other subjects are presented these products in a consumption frame, meaning that they are told how much each product would ultimately allow its purchaser to consume and for how long, using words such as "spend" and "payment," describing periods in terms of the purchaser's age, and never alluding to an account or its value. The key distinction is that the consumption frame shifts the frame: instead of simply considering the returns on the investment, individuals are presented with the consumption consequences of the investment. The consumption frame implicitly incorporates the results of investment decisions, as well as the time path of consumption, and, in this sense, is broader. The framing hypothesis suggests that the life annuity should be attractive in the consumption frame and unattractive in the investment frame.

We collected data to test this hypothesis in a four-arm Internet survey conducted in December 2007. The Internet survey firm Zoomerang hosted the survey and recruited respondents over age 50 from a pre-existing panel of individuals willing to participate in surveys in return for small incentives. A total of 1,342 individuals, approximately 335 per arm, completed the survey. All respondents answered seven forced-choice questions. Each question described the investment/spending decisions of two fictitious people and asked, "Who has made the better choice?" In all arms of the survey, an introduction stated that both people receive $1,000 each month from Social Security, have "some savings," and have already set aside money for their children. The presence of savings and money for the children were intended to address respondents' potential concerns about insurance from consumption shocks and bequests. In a real-life setting, such concerns could be addressed via partial annuitization.

Two arms of the survey presented the introduction and the choices using the investment frame, and two arms used the consumption frame. Brown et al. (2007) provide the exact wording of the products and the frames. In all four arms of the survey, the choices were described in terms of amounts and durations: the specific terms "annuity," "savings account," and "bond" were not used for labels. Several choices were compared in all arms: (a) a life annuity paying $650 each month until death; (b) a traditional savings account bearing 4 percent interest; (c) a consol bond paying $400 each month forever; (d) a 35-year period annuity paying $500 each month; and (e) a 20-year period annuity paying $650 each month. In all four arms of the survey, each respondent compared the life annuity separately to each of the other products. In addition, in the investment frame, each respondent compared a principal-protected life annuity (i.e., a life annuity that guaranteed enough payments so that the nominal value of the principal would be repaid even in the event of an early death) paying $625 each month to the traditional savings account. All choices were designed to be actuarially equivalent, and respondents were informed of this fact. To avoid spurious effects, the survey included several other comparisons that did not feature the life annuity, varied the order of the comparisons, and varied whether the life annuity was presented first or second within a given comparison.

To further address the role of the bequest motive in suppressing annuitization, we added an additional dimension of variation in the survey. Half of the respondents in each frame were told that, after death, remaining earnings or payments went to charity (the weak bequest condition); the other half that they went to children (the strong bequest condition).

We note that while our survey results are based on hypothetical scenarios, these scenarios are very similar to actual financial decisions that respondents and people they know have made. This stands in sharp contrast to the frequently used (and criticized) contingent valuation situations, which attempt to value the existence of things outside of normal experience. Robert B. Barsky et al. (1997) showed that data on stated preferences regarding risk tolerance and consumption path preferences were related in sensible ways to predicted behaviors. More generally, in a review of studies using stated preference data versus revealed preference data, Jordan J. Louviere, David A. Hensher, and Joffre D. Swait (2002) found that estimates of parameters based on the two types of data are often quite similar. An advantage of this approach is that we can obtain stated preferences over alternatives that may not be offered in a market (and for which there are no revealed preferences) but that are constructed to directly test our hypothesis. While we do not intend these stated preference data to be conclusive, the results are useful for guiding future research, possibly including experiments using actual product choices.

III. Results

When questions were presented in the consumption frame, the majority of individuals preferred the consumption stream consistent with a life annuity to the consumption streams available from other products of comparable actuarial value. Specifically, in this frame, when individuals were told that any payments after death went to charity, 72 percent of respondents preferred the $650 per month that could be provided by a life annuity to the consumption stream from a savings account of comparable actuarial value. Of respondents, 77 percent preferred the life annuity to receiving $650 per month for 20 years (age 85); 76 percent preferred the life annuity to receiving $500 per month for 35 years (age 100); and 71 percent preferred the life annuity to receiving $400 forever (the consol bond).

In contrast, when individuals faced the same choices in the investment frame, the proportions reversed, with the majority of individuals *not* choosing the life annuity. Specifically, only 21 percent of respondents preferred an account earning $650 each month for life (i.e., a life annuity) to investing $100,000 at 4 percent. Further, only 48 percent preferred the life annuity to an account earning $650 per month for 20 years; 40 percent preferred the life annuity to an account earning $500 per month for 35 years; and only 27 percent preferred the life annuity to an account earning a 5 percent interest rate from which interest but not invested money could be withdrawn. Note that in the life and period annuity cases, the respondent was explicitly told that, at the end, the investment would be worth nothing. In every case, the difference in rates between the consumption and investment frames was statistically significant.

In order to explore the direct effect of bequest motives, as well as any interaction between bequests and framing, we also randomized the treatment of bequests in our sample. When individuals were told that remaining payments went to children, rather than to charity, the percentages of respondents preferring the life annuity in the consumption frame declined, although it remained above 50 percent in most cases. Specifically, 59 percent of respondents preferred the life annuity to a savings account; 65 percent preferred the life annuity to $650 per month to age 85; 53 percent preferred the life annuity to $500 per month to age 100; and 49 percent preferred the life annuity to $400 "forever." Importantly, however, the percentages of respondents preferring the life annuity also fell in the investment frame so that the magnitude of the between-frame differences remained quite similar. Thus, across both a strong and a weak framing of bequests, we find a substantially larger fraction of the population finds annuities attractive when framed in consumption, rather than investment, terms.

While the strong effect of the frame on the stated preferences for life annuities is the key finding of the survey, our research also provides insights into how the framing affects various features of the annuity product. Specifically, there are at least two distinct features of a life annuity that distinguish it from a savings account: (a) the conversion from flexible access to money (i.e., "liquidity" in the investment frame) to a fixed stream of payments; and (b) the application of the mortality premium to the annuity payments. We are able to isolate the effect of each of these factors by comparing alternative products within each frame.

In the consumption frame, we find that the loss of flexibility did not have much impact on the respondents' evaluation of choices. Similar, albeit slightly lower, percentages of respondents preferred the life annuity to the savings account (flexible access) as preferred the life annuity to the period-certain annuity (fixed payment). In contrast, the loss of flexibility did matter in the investment frame: a smaller fraction of respondents chose the life annuity over the savings account than chose the life annuity over the period-certain annuity.

We also find that the mortality premium, which arises from pooling mortality risk, was a positive attribute in the consumption frame, with respondents consistently favoring life annuities relative to period-certain annuities. In contrast, the mortality premium was viewed neutrally or negatively in the investment frame, with respondents split equally on the choice of a life or 20 year annuity and a majority disliking the life annuity relative to its 35 year counterpart. These attitudes are consistent with our hypothesis: a dislike of illiquidity and loss of control are salient in the investment frame, but not in the consumption frame. Similarly, a desire to insure against longevity risk is salient in the consumption frame but not the investment frame.

Our survey also indicates that principal protection is highly valued in the investment frame: in the weak bequest condition, 47 percent of respondents believe that a principal-protected life annuity earning $625 per month is a better choice than a savings account, while only 21 percent believe that an unprotected life annuity dominates. The result is more dramatic in the strong bequest arm. Again, this high valuation is consistent with our hypothesis, and specifically with an aversion to the loss of wealth with a reference point at the amount of the initial investment.

IV. Conclusion

We hypothesize that framing matters for annuitization decisions: in a consumption frame, annuities are viewed as valuable insurance, whereas in an investment frame, the annuity is a risky asset because the payoff depends on an uncertain date of death. Survey evidence is consistent with our hypothesis that framing matters: the vast majority of individuals prefer an annuity over alternative products when presented in a consumption frame, whereas the majority of individuals prefer non-annuitized products when presented in an investment frame. To the extent that the investment frame is the dominant frame for consumers making financial planning decisions for retirement, this finding may help to explain why so few individuals annuitize.

This finding provokes the immediate question: if framing matters, why don't annuity providers use the consumption frame? We conjecture that the investment frame is the dominant frame in the market and in most younger customers' minds, both because it is simpler, due to the focus on nearer-term and impersonal outcomes, and because little is lost by using this frame during the wealth accumulation stage of life. We further conjecture that firms tend not to "convert" retirement-age customers to the consumption frame for several reasons: resources are required to incorporate additional personalized information and thus convert consumers to a more complex frame; a given firm may not capture the return from raising a customer's interest in particular products in the consumption frame because the converted customer can purchase from another lower-cost seller; the compensation of sales staff (e.g., through commissions) may be oriented to products most consonant with investment frame and the compensation system may involve sales people outside the direct control of a given firm; and invoking the consumption frame may undermine demand for the firm's other non-life-contingent products. Exploration of these conjectures would be valuable future work.

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Cognitive Constraints on Valuing Annuities

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Cognitive Constraints on Valuing Annuities

Jeffrey R. Brown, Arie Kapteyn, Erzo F.P. Luttmer, and Olivia S. Mitchell

Abstract

This paper documents consumers' difficulty valuing life annuities. We show that the prices at which people are willing to buy annuities are substantially below the prices at which they are willing to sell them, a finding we show is *not* attributable to an endowment effect. We also find that buy values are *negatively* correlated with sell values and that the sell-buy valuation spread is negatively correlated with cognition; the spread is larger for those with less education, weaker numerical abilities, and lower levels of financial literacy. Our evidence contributes to the emerging literature on heterogeneity in financial decision-making abilities.

Key Words: pension, annuity, retirement income, Social Security, financial literacy, cognition

JEL Codes: D14, D91, G11, H55

Cognitive Constraints on Valuing Annuities

It is difficult for the average person contemplating retirement to determine how to draw down his wealth. Choosing a wealth decumulation and consumption strategy that maximizes lifetime utility is a highly complex problem that requires the ability to optimize intertemporally and under multiple sources of uncertainty, aspects that require substantial cognitive effort. Most formal models of annuitization, however, ignore the possibility that individuals may differ in their decision-making competency. The commonly used life-cycle model assumes a rational and fully-informed individual who knows the distribution of mortality rates, market returns, inflation, future expenditures, and income, and who can use this knowledge to optimally choose the mix of financial products to smooth his marginal utility of consumption across time and states-of-the-world at the least cost.

Recently, economists have been more actively documenting differences in individual decision-making abilities and heterogeneity in the extent to which their behavior can be described as economically rational (Choi, Kariv, Müller, and Silverman 2014). A key implication of this line of research is that there can be a gap between peoples' actual decisions and the decisions they would have made if they had perfectly developed decision-making abilities. This paper explores this idea in the important context of retirement income security, focusing specifically on the quality of decision making when valuing an annuitized income stream. Rather than assessing quality by comparing actual annuitization behavior to a theoretically optimal level of annuitization for each individual – a Herculean task given that existing research provides a wide range of results (literally from zero to full annuitization) depending on model assumptions – we instead focus on whether people are internally consistent in their valuations across different elicitation methods. Specifically, we present individuals with scenarios in which they are offered an opportunity to exchange an annuity for a lump sum (what we call "selling" the annuity), as well as scenarios in which the same individuals are offered an opportunity to exchange a lump sum for an annuity (what we call "buying" the annuity). In both cases, we also vary whether the trade-off is presented in a manner consistent with compensating or equivalent variation measures from welfare economics, allowing us to distinguish variation in valuations from endowment effects.

Our central hypothesis is that people differ in their ability to meaningfully value a stream of life annuity income relative to a lump sum, and that this ability is correlated with measures of cognitive ability including education, financial literacy, and numeracy. There are four primary reasons that we have chosen to study the lump-sum versus annuity decision rather than other financial or economic decisions. First, the annuitization decision is important in its own right as an academic research topic. Indeed, there is a vast academic literature, dating back a half century, on the role that annuities should and do play in peoples' portfolios in later life.[1] Second, as we will discuss in more detail below, it is also important and timely as an issue of retirement policy in many developed nations. Third, the annuitization decision is a natural place to look for variation in consumers' decision-making abilities. Valuing an annuity versus a lump sum is cognitively challenging because it requires that one wrestle with multiple sources of uncertainty (e.g., mortality, returns, inflation) and it also requires that one make a near-term choice with far-distant consequences, two characteristics known to render decision making difficult (Beshears, Choi, Laibson, and Madrian 2008). Fourth, because individuals are typically faced with an annuitization decision only one or two times in their lives, this is not a transaction that people learn about through repeated market interactions (Bernheim 2002). In such settings, individuals are known to be less likely to optimize and more likely to adopt rule-of-thumb behaviors (Kling, Phaneuf, and Zhao 2012), which can drive a wedge between true versus revealed preferences (Beshears, Choi, Laibson, and Madrian 2008).

We provide six pieces of evidence consistent with the hypothesis that individuals have difficulty valuing annuities and that the degree of difficulty is correlated with their cognitive abilities. First, we show that a non-trivial fraction of the population has implied annuity values that are difficult to reconcile with optimizing behavior under *any* plausible set of parameters. Second, we uncover a large divergence between the price at which individuals are willing to *buy* versus *sell* an annuity, a result that cannot be explained by liquidity constraints or endowment effects. Third, and even more striking, we find that the buy and sell valuations are *negatively* correlated. In other words, people who demand higher sell prices are also more likely to offer very low buy prices. Fourth, we show that the size of the buy-sell valuation discrepancy is strongly negatively correlated with cognitive ability as measured by education, financial literacy, and numeracy. This is consistent with less cognitively capable individuals having much greater

[1] Two reviews include Benartzi, Previtero, and Thaler (2011) and Poterba, Venti and Wise (2011).

difficulty valuing a stream of annuity payments. Fifth, we use additional experimental variation to show that the elicited valuations are sensitive to anchoring effects and thus they violate the "invariance" criterion of rational decision making. Finally, we argue that it is difficult to explain observed cross-sectional variation in the measured annuity valuation amounts with theoretically attractive measures. In other words, the pattern of significant marginal valuation predictors is more consistent with individuals using simple heuristics rather than full optimization to value the trade-offs.

Our evidence is drawn from a randomized experiment we conducted in the American Life Panel (ALP), where we presented respondents with hypothetical choices between a lump sum and a Social Security annuity. By varying whether the questions elicited a compensating variation (CV) or an equivalent variation (EV) value, whether the individual was buying or selling the annuity, the size of the increments, and the order of the questions, we directly examine the coherence and stability of subjective valuations placed by respondents on their Social Security annuities. We collected a number of additional variables to control for potentially confounding factors such as heterogeneity in liquidity constraints and beliefs about political risk.

Like most economists, we usually find evidence based on actual choices in natural settings more compelling than evidence based on hypothetical choices. We acknowledge important drawbacks of using hypothetical choices, such as the possibility that lower stakes could lead respondents to exert less effort and seek out fewer resources to assist with their decisions. However, although these considerations may make hypothetical choice behavior noisy, it would be surprising if they led to systematic patterns in hypothetical choice behavior that would be completely absent in actual choices.

Counterbalancing these drawbacks are three important benefits of using a hypothetical choice setting. First, the hypothetical setting allows us to observe an individual's annuitization decisions for a wide range of annuity prices, from which we obtain individual-specific annuity valuations without having to rely on functional form assumptions. In real world settings, annuitization decisions are typically made at a single price (and if there is price variation, it is generally not exogenous). Second, in a hypothetical setting, it is feasible to observe both the price at which an individual is willing to buy and the price at which he is willing to sell the annuity. Such within-person variation turns out to be extremely valuable in exploring cognitive constraints on individuals' abilities to value annuities. Third, the hypothetical setting allows us to elicit annuitization choices for a broadly representative sample of the U.S. population. As discussed in the literature overview below, actual annuitization decisions in natural settings are typically only observed for rather select populations.

In addition to advancing our academic understanding of consumer behavior in this area, our results also have considerable practical policy relevance. In March 2014, for example, the UK Chancellor announced the end of a requirement that savers annuitize a portion of their assets upon retirement (PricewaterhouseCoopers, 2014), a significant policy change that led to an immediate and substantial decline in annuity sales (Gray, 2014). In contrast, the U.S. has been taking steps in the direction of encouraging annuities in defined contribution plans (US DOL 2010), with some analysis going so far as to suggest that people be automatically annuitized upon retirement (Gale, Iwry, John, and Walker 2008; Steverman 2012). Numerous other countries have also been debating these issues over the past decade.[2] These discussions, in part, revolve around whether people can make optimal payout decisions using their accumulated retirement assets. Moreover, many countries are grappling with fiscally unsustainable pay-as-you-go public pension systems. To the extent that households are poorly equipped to value the annuities offered by their public pensions, this has implications for the political feasibility of reforms changing the benefit structure, particularly if retirees were to be offered a choice between a lump sum and future annuity payments. The same point applies to state and local public defined benefit plans (DB) in the U.S., which also face substantial underfunding problems (Novy-Marx and Rauh 2011); indeed some reformers have called for a reduction in DB annuities in exchange for lump-sum contributions to defined contribution (DC) accounts (e.g., Kilgour 2006).

In what follows, we first summarize key prior studies on the demand for annuities from both the neoclassical and the behavioral economics literatures. Next, we describe the American Life Panel (ALP) internet survey, a broadly representative sample of the U.S. population, and we outline how we elicited lump-sum versus annuity preferences in this survey, using a purpose-built module. We then present our key empirical results, followed by a number of robustness checks and further analyses for subgroups that vary according to financial capabilities. We conclude with a discussion of possible policy implications and future research questions.

[2] Similar debates about the role of lifetime income in retirement plans are occurring in many European nations, including the Netherlands (Brown and Nijman 2012), Italy (Guazzarotti and Tommasino 2008), and many others (Fornero and Luciano 2004).

I. Related Literature

A. Annuity Demand

There is a very large economics literature focused on modeling the optimal level of annuitization for life-cycle consumers under various assumptions.[3] That literature began with Yaari's (1965) paper in which he noted a set of conditions under which it would be optimal for an individual to annuitize all of his wealth.[4] Extensions to the theory went on to show that full annuitization would be optimal under more general conditions,[5] a puzzling prediction in light of very low annuitization rates in the real world (Mitchell, Piggott, and Takayama 2011). Extended life-cycle models have been constructed to measure consumer valuations of life annuities and to compute how optimal annuitization will vary with other factors including: pricing (Mitchell, Poterba, Warshawsky, and Brown 1999); pre-existing annuitization (Brown 2001; Dushi and Webb 2006); risk-sharing within families (Kotlikoff and Spivak 1981; Brown and Poterba 2000); uncertain health expenses (Turra and Mitchell 2008; Sinclair and Smetters 2004; Peijnenburg, Nijman, and Werker 2010a, 2010b); bequests (Brown 2001; Lockwood 2011); inflation (Brown, Mitchell, and Poterba 2001, 2002); the option value of learning about mortality (Milevsky and Young 2007); stochastic mortality processes (Reichling and Smetters 2012; Maurer, Mitchell, Rogalla, and Kartashov 2013); and broader portfolio issuesincluding labor income and the types of assets on offer (Inkmann, Lopes, and Michaelides 2011; Koijen, Nijman, and Werker 2011; Chai, Horneff, Maurer, and Mitchell 2011; Horneff, Maurer, Mitchell, and Stamos 2009, 2010). Opinions differ on the extent to which this theoretical literature has been successful in resolving

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[3] Rather than providing a comprehensive review here, we instead highlight those studies most germane to the research that follows. Readers interested in the broader literature on life annuities may consult Benartzi, Previtero, and Thaler (2011); Poterba, Venti, and Wise (2011); Brown (2008); Horneff, Maurer, Mitchell, and Dus (2008); and Mitchell, Poterba, Warshawsky, and Brown (1999). Note that we use the term "life annuity" because we are interested in products that guarantee income for life, as opposed to financial products such as "equity indexed annuities" that are mainly used as tax-advantaged wealth accumulation devices (and hence they are rarely converted into life-contingent income).

[4] The conditions include no bequest motives, time-separable utility, exponential discounting, and actuarially fair annuities (among others).

[5] Davidoff, Brown, and Diamond (2005) showed that full annuitization is optimal under complete markets with no bequest motives. Peijnenburg, Nijman, and Werker (2010a; 2010b) found that if agents saved optimally out of annuity income, full annuitization can be optimal even in the presence of liquidity needs and precautionary motives. They further found that full annuitization is suboptimal only if agents risk substantial liquidity shocks early after annuitization and do not have liquid wealth to cover these expenses. This result was robust to the presence of significant loads.

the annuity puzzle, even for marginal annuitization decisions (e.g., Shepard 2011).

There is also a sizable empirical literature on annuities, despite the small size of the voluntary life annuity market in most countries. Brown (2001) used the 1992 wave of the U.S. Health and Retirement Study (HRS) to show that expected annuitization from DC plans was correlated with the annuity valuations predicted by a life-cycle model based on demographic characteristics, though only for persons with sufficiently long (>1 year) planning horizons. Hurd and Panis (2006) explored payouts from DB plans in the HRS and found peoples' behavior was consistent with *status quo* bias. Bütler and Teppa (2007) used Swiss administrative data to track choices made by employees in ten different pension plans and concluded that annuitization was higher in plans where an annuity was the default payout option. Chalmers and Reuter (2012) exploited exogenous variation in the price of annuities using Oregon public-sector workers; they (unexpectedly) found that worker demand for partial lump-sum payouts rose rather than fell as the value of the forgone life-annuity payments increased, leading them to conclude that the decisions were being made by unsophisticated individuals. Previtero (2014) showed that annuity demand was negatively correlated with the prior year's stock returns, consistent with consumers engaging in naïve trend chasing.

Several experimental papers have also suggested that annuitization decisions may be reflective of non-optimizing behavior. Agnew, Anderson, Gerlach, and Szykman (2008) showed that individuals could be steered toward or away from life annuities in an experimental setting, depending on whether the products were described using positive or negative frames. Brown, Kling, Mullainathan, and Wrobel (2008) used an internet survey to show that perceptions of annuity value relative to alternative financial products were heavily influenced by whether the products were described using "consumption" or "investment" frames. Beshears, Choi, Laibson, Madrian, and Zeldes (2014) also found evidence that framing affects annuity demand. Brown, Kapteyn, and Mitchell (2013) showed that Social Security claiming behavior (which is akin to making an annuitization decision) was influenced by framing changes. Accordingly, this small literature suggests that individuals behave in a manner at odds with optimizing models.

Overall, the difficulty explaining annuitization behavior using optimizing models, combined with the empirical and experimental work suggesting behavior is not fully consistent with rational decision making, motivates our research into whether individuals are making optimization errors in making decisions about annuities and whether the heterogeneity in decision-making quality is correlated with other observable factors.

B. Variation in Decision-making Abilities

In contrast to the neoclassical literature, which posits perfectly informed and rational individuals optimizing their consumption path over the life cycle, Lusardi and Mitchell (2014) provide a comprehensive review of the large and growing literature relating financial literacy to behavior, including the robust finding that many households lack basic financial knowledge. Research has documented that households make a range of financial mistakes when managing financial affairs (e.g., Calvet, Campbell, and Sodini 2007, 2009; Agarwal, Driscoll, Gabaix, and Laibson 2009) and that households making mistakes often lack day-to-day financial skills (Hilgert, Hogarth, and Beverly 2003). It has also established that financial literacy is correlated with the propensity to participate in financial markets (Kimball and Shumway 2006; Christelis, Jappelli, and Padula 2010; van Rooij, Lusardi, and Alessie 2011; Almenberg and Dreber 2011; and Arrondel, Debbich, and Savignac 2013) and in pensions (Fornero and Monticone 2011). Earlier work by Lusardi and Mitchell (2007, 2011) also showed that more financially literate individuals were more likely to engage in retirement planning and to accumulate retirement wealth.

A related literature has focused on variation in cognitive abilities and financial decision making. Fang, Keane, and Silverman (2008) found that cognitive functioning was a stronger predictor of Medigap purchase than risk preferences. Agarwal and Mazumder (2013) reported that performance on cognitive tests helped explain the quality of financial decisions related to the use of credit. A subset of this literature has also focused more specifically on retirement-preparedness among older individuals. For example, McArdle, Smith, and Willis (2011) and Banks, O'Dea, and Oldfield (2010) found that cognitive abilities helped explain retirement wealth accumulation.

Taken together, these and many other studies suggest that people differ in their financial decision-making abilities and that these differences are important correlates of financial well-being late in life. Taking this literature an important step further in establishing causality, Choi, Kariv, Müller, and Silverman (2014) conducted a large-scale experiment designed to directly test the extent to which individual decisions were consistent with the Generalized Axiom of Revealed Preference (GARP); they found substantial heterogeneity. Importantly for our work, they found that their measure of decision-making quality was higher among those with more education and among younger individuals, while they also showed that individuals with better decision-making skills accumulated more wealth. Behrman, Mitchell, Soo, and Bravo (2012) also reported that the more financially literate saved more in their pensions, controlling for the possible endogeneity of financial knowledge.

Our experiments contribute to this literature in two ways. First, we focus on a decision important in its own right – annuitization – but where heterogeneity in decision-making quality has not been studied. Second, we use an outcome that is a novel measure of decision-making ability; we take the spread of peoples' responses across different approaches to eliciting stated valuations for life annuities as a measure of low decision-making quality. We find that this spread is strongly inversely related to cognition.

II. Methodology and Data

A. The Social Security Context

Our experiments, described below in greater detail, use Social Security benefits as the context rather than describing an unfamiliar hypothetical annuity product. This approach has several advantages. First, most workers have an understanding that Social Security pays benefits to retirees that last for as long as they live (Greenwald, Kapteyn, Mitchell, and Schneider 2010; Liebman and Luttmer 2014), which means that respondents will understand the nature of our "offer" to trade off annuities and lump sums. Second, our context provides a simple way to control for possible concerns about the private annuity market that might influence results such as the lack of inflation protection (our question makes it clear that Social Security is adjusted for inflation), or concerns about counterparty risk of the insurer providing the annuity.[6] Third, given the ongoing debate about the U.S. long-term fiscal situation, our setting is highly policy-relevant. For example, past discussions of possible pension reforms around the world, as well as at the state and local levels in the U.S., have included proposals to partially "buyout" benefits by issuing government bonds to workers in exchange for a reduction in their annuitized benefits. Several U.S. corporations have also recently offered to buy back defined benefit pension annuities from retirees, in exchange for a lump sum (c.f., Wayland 2012).

B. The American Life Panel

[6] Below we examine whether concerns about the fiscal sustainability of Social Security influences people's valuation of the Social Security annuity. See Luttmer and Samwick (2012) for a detailed analysis of the effects of policy uncertainty on valuations of future Social Security benefits.

To test how people value their Social Security annuity streams, we fielded a survey between June and August of 2011 using the RAND American Life Panel, a panel of U.S. households that regularly take surveys over the Internet. If, at the recruiting stage, households lacked Internet access, this was provided by RAND.[7] By not requiring Internet access in the recruiting stage, the ALP has an advantage over most other Internet panels when it comes to generating a representative sample.[8] The American Life Panel included about 4,000 active panel members at the time of our experiment. Our survey was conducted over two waves of the ALP to keep the length of each questionnaire within manageable bounds, and we invited ALP participants age 18 or older to take our survey. For the first wave, we selected 2,954 respondents, of whom 2,478 completed the survey for a response rate of 83.9%. Those who completed the first wave were invited to participate in a second survey at least two weeks later; of these, 2,355 respondents completed the second wave for a response rate of 95.0%. If a participant indicated he did not think he would be eligible to receive Social Security benefits (either on his own earnings records or on those of a current, late, or former spouse), he was asked to assume for the purposes of the survey that he would receive Social Security benefits equal to the average received by people with his age/education/sex characteristics (see Online Appendix B). Our sample comprised 2,112 complete responses for both waves 1 and 2.[9]

Table 1 compares our sample characteristics with those of the same age group in the Current Population Survey (CPS).[10] Our sample is, on average, five years older, more female, more non-Hispanic white, better educated, slightly higher-income, and has a somewhat smaller household size than the CPS; the regional distribution is close to that of the CPS. The fact that our sample is more highly educated means that, if anything, our respondents should be in a better position to provide meaningful responses to complex annuity valuation questions, compared to a

[7] Initially these households received a WebTV allowing them to access the Internet. Since 2008, households lacking Internet access at the recruiting stage have received a laptop and broadband Internet access.
[8] A more detailed explanation of the ALP is provided in Online Appendix A, along with a brief description of how we estimated Social Security benefits for survey respondents. Our survey instrument is included in Online Appendix B.
[9] Of the 2,355 respondents who completed the second wave, we dropped 69 observations from the pilot version of wave 2 (where the questionnaire was slightly different). We further dropped 168 observations where survey instrument was incorrectly administered due to a technical glitch and we dropped 6 observations with missing information on basic demographics (age, education, or marital status).
[10] Summary statistics of other key variables from our survey (such as annuity valuations, discussed below) are listed in Online Appendix Table A.1.

national sample. Despite the differences between the ALP and the CPS, our ALP sample does include respondents from a wide variety of backgrounds, so in this sense, we think of the ALP as broadly representative of the U.S. population.

Table 1 here

C. Eliciting Lump-Sum versus Annuity Preferences

To elicit preferences over annuitization, respondents were posed several questions of the following sort:

> In this question, we are going to ask you to make a choice between two money amounts. Please click on the option that you would prefer. Suppose Social Security gave you a choice between:
> (1) Receiving your expected Social Security benefit of $SSB per month.
> *or*
> (2) Receiving a Social Security benefit of $(SSB-X) per month <u>and</u> receiving a <u>one-time payment</u> of $LS at age Z.

The variable *SSB* is an estimate of the individual's estimated monthly Social Security benefit; the variable *LS* refers to the lump-sum amount; and *Z* is the individual's self-reported expected claiming age. For those not currently receiving benefits, the trade-off was posed as a reduction in future monthly Social Security benefits in exchange for a lump sum to be received at that person's expected claiming age. For those currently receiving Social Security benefits, the questions were modified so as to compare a change in monthly benefits to the receipt of a lump sum in one year. In both cases, the receipt of the lump sum was in the future rather than immediately; we did this to avoid having the answers being affected by possible present-biased preferences. Before asking the annuity trade-off question, we instructed all respondents to "please assume that all amounts shown are after tax (i.e., you don't owe any tax on any of the amounts we will show you)" and "please think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation)." In the trade-off question, we told married respondents, "Benefits paid to your spouse will stay the same for either choice." Thus, individuals were asked to value a single-life inflation-indexed annuity.

In order to probe the reliability of the valuations provided by respondents, we varied the question in a systematic way along two dimensions. First, we elicited how large a lump sum would be required to induce an individual to accept a reduction of (i.e., to *sell*) a portion of his

Social Security income; below we refer to this version of the question with the shorthand "sell." We also elicited how much the individual would be willing to *pay* in order to increase his Social Security annuity (the "buy" condition). The difference in responses to these alternative solicitations is a central focus of what follows.

A second dimension along which we varied our questions depended on whether we elicited a compensating variation (CV) – the annuity/lump-sum trade that would keep people at their existing utility level – or an equivalent variation (EV) –the lump-sum amount that would be equivalent in utility terms to a given change in the monthly annuity amount. As we discuss in greater detail below, an analysis of the CV versus EV distinction should allow us to distinguish our findings from a simple *status quo* bias or endowment effect. This is because in the EV version of the questions, each individual had to choose an increment or decrement to his annuity. The *status quo* was not an option in this scenario.

In total, we elicited all four measures and designate them as **CV-Sell** (as in the example above), **CV-Buy**, **EV-Sell,** and **EV-Buy**. The chart below illustrates the essential differences across these four scenarios. We define *SSB* as the monthly Social Security benefit the individual was currently receiving (if the individual was a current recipient), or was expected to receive in the future (if the individual was not a recipient); *X* is the increment (or decrement, if subtracted) to that monthly Social Security benefit. Finally, we set *LS* as the lump-sum amount offered in exchange for the change in monthly benefits. In essence, this paper is about how individuals tradeoff a monthly benefit of $*X* for a lump-sum of amount $*LS*.

Four Variants of the Annuity Valuation Tradeoff Question

	"Sell"-version		"Buy"-version	
	Choice A	Choice B	Choice A	Choice B
Compensating Variation (CV)	[*SSB-X*] + *LS*	[*SSB*]	[*SSB+X*] - *LS*	[*SSB*]
Equivalent Variation (EV)	[*SSB*]+ *LS*	[*SSB+X*]	[*SSB*] - *LS*	[*SSB-X*]

Note: *SSB* stands for current/expected monthly Social Security benefits, *X* is the amount by which monthly Social Security benefits would change and *LS* is a one-time, lump-sum payment. Positive amounts are received by the individual while negative amounts indicate a payment by the individuals. Amounts between square brackets are paid monthly for as long as the individual lives, whereas *LS* is a one-time payment. The individual is asked to elect Choice A or Choice B.

The CV-Sell scenario presented individuals with a choice between their current or expected Social Security benefits (*SSB*), versus a scenario in which their benefits would be reduced by \$*X* per month in exchange for receiving a lump sum of \$*LS*. The EV-Sell scenario provided a choice between receiving a higher monthly benefit (*SSB*+*X*) or receiving \$*SSB* plus a lump sum of \$*LS*. Note that within the Sell scenario, one can obtain EV simply by adding \$*X* to each side of the CV trade-off. Given that *X*=\$100 per month in the baseline versions, the change in benefits is modest relative to total monthly income for most individuals. We would therefore expect CV and EV to be comparable, barring strong endowment effects that could be present in the CV formulation but not in the EV formulation (where the *status quo* was not an option).

Switching to the Buy scenarios, the CV-Buy question provided a choice between *SSB* and a benefit increased by \$*X* in exchange for paying \$*LS* to Social Security. EV-Buy provided a choice between receiving a lower monthly benefit (*SSB*-*X*) and paying a lump sum to maintain the existing benefit. Note that in these Buy scenarios, one can obtain CV simply by adding \$*X* to each of the EV scenarios. Again, it is worth noting that no *status quo* option was available in the EV case.

In order to converge on the subjective valuation resulting from any given measure above, the survey used a "branching" approach. For example, we started with a \$100 increment to the monthly annuity versus a \$20,000 lump sum. Then, based on the individual's response, we either increased or decreased the amount of the lump-sum payment. By walking each respondent through a multi-stage branching process, we converged on a small range of lump-sum values that approximated the respondent's implied subjective valuation of the change in the annuity stream.

As part of our experimental design, we chose one of our four approaches as a benchmark, permitting us to do additional sensitivity tests along other dimensions. While there is no theoretical basis for suggesting that one treatment would be preferred to the other three, we selected the CV-Sell option because it is more relevant to policy discussions. For example, offering retirees an opportunity to sell their annuities for lump sums is a transaction observed in recent years (e.g., GM offered retirees lump sums in lieu of their life annuities). The Sell measure is also less likely than the Buy measure to be bounded by people's access to liquidity. Accordingly, all respondents were asked the CV-Sell question in one of the two waves, whereas the other three versions (CV-Buy, EV-Sell, and EV-Buy) were asked in a randomized order in the other wave. The placement of the CV-Sell question in the first or second wave was randomized across respondents. The two surveys were administered approximately two weeks apart. Below, we test whether responses to CV-Sell differ depending on whether this question was in the first or second wave.

Two other studies have employed a branching approach to elicit annuity valuations, although they were much more limited in focus.[11] Cappelletti, Guazzarotti, and Tommasino (2013) used a national survey of Italian households in 2008 to ask whether people would give up half their monthly pension income (assumed to be €1000) in exchange for a lump sum of €60,000, paid immediately. Depending on their responses, individuals were branched to higher or lower lump-sum amounts. Liebman and Luttmer (2011) conducted a 2008 survey on the perceived labor supply incentives in Social Security, and they included in their survey a question asking people for the equivalent variation of a $100/month increase in their Social Security benefits (this is equivalent to our EV-Sell question.) Because each of those papers used only a single elicitation method, neither addresses the hypotheses tested in this paper.

D. Other Sources of Experimental Variation

We also randomized along a number of other dimensions for two reasons. First, we randomized the order of the options within a question, to test whether respondents were taking the survey seriously (as opposed to, say, always choosing option A). Second, we tested for anchoring effects in our benchmark question (CV-Sell) as well as whether responses varied with the magnitude of the change in the benefit, to provide a further assessment of the role of cognitive limitations. Furthermore, we asked a version of the questions designed to control for political risk, to ensure that our results were not driven by concern over the system's pending insolvency. Each of these factors is discussed in detail after we present our main results.

III. Evaluating Heterogeneity in Annuity Valuations

Figure 1 reports the cumulative distribution function (CDF) of the responses to the CV-Sell and CV-Buy questions, while Figure 2 provides a similar plot for EV-Sell and EV-Buy.

[11] In addition to the two studies discussed in the text, a subset of the present authors has previously sought to elicit subjective annuity valuations in two HRS experimental modules. Errors in questions or response coding unfortunately interfered with analysis. One module in the 2004 HRS asked respondents their willingness to trade $500 of a hypothetical $1000 monthly Social Security benefit for a lump sum. Although the lump-sum amount offered to unmarried individuals was approximately actuarially fair, the amount offered to married couples was too low. A second module was fielded in the 2008 HRS, but coding instructions provided to field interviewers led to an inability to distinguish answers at the two extremes, i.e., those who placed a zero value on an annuity versus those who placed a very high value on annuities.

Given our bracketing of responses, the two Figures plot both the upper and lower bounds for each respondent's annuity valuation.[12] In Figure 1, the midpoint of the upper and lower bounds for the CV-Sell question indicates a valuation of $13,750 for a $100-per-month change in Social Security benefits. The CV-Buy question midpoint valuation is only $3,000. In Figure 2, the comparable valuations are $12,500 for EV-Sell and $3,000 for EV-Buy. By comparison, the median *actuarial value* of this annuity for respondents in our sample is $16,855 (computed using Social Security's intermediate assumptions of a three percent interest rate and intermediate mortality).

Figures 1 and 2 here

Four patterns are evident in these two figures. First, median valuations are all substantially below the actuarial value. Second, there is substantial dispersion of valuations in all four valuation approaches. Third, the distributions of EV and CV valuations appear similar, holding fixed whether it is a Buy or Sell valuation, although we will see below that the correlation is far from perfect. Fourth, there is a very large difference between the Sell and Buy valuations, regardless of whether it is elicited in a CV or an EV setting. After briefly discussing each of these issues, we will then delve deeper into analyzing differences in valuations within and across individuals.

A.Median Valuations

If one simply pools the responses to our four valuation questions – CV-Sell, CV-Buy, EV-Sell and EV-Buy – 70% of the responses have an upper bound below the actuarially fair level and 64% of the responses have an upper bound that is at least $5,000 below the actuarially fair level.[13] This finding is interesting given the ongoing discussion in the literature about the "annuity puzzle," i.e., the fact that life-cycle models typically place a high utility value on annuitization, whereas most consumers appear to avoid purchasing them. Yet there are many reasons – some rational (e.g., bequest motives, a desire for liquidity), some behavioral (e.g., present-biased preferences) – for why people might value an annuity below its actuarially fair

[12] The CV-Sell figure plots valuations only for individuals who saw the $100 increment first (the other three annuity valuation questions are only asked for $100 increments). Other respondents saw higher annuity amounts first and, as we discuss below, this anchoring effect led to a higher valuation in their response to CV-Sell.

[13]As in the figure, we limit the sample for the CV-Sell response to individuals who saw the $100 increment first to avoid anchoring effects. If we double the weight on the remaining half of the CV-Sell responses (to compensate for the fact we dropped CV-Sell responses affected by anchoring), the percentages become 68% and 61%, respectively.

level and it is not the purpose of this paper to explain the annuity puzzle. Rather, our goal is to test whether valuations are consistent with optimizing behavior. We do this not by comparing elicited values with theoretical values, but rather by examining the stability and consistency of stated preferences. The remainder of our results should be viewed in light of this important distinction.

B. Dispersion of Valuations

The CDFs in Figures 1 and 2 reveal substantial heterogeneity in respondent valuations. For example, five percent of the sample reports upper-bound CV-Buy valuations of $1,500 or less, levels so low that they are difficult to explain using any "rational" economic model, since the $100 monthly annuity payments would provide more than this amount in only 16 months. The exception would be if some individual were virtually certain that he would die in that period, but we find that these outliers persist even when we control for respondents' self-reported health status and survival probabilities. At the other extreme, 16 percent of the respondents reported lower-bound CV-Sell annuity values of $60,000 or higher – nearly four times the actuarial value of the annuity. Moreover, over six percent of the respondents in the CV-Sell approach said they would not accept a lump sum of less than $200,000. This is unexpected, since even if someone earned only a 60 basis-point (0.60%) annual return on the $200,000 lump sum, he could replace the $100 per month he was giving up with this return *and still keep the lump sum* of $200,000. As discussed in more detail below, these findings are not explained by subjective life expectancy, concerns about political risk, or other plausible "rational" explanations.[14] In other words, many respondents appear to be having difficulty providing economically meaningful

[14] We control for political risk in two ways in this study. First, we asked individuals about their confidence that the Social Security system will be able to provide them with the level of future benefits they are supposed to get under current law. Including responses to this question as a control variable in various analyses does not substantially affect our findings. Second, we asked a version of our CV-Sell annuity valuation question in which we explicitly instructed individuals not to consider political risk by stating: "From now on, please assume that you are absolutely certain that Social Security will make payments as promised, and that there is no chance at all of any benefit changes in the future other than the trade-offs discussed in the question below." Using the most unbiased comparison available (i.e., comparing the response to the no-political-risk question to the baseline CV-Sell question for those for whom the two questions were asked in different waves of the survey), we find that the response to the no-political-risk question is a statistically insignificant 10 percent *lower* than the response to the baseline CV-Sell question. Taken literally, this implies a negative risk premium. We believe, however, the more likely explanation is that our question may have had the unintended effect of making political risk more salient, rather than less. Overall, our analysis suggests that the incorporation of political risk does not alter our main findings.

values for the Social Security annuity, at least in the tails of the CDF.

C. Comparing CV and EV

As noted above, we obtain the EV-Sell questions by simply adding $100 to both of the options in the CV-Sell questions. Given the small magnitude of the shift (relative to mean estimated monthly benefits of $1,395), we expect that a fully rational decision maker would provide quite similar assessments across these two ways of eliciting value. Although the distributions of CV-Sell and EV-Sell look similar in Figures 1 and 2 (as do the distributions of CV-Buy and EV-Buy), individual responses are not as correlated as one might infer. Table 2 reports the correlations across the four different measures.[15] In column 1, we see that although CV-Sell and EV-Sell are significantly positively correlated, the correlation of +0.31 is far from perfect. It is notable that we asked the CV-Sell and the EV-Sell questions in different survey waves; thus each individual answered the two questions at least two weeks apart. Given this lag, it is unlikely that the correlation is driven by anchoring or memory effects that could arise if the questions had been asked within the same questionnaire. At +0.72, the correlation between CV-Buy and EV-Buy is substantially higher than the correlation between CV-Sell and EV-Sell. However, given that CV-Buy and EV-Buy were asked in the same wave, we cannot rule out that anchoring effects may have contributed to this higher correlation.

Table 2 here

D.Sell Prices Exceed Buy Prices

The most striking pattern that emerges from Figures 1 and 2 is that the distributions of annuity valuations from the Buy solicitations are substantially below those of the Sell solicitations. Recall that the Sell question asked how much a person would have to be compensated to *give up* part of his Social Security annuity, whereas the Buy question asked how much he would be *willing to pay* to increase his Social Security annuity. In Figure 1, the median midpoint response drops from $13,750 for CV-Sell to only $3,000 for CV-Buy, and responses at other points on the distribution drop as well.

If we observed this result only in the CV case, one might argue that this could result from *status quo* bias (Samuelson and Zeckhauser 1988) or an endowment effect (Kahneman, Knetsch,

[15] To control for correlations induced by common experimental manipulations, we regress the log midpoint value of the response on controls for the relevant manipulations and then correlate the residuals, which are reported in Table 2. Uncorrected correlations are similar and shown in Online Appendix Table A.2.

and Thaler 1991). Yet Figure 2 shows that an almost identical shift occurs when we use the EV-Sell and EV-Buy responses, where the *status quo* is not an option because both the annuity and the lump sum are represented as deviations away from the initial endowment.

To rule out the possibility that answers might be driven by liquidity constraints, we also asked respondents about their ability to come up with the money needed for the lump sum. The vast majority (91 percent) indicated that their choice was *not* due to liquidity constraints,[16] and the clear divergence in valuations persists even when we focus on the non-liquidity constrained sub-sample.

Rather than *status quo* bias, endowment effects, or liquidity constraints, we conjecture that this wedge is the outcome of valuation difficulties on the part of respondents. This conjecture has two testable implications. First, individuals who have difficulty valuing annuities may seek to protect themselves by agreeing to an annuity transaction only if the annuity is priced very attractively, which would lead them to demand a high price to sell, but offer a low price to buy. We refer to this as a "reluctance to exchange," which would imply that buy valuations will be *negatively* correlated with sell valuations. Second, it implies that the size of the wedge between buy and sell valuations will be decreasing with cognitive abilities.

E. Negative Buy-Sell Correlations

Although Figures 1 and 2 reveal large differences in the distributions of responses between Sell and Buy valuations, they do not reveal whether *within-person* responses to these alternative valuation measures are correlated. Hence we cannot yet conclude that the entire distribution is shifting to the left, or whether the same individuals are also changing their positions in the distribution depending on whether they see a Sell or Buy measure. This is addressed in Table 2, where we find a striking negative correlation between Buy and Sell valuations. Specifically, the correlation between CV-Sell and CV-Buy is -0.11, whereas the

[16] Specifically, we asked whether each respondent could come up with $5,000 "if you had to" and, separately, whether he could come up with the lump sum needed to purchase the higher annuity. The time frame for accessing the money was the same time frame as in the annuity valuation question, namely one year from now or the respondent's expected claim date, whichever was later. About two-thirds of the respondents answered that they were certain they could come up with $5,000, and over 90 percent responded that they could come up with the amount probably or certainly. About 82 percent of respondents indicated that they could come up with the lowest lump-sum amount that they declined to pay. Of the 18 percent that indicated they could not come up with this amount, half said that even if they had the money, they would decline to pay the lump sum. Thus, for 91 percent of the respondents, liquidity constraints were not the reason for the low reported annuity valuation in the CV-Buy trade-off question.

correlation between EV-Sell and EV-Buy is -0.15; both are highly statistically significant. These negative correlations suggest that individuals who place above-average values on a $100 monthly annuity when asked to sell it tend to be willing to pay less than average to purchase a 100/month annuity flow. The negative correlation also suggests substantial movement within the distributions, rather than just a downward shift for everyone when we move from a Sell to a Buy elicitation method. This pattern is consistent with individuals who have difficulty valuing annuities being reluctant to exchange annuities because they wish to ensure that they are not losers in a transaction they have difficulty evaluating.

F. The Role of Cognition and the Sell-Buy Spread

If the Sell-Buy differential is the result of differences in decision-making abilities, then the size of the spread should be correlated with measures of cognition. To explore this, we construct a measure of the "Spread" that is equal to the absolute value of the difference between the log CV-Sell and the log CV-Buy valuation of a $100 change in monthly Social Security benefits. The spread is defined as an absolute value because a discrepancy between Sell and Buy valuations in either direction is indicative of a lack of optimizing behavior. In practice, the spread is dominated by the 80 percent of individuals who place a higher value on CV-Sell than on CV-Buy. Because the spread is measured as the difference in log points, this variable reflects the relative value of Sell and Buy solicitations. The mean of the Spread variable is 2.58 and its median is 2.30, indicating that the median individual reports Sell and Buy valuations that differ by a factor of 10. In the large majority that places a higher value on the Sell than the Buy valuation, the mean and median of the Spread variable are respectively 2.63 and 2.35, which indicates that the median person in this sample demands a price to sell a $100 per month annuity that is 10.5 times higher than the price that he is willing to pay to purchase this same annuity.

In Figure 3, we show the bivariate relation between the CV Sell-Buy Spread and various measures of cognition. Panel A groups respondents according to an index of financial literacy, measured as the sum of correct answers to the three questions devised for the Health and Retirement Study and used in the ALP to rate respondents' financial literacy levels.[17] Consistent with our hypothesis that the discrepancy between Sell and Buy is driven by differences in decision-making ability, we find that that the wedge between the responses falls sharply with

[17] The three questions test for an understanding of inflation, compound interest, and risk diversification (for a complete listing of the questions see Lusardi and Mitchell 2014).

measured increases in financial literacy. In Panel B, we make use of the scores on a number scoring test, where respondents are shown incomplete sequences of numbers and are asked to complete the sequence (e.g.: 7, 8, …, 10). Based on six such sequences and a RASCH scoring algorithm (Linacre 1999), each respondent is assigned a score. We find a sharp and monotonic decline in the Sell-Buy Spread across the quintiles of this numeracy measure. In Panel C, we split the Spread measure by level of education and once again we find a sharply declining pattern. Panel D uses an overall cognition index, which is the first principal component of the three measures of cognition.[18] Not surprisingly, given the patterns in the earlier panels and the fact that the weight on each of the three factors is roughly equal, we find a strong, monotonic, negative relation between the Sell-Buy Spread and our cognition index.[19]

Figure 3 here

We repeat this analysis in a regression framework in Table 3, along with controls for other factors. In column 1, we regress the Spread against age dummies and controls for experimental variations (to be discussed in the next section). We note that the coefficient on age 65+ is positive and significant; these older individuals have a 44 percentage point larger absolute difference between their Sell and Buy valuations than the reference age category (age 34 or younger) and the difference remains large (39 percentage points) and significant if we compare them to the age 50-64 category. This finding is important for two reasons. First, it addresses concerns that younger individuals may be less attuned to our decision context because they are further removed from making the comparable real-world decision and also because they may be less likely to be familiar with how Social Security benefits are paid as monthly income for life. Yet we find the opposite: younger individuals have more consistent valuations than do older individuals. Second, this evidence fits with our hypothesis regarding cognitive functioning. Agarwal, Driscoll, Gabaix, and Laibson (2009) show that cognitive functioning declines at older ages and may contribute to a decline in financial decision making. As we will see below, adding

[18] Although we use principal components analysis to construct the weights in the cognition index, the contributions of each of the three components turn out to be very close to equal. Thus, we obtain very similar results if we construct an index in which we simply give each of the three components equal weight.

[19] Online Appendix Figure A.1 shows that findings of Figure 3 (monotonically declining spreads in each of the three measures of cognition as well as in the index) also hold when the Sell-Buy spread is based on EV valuations rather than CV valuations. Online Appendix Figure A.2 shows that we obtain declining spreads (but not always monotonically so) when we use the spread between CV and EV valuations (both using the Sell condition).

direct controls for cognition strengthens, rather than mitigates, this relation.

Table 3 here

In column 2, we add in our three direct measures of cognition. All three of them – financial literacy, education, and numeracy – are significantly negatively correlated with the Sell-Buy Spread. Each additional correct answer on the financial literacy questions reduces the spread by 0.32 log points. Moving up one education category reduces the spread by 0.24 log points. A one standard deviation increase in the score on the number series questions reduces the spread by 0.31 log points. In column 3, we combine these measures into our cognition index, and we find a strongly significant relation. A one standard deviation increase in cognition corresponds to a 0.59 log point reduction in the Sell-Buy Spread. In column 4, we add additional controls for demographics and preferences, including sex, marital status, race and ethnicity, family income, home ownership, self-reported health, children, risk aversion, return expectations, and political risk, among others.[20] Even with this rich set of additional controls, the coefficient on the cognition index remains highly significant, with a coefficient of -0.42. The results of Table 3 are similar if we use the Sell-Buy Spread based on EV valuations rather than on CV valuations (see Online Appendix Table A.4). If we take the spread between CV-Sell and EV-Sell, which have similar values on average because they are both Sell measures, we continue to find significant negative effects of the cognition index on the spread, though the magnitude of the coefficient drops by half (see Online Appendix Table A.5). This indicates that individuals with higher values of the cognition index give more internally consistent answers even in settings where the "reluctance-to-exchange" motive should not be prominent.[21]

Thus far, we have shown that an important fraction of the population has implied annuity values that are difficult to reconcile with optimizing behavior under *any* plausible set of parameters. We have also documented a large divergence between the price at which individuals are willing to *buy* an annuity and the price at which they are willing to *sell* an annuity, and we

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[20] Definitions and summary statistics of control variables are given in Online Appendix Table A.1. The coefficients on the control variables can be found in Column 1 of Online Appendix Table A.3.

[21] In Online Appendix Figure A.3 and Table A.6, we show that the negative correlation between Sell and Buy valuations decreases in absolute value for those with higher levels of cognition. In addition, the positive correlation between CV and EV valuations tends to increase with cognition. Hence, cognition also has effects in the expected direction on our correlations. However, because correlations cannot be measured at the individual level (but only for subsamples), these results have less statistical precision. We therefore placed them in the Online Appendix and present the effect of cognition on the Sell-Buy Spread given that the Sell-Buy Spread is measured at the individual level.

showed that this cannot be explained by liquidity constraints or endowment effects. Moreover, buy and sell valuations are *negatively* correlated, and the size of the sell-buy disparity is highly correlated with cognitive ability, as measured by education, financial literacy, and numeracy. The next section extends our analysis in several additional directions.

IV.Robustness and Further Results

A. Are the Responses Meaningful?

In view of the implausible values in the tails of the distributions, the negative correlation across Sell and Buy valuations, and the large Sell-Buy Spread, some might surmise that a subset of respondents might not have taken the survey seriously (or perhaps did not understand it).[22] Nevertheless, we have already shown that there is information contained in the elicited valuations: respondents provide consistent responses to similarly constructed offers (e.g., CV-Sell and EV-Sell) despite being asked in different waves two weeks apart. Additionally, as part of our experimental design, we included two additional sources of variation solely designed to test whether responses were meaningful. First, we randomized the order of the scenarios to which people were exposed.[23] Second, we also randomized the order of the options *within* a question (i.e., whether the lump-sum increment was the first or the second response). If the order of the questions or the order of the options within the questions mattered, this would suggest that individuals had difficulty with the survey itself. Therefore we test for sensitivity to "asked in wave 1" and "lump-sum option shown first" at the same time we test for sensitivity to anchoring and starting values in the next sub-section. As we shall see, the evidence is consistent with respondents reading and understanding the questions.

B. Sensitivity to Anchoring and Starting Values

We also incorporated two sources of experimental variation designed to further test for the consistency of valuations with optimizing behavior. First, we varied the starting values of the size of the lump sum, randomizing across \$10,000, \$20,000 and \$30,000; we refer to this as "log

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[22] In the mechanism design literature on contingent valuation, concerns of this type are often referred to as being about whether the choices are consequential. The concern is that if respondents do not believe their survey responses are consequential, they may not dedicate effort to the survey.

[23] We first randomized at the individual level whether CV-Sell was asked in the first or second wave of our survey; CV-Buy, EV-Sell, and EV-Buy were asked in the other wave of the survey. Within the wave in which CV-Buy, EV-Sell, and EV-Buy were asked, we randomized their order over each of the six possible orderings.

of starting value." Second, in the CV-Sell case, we varied the order of size of the increment of the monthly benefit. Specifically, we presented the CV-Sell version multiple times to each respondent for X=\$100, X=\$500, X=\$*SSB* (i.e., the entire amount of the respondent's Social Security benefits), and for a random X that was a multiple of \$100 (less than min(\$SSB-100, 2000), and not equal to 100 or 500). We also randomized whether we asked the CV-Sell with the Xs arranged in increasing order or with the Xs arranged in decreasing order. We control for this randomization in the regressions (i.e., whether people were shown values from small-to-large or large-to-small). We refer to this in our tables as "asked after larger version."

All four of these randomizations (two used to test for meaningfulness of responses and two to test for consistency with optimizing behavior) were conducted independently. A simple correlation analysis (not detailed here) confirmed that this randomization was indeed done correctly, such that variation along each dimension was orthogonal to the variation along the other dimensions.

C. Results of these Extensions

If individuals have difficulty valuing annuities, then we would expect to find that people would be sensitive to irrelevant cues such as starting values and the whether asked after a larger version. Conversely, we do not necessarily expect that the order of the scenarios or the options would matter for valuation decisions, as long as the respondent tried to answer the questions. Our results appear in the first column of Table 4, where we regress the log midpoint of our baseline CV-Sell variable (using a \$100 variation in Social Security benefits) against the four variables capturing all sources of randomization.[24]

Table 4 here

Several findings stand out. First, there is no evidence that individuals simply elected the first option shown (i.e., there is no effect of "Lump sum shown last"), giving some comfort that the respondents *did* take care in answering the survey questions. Relatedly, it does not matter whether the question was asked in the first or second wave (i.e., "Asked in wave 1" has a small and insignificant coefficient estimate). Second, there is bias with respect to both of the other measures, as would be expected if individuals had difficulty valuing annuities. Specifically, the starting value had a statistically significant coefficient of +0.37. Because both the annuity

[24] We do this analysis on the CV-Sell version because only the CV-Sell version asks for different increment sizes of the Social Security amount. This means that we can randomize the order in which the increment sizes are shown only for the CV-Sell version.

valuation and the starting value are measured in logs, this means that increasing the first lump-sum amount shown by 10% raised respondents' valuations by an average of around 3.7%. Furthermore, when the CV-Sell question was shown after a CV-Sell question with a larger change in Social Security benefits (so the order was large-to-small), respondents reported a 0.7 log-point higher average valuation of the annuity than if the baseline CV-Sell question was seen first.

We next re-run this regression on two respondent sub-samples: those in the top (col. 2) and those in the bottom quintile (col. 3) of the cognition index. We find the effect of the log of the starting value is insignificant for individuals with higher cognitive abilities, whereas it is substantially more important (the coefficient is 0.92) for those in the bottom quintile of cognition. This suggests that less cognitively capable people are more sensitive to anchoring effects. Interestingly, however, the effect of "asked after larger version" is significant and similar in magnitude across the cognition quintiles. Moreover, the "asked after larger version" effect is extremely persistent across any cut of the data by measures of cognition. Whether the lump-sum option was shown as the first or second option continues to be insignificant for all quintiles, although we do now find that whether the question was asked in wave 1 or wave 2 is significant in the lowest cognition quintile. That is, respondents in the bottom quintile appear to provide a significantly higher valuation in the second wave, though why this is so is not evident.

In column 4, we return to the full sample and include interactions between the cognition index and each of the four survey manipulations. Results tell a similar story: people are sensitive to starting values and even more so if they have lower cognitive abilities. "Asked after larger version" is highly significant, but is not mitigated by cognition. "Asked in wave 1" and "lump-sum option shown last" continue to be statistically insignificant.

D. Explaining Annuity Valuations

A key reason that life annuities play such an important role in life-cycle economic models is that they provide a cost-effective way to smooth consumption by insuring against longevity risk. Although numerous authors have calculated the welfare gains associated with annuitization, there is conflicting evidence on the extent to which real-world individuals actually value the insurance. Brown (2001) showed that a utility-based measure of annuity valuation was correlated with a binary measure of intended annuitization of asset balances. Bütler and Teppa (2007) documented similar findings in the Swiss system. Nevertheless, such measures explain only a very small fraction of the variation in the annuitization decision. Brown, Kling, Mullainathan, and Wrobel (2008) suggested that the ubiquitous framing of retirement planning in terms of wealth accumulation has conditioned individuals to ignore the insurance aspects of annuities and view them through an investment lens, consistent with individuals resorting to simplified decision-making heuristics in the face of complexity (Benartzi, Previtero, and Thaler 2011).

We hypothesize that when individuals confront trade-offs of the type presented in our survey, they find it difficult to sort through the lifetime utility implications and instead resort to thinking in simpler financial terms. To test this hypothesis, we regress annuity valuations against various determinants of annuity demand in our data. Column 1 of Table 5 regresses the average of CV-Sell and CV-Buy valuations against the actuarial value of the annuity offer presented (which varies by cohort, age at annuitization, and sex; it also assumes a real interest rate of three percent).[25] The actuarial value term has a coefficient of 1.02, suggesting that there is approximately a one-for-one correspondence between the annuity's actuarial value and individuals' subjective valuations of the annuity. Column 2 replaces the actuarial value with a utility-based measure. Following Brown (2001), this value is derived from a parameterized life-cycle model with variation coming from age at annuitization, mortality differences by cohort and sex, marital status (which determines whether it is a single or joint life optimization), risk aversion, current levels of non-annuitized wealth, current annuitized wealth, and interactions of these variables through the utility-maximizing model. We find that the coefficient on this theoretical, utility-based annuity value in column 2 is not significantly different from zero, though it is highly significantly different from one.[26] In columns 3 and 4, we repeat this analysis using even more control variables and we obtain very similar results.[27]

Table 5 here

Overall, we view these results as being consistent with individuals using simpler financial

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[25] We use the CV versions because, unlike the EV versions, they were asked in different waves of the survey. We take the average of CV-Sell and CV-Buy because there is no a priori reason to consider one more credible than the other.

[26] In results not detailed here, when we include both the actuarial value and the utility-based measure, we continue to find that the coefficient on the actuarial value is approximately one and that the utility-based measure is insignificant.

[27] In Online Appendix Table A.7, we repeat the regressions in columns 1 and 3 of Table 5, but now we use each of our four separate valuation measures (CV-Sell, CV-Buy, EV-Sell and EV-Buy). In seven of the eight additional specifications, we cannot reject the hypothesis that the coefficient on the actuarial value is equal to one, but we can reject that it is equal to zero. In unreported results, we also find that the utility-based measure is not significant using these alternative dependent variables.

decision rules (e.g., "How long will it take me to break even?") rather than taking into account the more complex consumption-smoothing and insurance considerations. We also note that the R-squared values are very low: around 0.05 to 0.06 depending on the specification. These findings are consistent with prior studies (e.g., Brown 2008) which also found it difficult to account for the observed variation in annuitization decisions.

Table 6 reports coefficient estimates on the annuity valuations for respondents based on our cognition index. Here we provide both estimated coefficients and the root mean squared error (MSE) for each specification. Although the coefficients differ non-monotonically across the cognition quintiles, in all cases they are not significantly different from 1.[28] We do, however, find that the root MSE is monotonically declining with the level of cognition. Recalling that our dependent variable is in logs, these differences are economically meaningful. For example, the root mean squared distance from the regression line declines by 0.24 log-points when one moves from the bottom to the second cognition quintile and a decline of a full 0.60 log-points when one moves from the bottom to the top cognition quintile. In other words, decisions made by less cognitively capable individuals are substantially noisier than those made by the more cognitively able.

Table 6 here

E. Robustness to Outliers and to Age of Sample

To verify that possible outliers have no major effects on the results, we replicated Figure 3 and Tables 2 through 6 using only annuity valuation measures that have been winsorized at the 10^{th} and 90^{th} percentiles. The results for these winsorized variables are very similar (see Online Appendix Figure A.4 and Tables A.8 through A.12). We also examine the possibility that our results might be driven by a lack of interest in our questions by younger respondents, who may not have given retirement planning much thought. We therefore replicated Figure 3 and Tables 2 through 6 using only respondents age 50 and above. The results for this sample are very similar (see Online Appendix Figure A.5 and Tables A.13 through A.17).

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[28] We also run a single regression in which the cognition index is interacted with the actuarial value (including the same controls as in Table 6, the direct effect of the cognition index and the direct effect of actuarial value). We find that the interaction term has a coefficient estimate of 0.001 (s.e.: 0.146), which confirms that the effect of the actuarial value on the annuity valuation does not differ significantly by cognition.

V. Discussion and Conclusions

This paper provides support for the hypothesis that there is important cross-sectional variation in individuals' abilities to value a stream of life annuity payments. Furthermore, this variation is highly correlated with an index of cognition we built using measures of education, financial literacy, and numeracy. On average, we find that consumers tend to value annuities *less* when given the opportunity to *buy* more, but they value them *more* when given the opportunity to *sell* annuities in exchange for a lump sum. Because this finding holds even when no *status quo* option is available, this finding is not driven by standard *status quo* or endowment effects. Instead, our results are consistent with consumers having difficulty ascertaining the value of an annuity. As a result, many people are only willing to buy or sell an annuity when it appears to be an exceptionally good deal and this tendency is strongest among the least cognitively able. We also show that people are sensitive to framing and starting values, which provides further evidence against optimizing behavior. Finally, we show that the cross-sectional variation in subjective annuity valuations is correlated with the relatively simple actuarial value, but not with amore cognitively-challenging utility-based value, and that decisions made by less cognitively adept individuals are substantially noisier than those of the more cognitively able.

Our findings raise questions about whether consumers are able to make utility-maximizing choices when confronted with a decision about whether to buy longevity protection. Although our results do not speak directly to why average annuity values are so low (and thus do not speak directly to what the literature calls the "annuity puzzle"), our findings do imply that one should not necessarily infer from the observed lack of annuitization that optimizing agents prefer lump sums over annuities. For example, the fact that so few people annuitize their defined contribution pension balances when given the opportunity to do so should not be interpreted as conclusive revealed preference evidence that they do not value longevity protection.

In addition to advancing our intellectual understanding, our results also have considerable policy relevance. For example, in early 2014, the UK eliminated its mandatory annuitization requirement, thus leaving the decision of whether or not to annuitize retirement account balances in the hands of individuals (Donaldson and Hutton 2014). By contrast, in Singapore, the government now requires retirees to purchase life annuities sufficient to cover subsistence needs (Fong, Mitchell, and Koh 2011). In the U.S., policymakers are increasingly expressing interest in ways to further encourage annuitization in 401(k) and other defined contribution plans (Gale, Iwry, John, and Walker 2008). There is also an emerging debate in the U.S. about whether to encourage or discourage a particular form of "de-risking" of corporate defined benefit pension plans, by offering retirees a lump sum in lieu of lifelong pension benefits. In these and other instances, our results suggest that many individuals lack the cognitive ability to make appropriate judgments about how to manage their money in retirement. Accordingly, policymakers would do well to recognize this substantial heterogeneity in people's optimization capabilities when individuals make crucially important financial decisions.

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Figure 1: Cumulative Distribution Functions of CV-Sell and CV-Buy Annuity Valuations

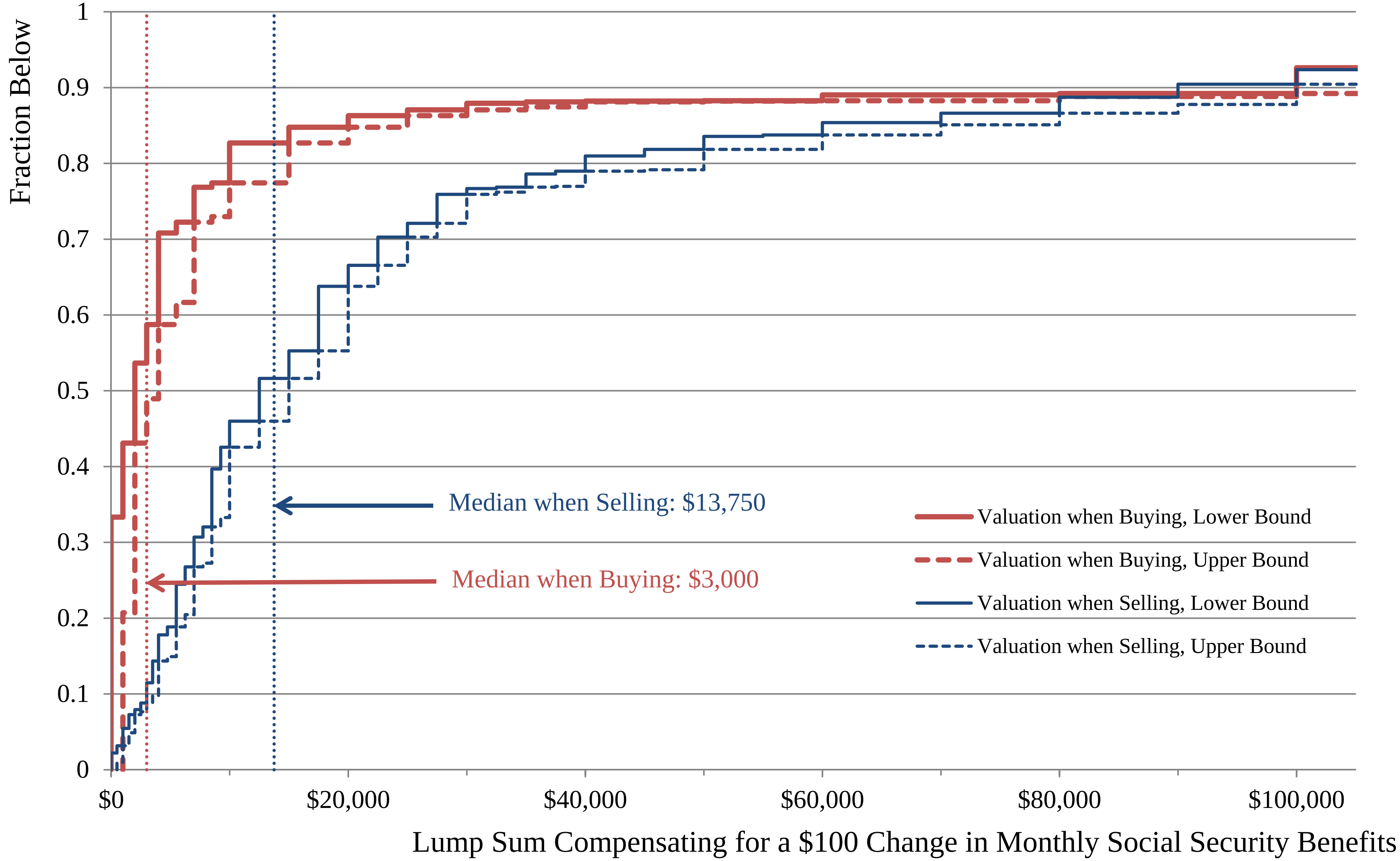


Figure 2: Cumulative Distribution Functions of EV-Sell and EV-Buy Annuity Valuations

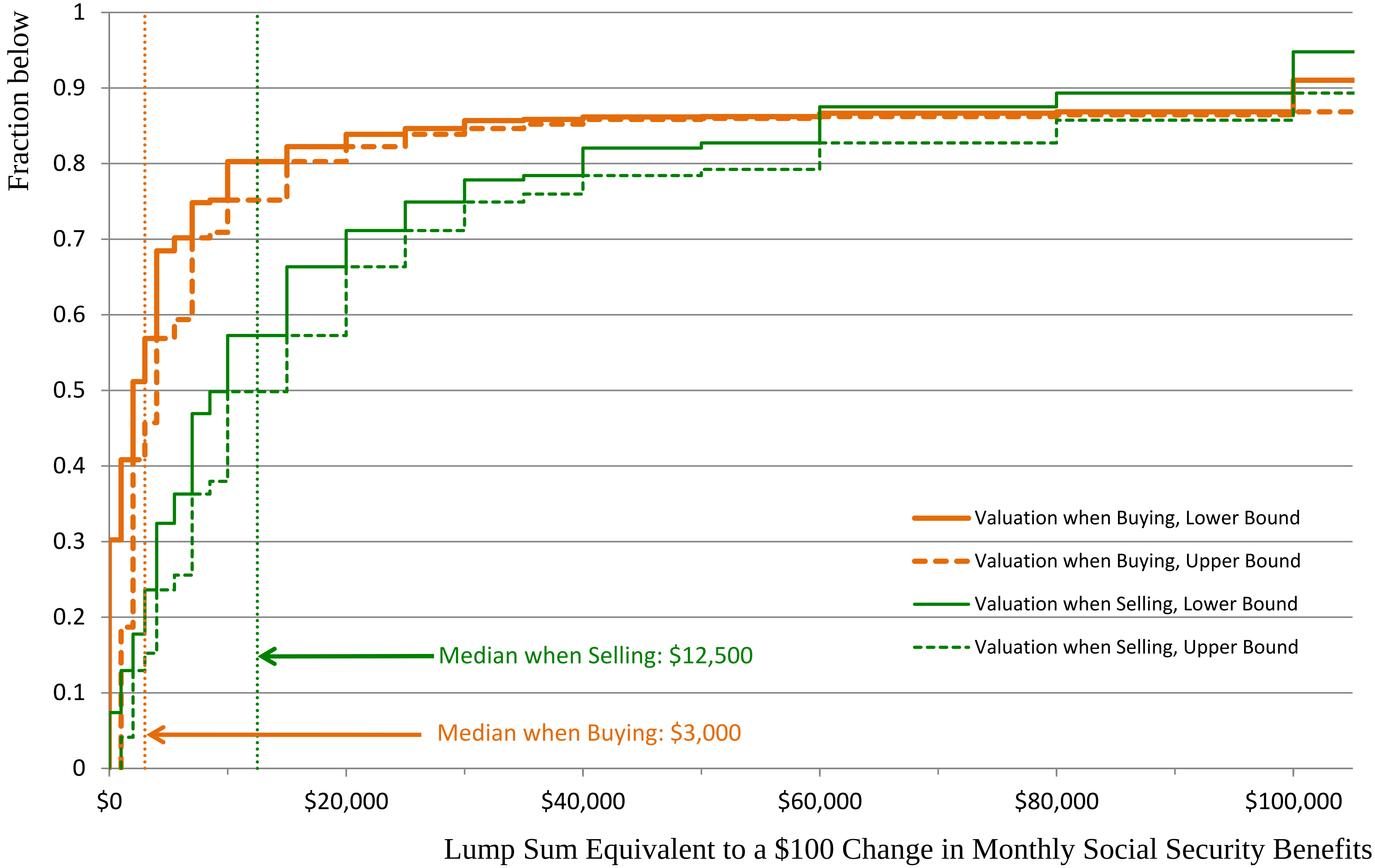
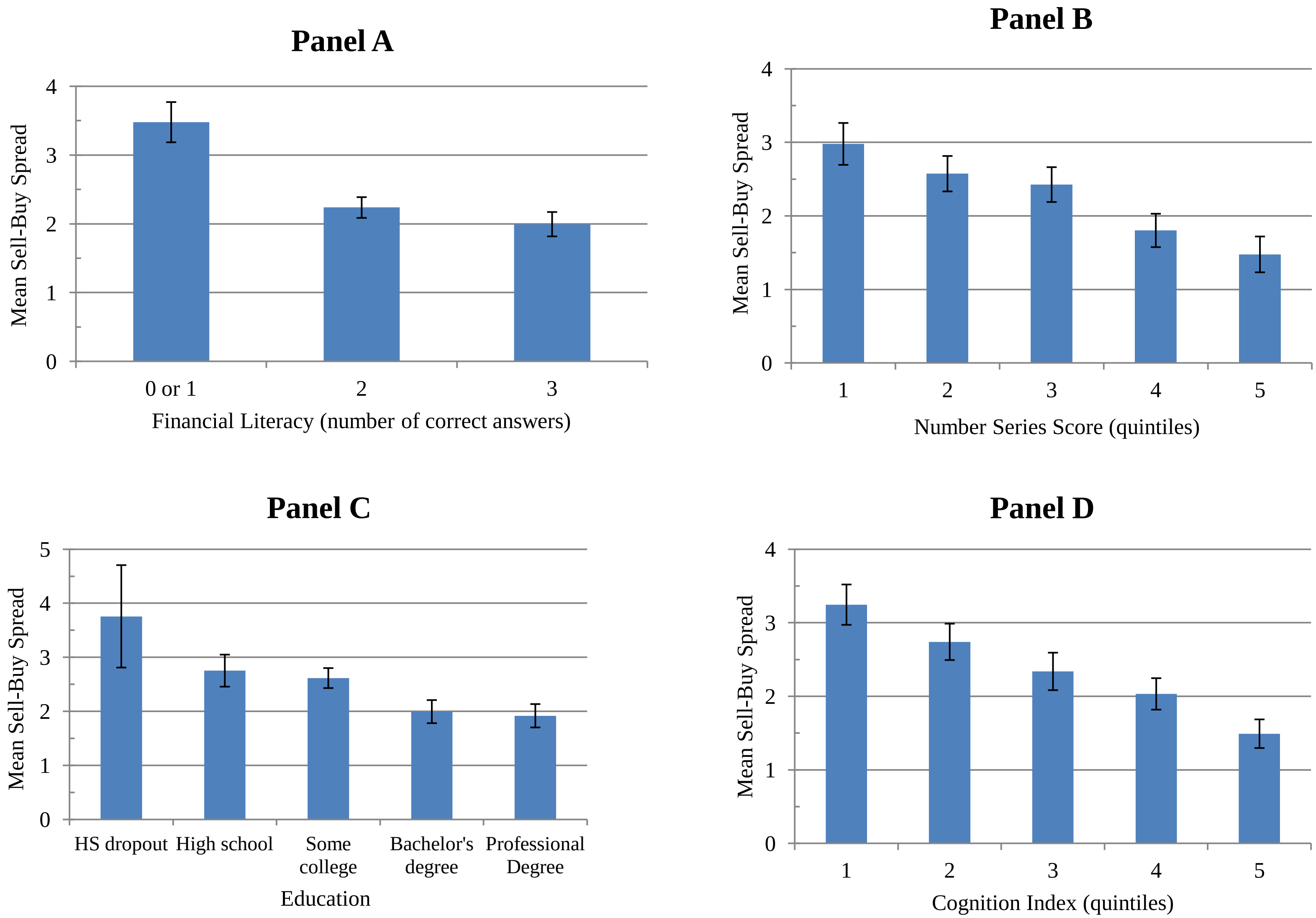


Figure 3: Sell-Buy Spread by Measures of Decision-Making Ability



Note: The whiskers represent 95% confidence intervals. The Sell-Buy Spread is measured as the absolute value of the difference between the log CV-Sell valuation and the log CV-Buy valuation of a $100 change in monthly Social Security benefits. For the Financial Literacy measure, we grouped those with no correct answers with those with one correct answer because there are very few observations (4%) with no correct answers.

Table 1: Characteristics of the ALP Sample

	(1) ALP Sample Mean	(2) CPS Mean	(3) Difference ALP-CPS
Age	51.4	46.2	5.19***
Age: 18-34	0.16	0.31	-0.15***
Age: 35-49	0.25	0.27	-0.02
Age: 50-64	0.41	0.25	0.16***
Age: 65+	0.18	0.17	0.01
Female	0.58	0.51	0.07***
Married	0.60	0.54	0.07***
Race/Ethnicity			
Non-Hispanic White	0.80	0.68	0.12***
Non-Hispanic Black	0.08	0.12	-0.04***
Hispanic	0.09	0.14	-0.05***
Other Race/Ethnicity	0.03	0.07	-0.03***
Education			
High School Dropout	0.02	0.13	-0.11***
High School	0.16	0.30	-0.14***
Some College	0.37	0.28	0.09***
Bachelor's Degree	0.25	0.18	0.07***
Professional Degree	0.19	0.10	0.10***
Ln Family Income	10.89	10.77	0.13***
Family Income: Below 25k	0.18	0.24	-0.07***
Family Income: 25k-50k	0.27	0.24	0.04***
Family Income: 50k-75k	0.21	0.18	0.03***
Family Income: 75k-100k	0.13	0.12	0.01**
Family Income: Above 100k	0.21	0.23	-0.02*
Household size	2.68	3.00	-0.33***
Household size of one	0.22	0.14	0.08***
Household size of two	0.36	0.33	0.03***
Household size of three	0.15	0.19	-0.04***
Household size of four +	0.27	0.33	-0.06***
Region			
Northeast	0.17	0.18	-0.02*
Midwest	0.24	0.22	0.02**
South	0.35	0.37	-0.01
West	0.24	0.23	0.01
Observations	2,112	146,785	

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. In both the ALP and the CPS the sample is restricted to those aged 18 and older. The ALP sample was collected between June and August of 2011. The CPS data are from March 2011 and use CPS person weights; the ALP data are unweighted.

Table 2: Correlations between Annuity Valuation Measures

Pairwise correlations	CV-Sell (in logs)	EV-Sell (in logs)	CV-Buy (in logs)	EV-Buy (in logs)
CV-Sell (in logs)	1			
EV-Sell (in logs)	0.31***	1		
CV-Buy (in logs)	-0.11***	-0.17***	1	
EV-Buy (in logs)	-0.11***	-0.15***	0.72***	1

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Each entry gives the pairwise correlation between the variable listed in the column and in the row. All four variables are a measures of the valuation that an individual places on $100 change in monthly Social Security benefits. See the text for exact definitions. All measures are expressed in logs of the midpoint between the upper and lower bounds. To correct for correlations induced by common experimental manipulations (such as the starting value) across the four variables, we regress each variable on the relevant experimental manipulations and take the residual. The correlations between the resulting residuals are shown in the Table; uncorrected pairwise correlations are very similar and provided in Online Appendix Table A.2.

Table 3: Explaining the Sell-Buy Spread

	Dependent Variable: Absolute Value of Difference between Log CV-Sell and Log CV-Buy			
Explanatory Variables	(1)	(2)	(3)	(4)
Age 35 to 49	-0.10	0.08	0.09	0.22
	(0.13)	(0.13)	(0.13)	(0.13)
Age 50 to 64	0.05	0.33***	0.34***	0.42***
	(0.12)	(0.12)	(0.12)	(0.13)
Age 65 and older	0.44***	0.66***	0.68***	0.66***
	(0.14)	(0.14)	(0.14)	(0.16)
Cognition index, standardized			-0.59***	-0.42***
			(0.04)	(0.07)
Financial literacy index, 0-3 scale		-0.32***		
		(0.06)		
Education index, 1-5 scale		-0.24***		
		(0.04)		
Number series score, standardized		-0.31***		
		(0.05)		
Controls for demographics and preferences	No	No	No	Yes
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0279	0.1230	0.1233	0.1677
Number of observations	2065	2065	2065	2065
Mean of dependent variable	2.58	2.58	2.58	2.58
Standard deviation of dependent variable	1.85	1.85	1.85	1.85

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Each column contains an OLS regression of the Sell-Buy Spread (absolute value of the difference between log CV-Sell and log CV-Buy) on the explanatory variables listed in the rows. CV-Sell is the lump-sum amount given to the individual that would exactly compensate the individual for a $100 decrease in monthly Social Security benefits. CV-Buy is the lump-sum amount the individual is just willing to pay for a $100 increase in monthly Social Security benefits. All regressions also include controls for missing values of explanatory variables and controls for experimental manipulations, namely: log of starting value, asked after larger version, asked in wave 1, lump-sum option shown last. The financial literacy index is equal to the number of correct answers to three financial literacy questions (mean: 2.12 s.d.: 0.80). The education index equals 1 for high school dropouts, 2 for high school graduates, 3 for some college, 4 for bachelor's degree, and 5 for professional degree (mean: 3.42 s.d.: 1.05). The number series score is a standardized measure of performance on a number of questions that involve completing number series. The cognition index is the first principal component of the financial literacy index, the education index, and the number series score. The coefficients on the demographic and preference variables of the regression in column 4 are shown in Online Appendix Table A.3 column 1.

Table 4: Effects of Randomizations and Interactions with the Cognition Index

	(1)	(2)	(3)	(4)
	Dependent Variable: log CV-Sell			
Explanatory Variables	Entire sample	Top quintile of cognition index	Bottom quintile of cognition index	Entire sample
Log of starting value	0.37***	0.17	0.92***	0.39***
	(0.07)	(0.13)	(0.21)	(0.07)
Asked after larger version	0.70***	0.70***	0.77***	0.69***
	(0.07)	(0.12)	(0.19)	(0.07)
Asked in wave 1	0.04	0.01	0.38**	0.05
	(0.07)	(0.12)	(0.19)	(0.07)
Lump-sum option shown last	0.09	0.01	-0.03	0.08
	(0.07)	(0.12)	(0.19)	(0.07)
Log of starting value × Cognition index				-0.20**
				(0.08)
Asked after larger version × Cognition index				-0.09
				(0.07)
Asked in wave 1 × Cognition index				-0.03
				(0.07)
Lump-sum option shown last × Cognition index				0.03
				(0.07)
Cognition index				-0.17***
				(0.04)
Adjusted R^2	0.0600	0.0832	0.0827	0.0737
N	2,090	385	412	2,090
Mean of dependent variable	10.02	9.82	10.27	10.02
Standard deviation of dependent variable	1.56	1.19	1.96	1.56

Notes: Robust standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Each column contains an OLS regression of the baseline CV-Sell measure on the explanatory variables listed in the rows. The baseline CV-Sell measure is the lump-sum amount given to the individual that would exactly compensate the individual for a $100 decrease in monthly Social Security benefits. CV-Sell is expressed in logs of the midpoint between the upper and lower bounds. The starting value for the annuity valuation was randomized at $10,000, $20,000, or $30,000. "Asked after larger version" equals one if the baseline CV-Sell measure was asked after a CV-Sell question in which Social Security benefits were varied by more than $100. Whether this occured was randomized. "Asked in wave 1" is a dummy variable that equals one if the CV-Sell question was asked in the first wave, and "Lump sum option shown last" is a dummy variable that equals one if the option involving the lump-sum amount was shown after the alternative option. Both dummy variables were randomized. The cognition index is the first principal component of the financial literacy index, the education index, and the number series score. All variables interacted with the cognition index are demeaned so that the coefficient on the cognition index can be interpreted as the effect of the cognition literacy index when the interaction variables are equal to their sample means.

Table 5: Explaining Annuity Valuations

	Dependent Variable: Mean of log CV-Sell and log CV-Buy			
Explanatory Variables	(1)	(2)	(3)	(4)
Log actuarial value	1.02***		0.84***	
	(0.25)		(0.26)	
Log theoretical utility-based annuity value		0.04		0.18
		(0.04)		(0.13)
Age	-0.05***	-0.02	-0.04**	-0.01
	(0.01)	(0.01)	(0.02)	(0.01)
Age squared/100	0.06***	0.02	0.04***	0.01
	(0.02)	(0.01)	(0.02)	(0.01)
Female	-0.08	0.01	-0.03	0.01
	(0.06)	(0.05)	(0.06)	(0.06)
Married	0.05	0.04	0.08	0.13*
	(0.06)	(0.06)	(0.06)	(0.07)
Black	0.05	0.08	0.03	0.04
	(0.12)	(0.12)	(0.12)	(0.12)
Hispanic	0.34***	0.36***	0.32***	0.32***
	(0.11)	(0.11)	(0.12)	(0.12)
Other	-0.08	-0.08	-0.08	-0.09
	(0.13)	(0.13)	(0.12)	(0.13)
Education index, 1-5 scale			-0.03	-0.03
			(0.03)	(0.03)
Log family income			0.03	0.02
			(0.04)	(0.04)
Owns an annuity			-0.07	-0.04
			(0.06)	(0.06)
Owns home			-0.16*	-0.16**
			(0.08)	(0.08)
Log financial wealth			0.01	-0.01
			(0.02)	(0.03)
Self-reported health index, 1-5 scale			-0.03	-0.03
			(0.03)	(0.03)
Ever had kids			-0.03	-0.04
			(0.06)	(0.06)
Risk aversion (standardized)			0.02	0.02
			(0.03)	(0.03)
Precaution (standardized)			-0.07**	-0.07**
			(0.03)	(0.03)
Expects returns greater than 3% p.a.			0.10*	0.10*
			(0.06)	(0.06)
Confident SS will pay promised benefits, 1-4 scale			0.12***	0.14***
			(0.03)	(0.03)
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0543	0.0473	0.0649	0.0607
Number of observations	2065	2065	2065	2065
Mean of dependent variable	9.18	9.18	9.18	9.18
Standard deviation of dependent variable	1.22	1.22	1.22	1.22

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Each column contains an OLS regression of annuity valuation (mean of log CV-Sell and log CV-Buy) on the explanatory variables listed in the rows. CV-Sell is the lump-sum amount given to the individual that would exactly compensate the individual for a $100 decrease in monthly Social Security benefits. CV-Buy is the lump-sum amount the individual is just willing to pay for a $100 increase in monthly Social Security benefits. All regressions also include controls for missing values of explanatory variables and controls for experimental variation, namely: log of starting value, asked after larger version, asked in wave 1, lump-sum option shown last. To calculate the theoretical utility-based annuity value, we solve the lifecycle dynamic programming problem for a household that matches the respondent on age, gender, marital status, spousal age (if married), start date of the annuity, financial wealth, existing annuity wealth, and coefficient of risk aversion, assuming a real discount rate of three percent per year. We solve this lifecycle dynamic programming problem twice: once for the CV-Sell equivalent wealth and once for the CV-Buy equivalent wealth. We take the log of both amounts and average them. The education index equals 1 for high school dropouts, 2 for high school graduates, 3 for some college, 4 for bachelor's degree, and 5 for professional degree. Summary statistics and sources for the explanatory variables are provided in Online Appendix Table A.1.

Table 6: Predictive Power of Actuarial Value by Quintile of the Cognition Index

Dependent Variable: Mean of log CV-Sell and log CV-Buy	(1) Coefficient on log actuarial value	(2) p-value on coefficient=1	(3) Root MSE	(4) Adjusted R^2	(5) N
Sample split by quintiles of the cognition index					
1. *Bottom quintile*	0.46	0.483	1.488	0.0922	404
	(0.77)				
2. *Second quintile*	0.76	0.686	1.246	0.0259	451
	(0.59)				
3. *Third quintile*	1.24**	0.618	1.163	0.0204	392
	(0.49)				
4. *Fourth quintile*	0.77	0.650	1.034	0.0498	433
	(0.50)				
5. *Fifth quintile*	1.49***	0.340	0.889	0.0677	385
	(0.51)				

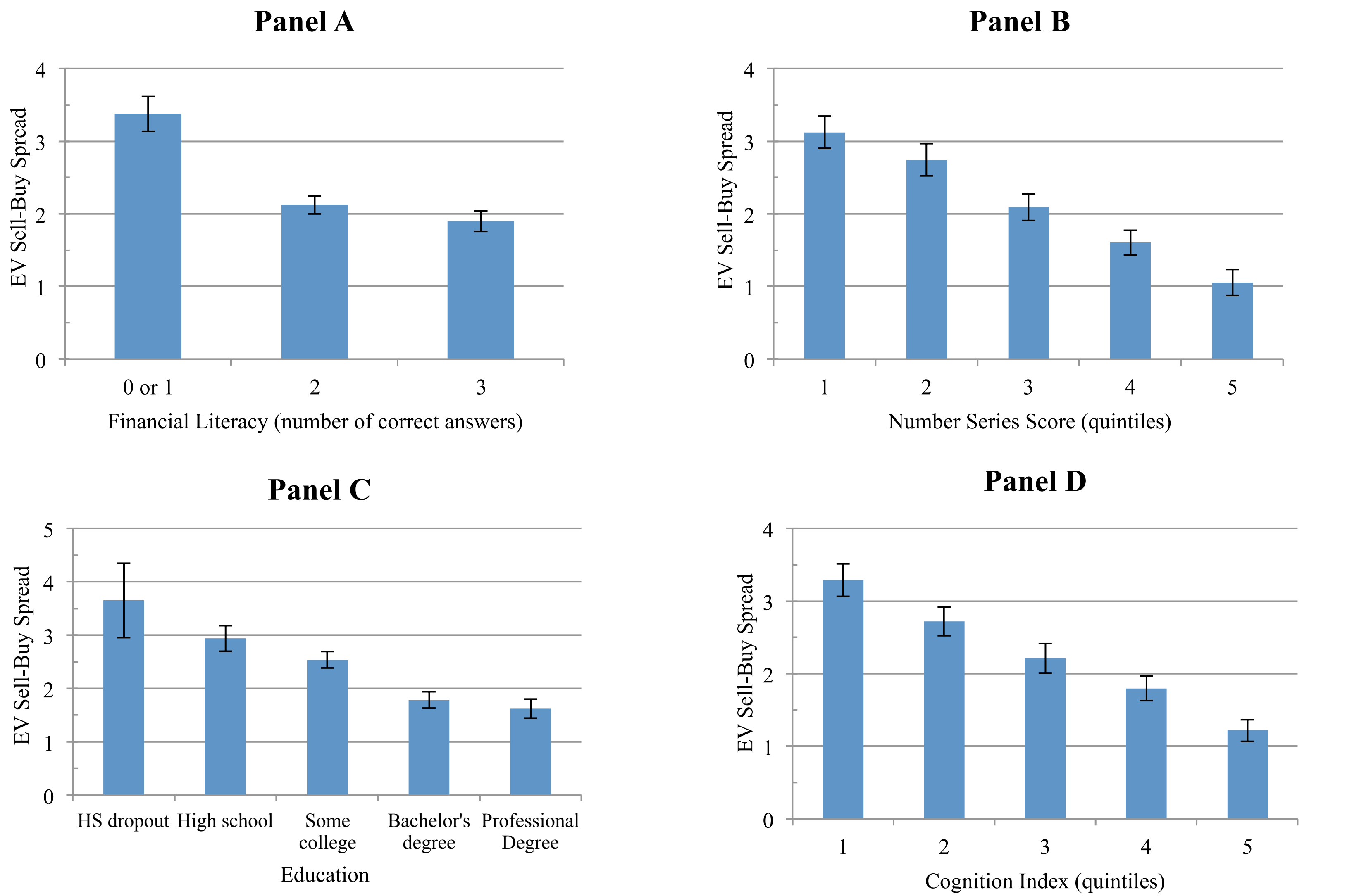
Notes: Robust standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Here we estimate specification 1 of Table 5 by subsample. Each row contains an OLS regression of the log annuity valuation (mean of CV-Sell and CV-Buy) on the log actuarial value and additional controls. Additional controls are those in specification 1 of Table 5. The cognition index is the first principal component of the financial literacy index, the education index, and the number series score.

Online Appendices for:

Cognitive Constraints on Valuing Annuities

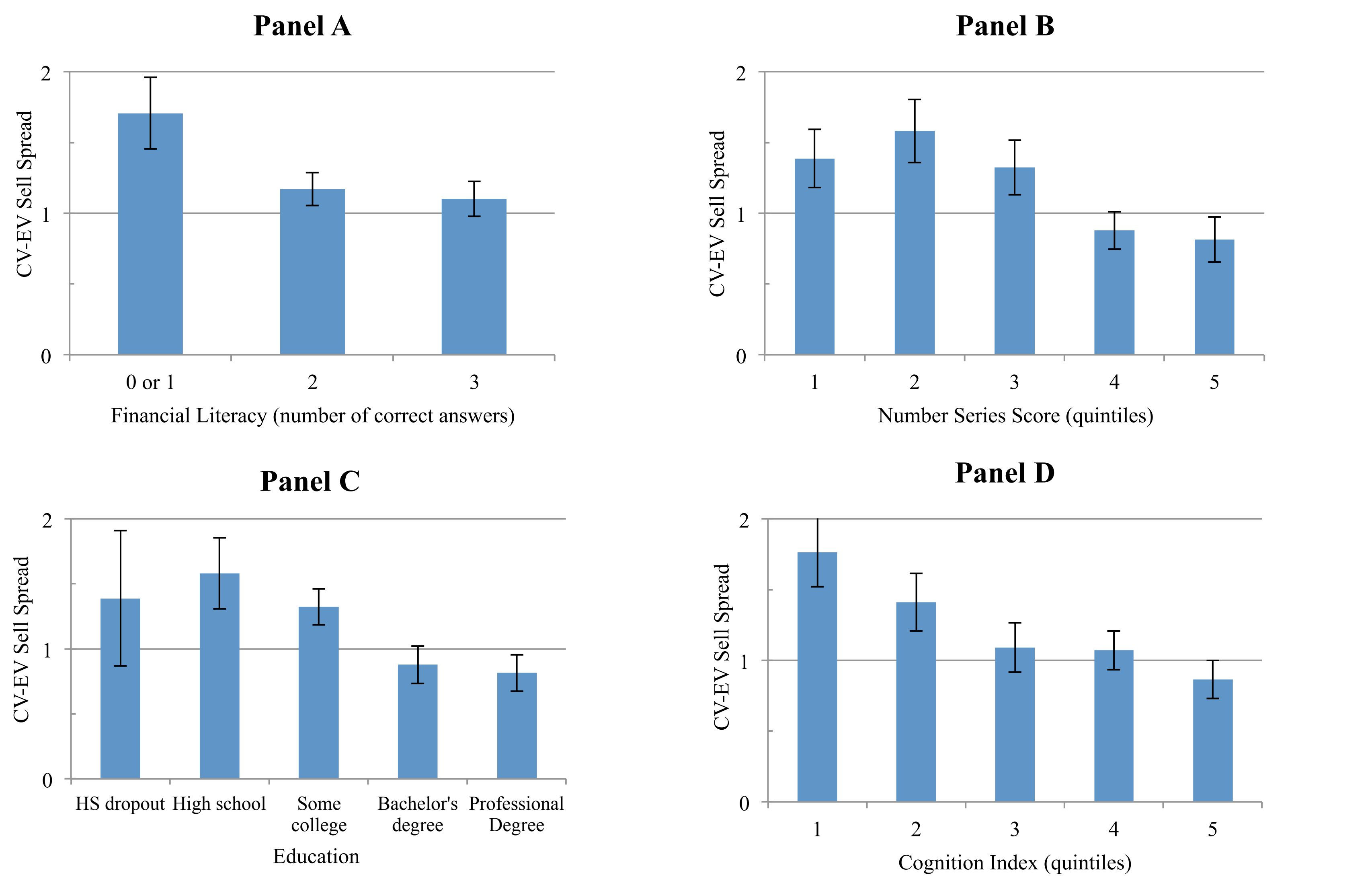
Jeffrey R. Brown, Arie Kapteyn, Erzo F.P. Luttmer, and Olivia S. Mitchell

Figure A.1: EV Sell-Buy Spread by Measures of Decision-Making Ability



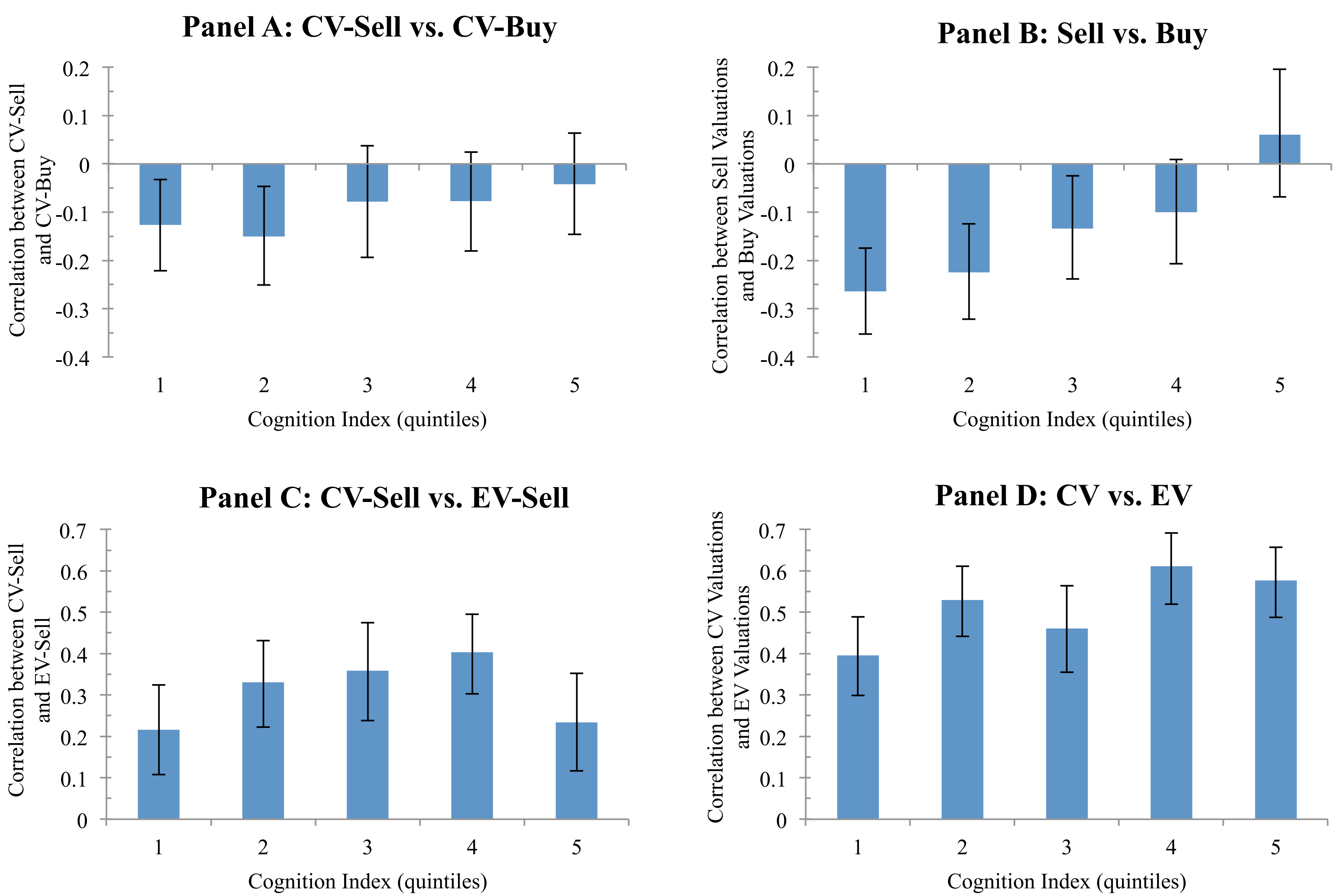
Note: The whiskers represent 95% confidence intervals. This figure is identical to Figure 3 except that the Sell-Buy Spread is based on EV valuations rather than CV valuations. The EV Sell-Buy Spread is measured as the absolute value of the difference between the log EV-Sell valuation and the log EV-Buy valuation of a $100 change in monthly Social Security benefits.

Figure A.2: EV-CV Sell Spread by Measures of Decision-Making Ability



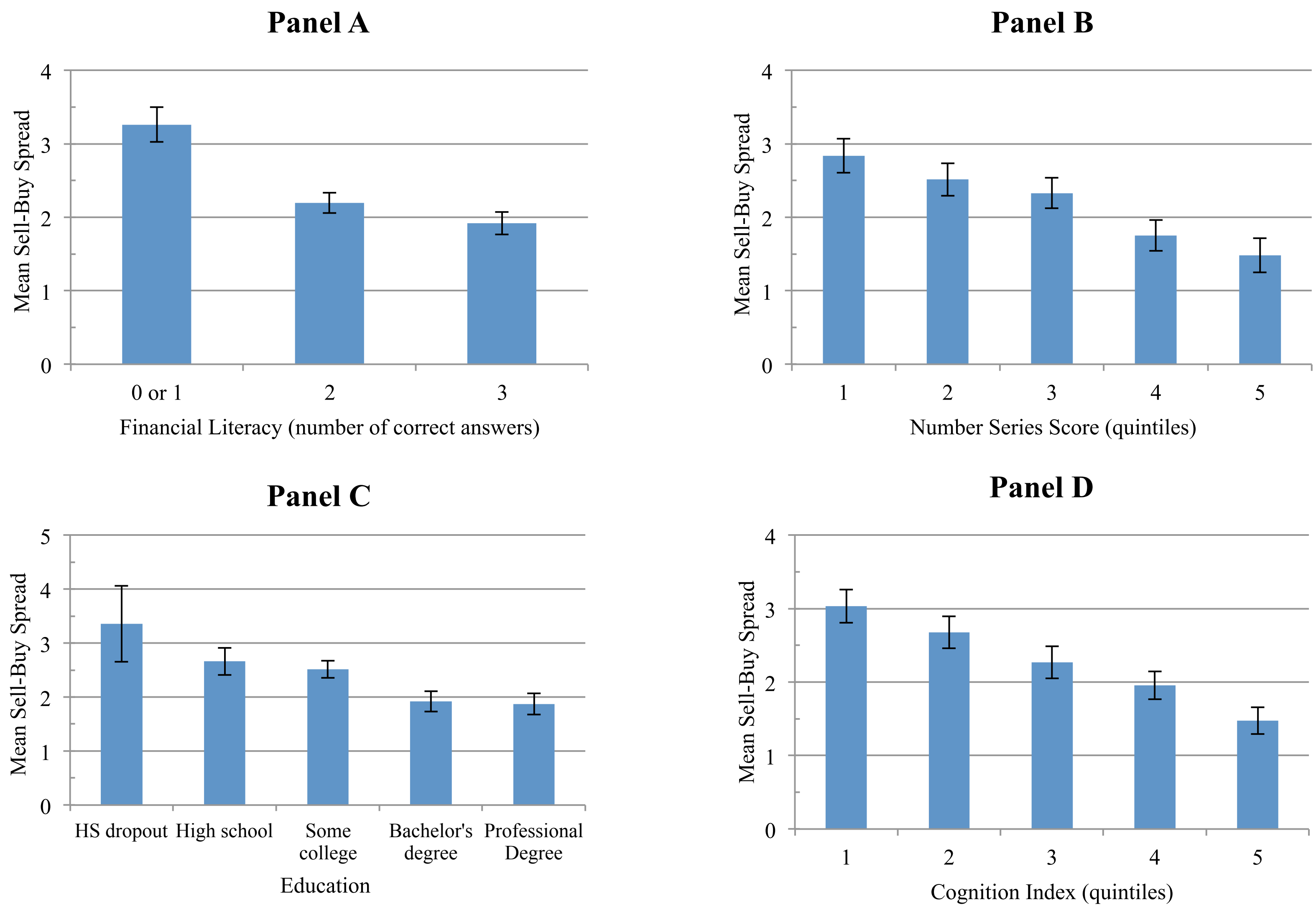
Note: The whiskers represent 95% confidence intervals. This figure is identical to Figure 3 except that the graphs plot the EV-CV Sell Spread rather than the CV Sell-Buy Spread. The EV-CV Sell Spread is measured as the absolute value of the difference between the log EV-Sell valuation and the log CV-Sell valuation of a $100 change in monthly Social Security benefits.

Figure A.3: Correlations of Log Annuity Valuations by the Cognition Index



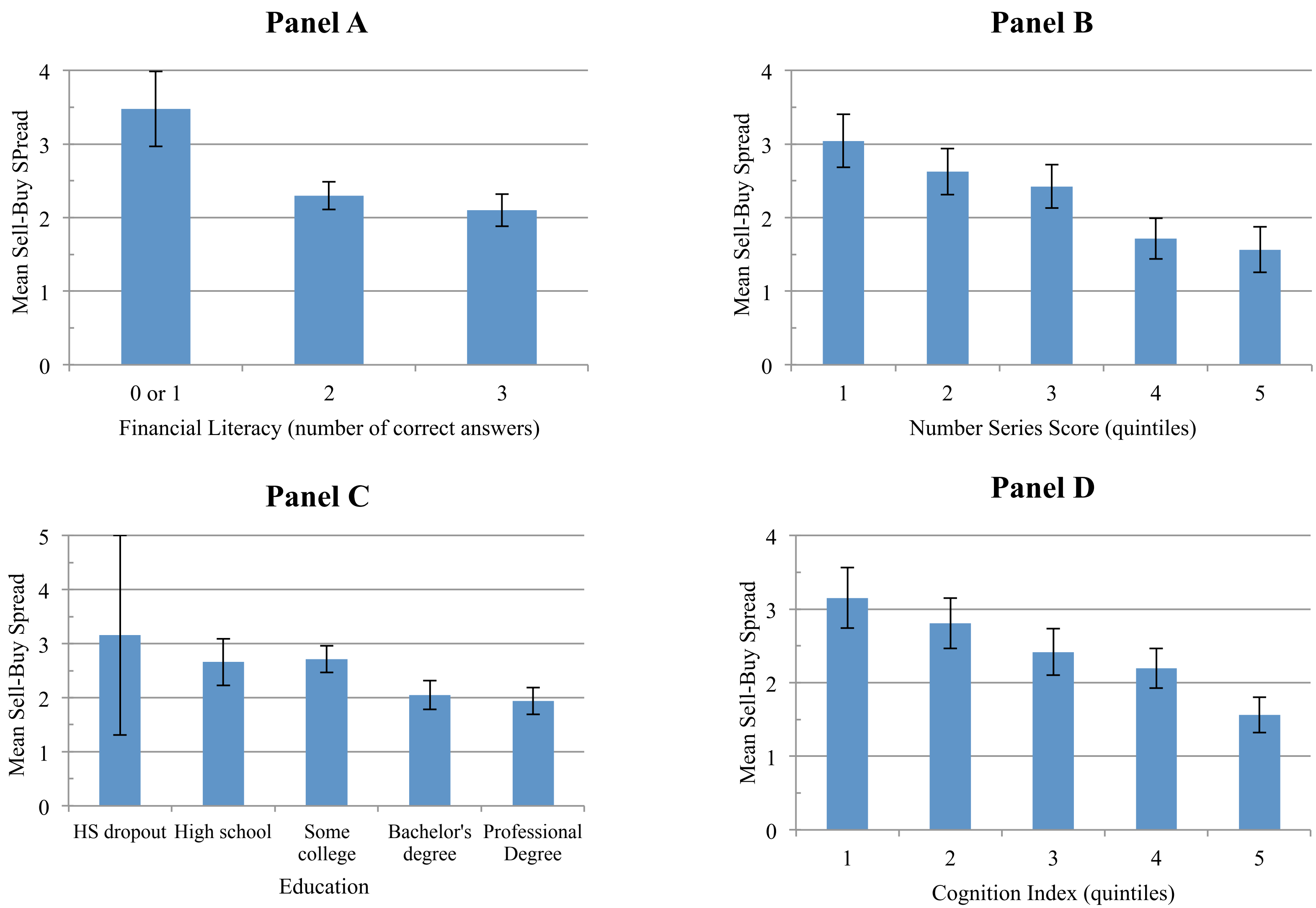
Note: The whiskers represent 95% confidence intervals. Confidence intervals are based on exact percentiles in 10,000 bootstrap replications. All annuity valuations are expressed in logs. The Sell Valuation is the average of log CV-Sell and log EV-Sell. The Buy Valuation is the average of log CV-Buy and log EV-Buy. The CV Valuation is the average of log CV-Sell and log CV-Buy. The EV Valuation is the average of log EV-Sell and log EV-Buy. To correct for correlations induced by common experimental manipulations (such as the starting value) across the four valuation measures, we regress each valuation measure on the relevant experimental manipulations and take the residual. These regressions are run separately for each quintile of the cognition index. The correlations between the resulting residuals are shown in the figure.

Figure A.4: Winsorized Sell-Buy Spread by Measures of Decision-Making Ability



Note: The whiskers represent 95% confidence intervals. This figure is identical to Figure 3 except that the Sell-Buy Spread was calculated based on annuity valuation measures that were winsorized at the 10th and 90th percentiles. The Sell-Buy Spread is measured as the absolute value of the difference between the winsorized log CV-Sell valuation and the winsorized log CV-Buy valuation of a $100 change in monthly Social Security benefits.

Figure A.5: Sell-Buy Spread by Measures of Decision-Making Ability for the Age 50+ Sample



Note: The whiskers represent 95% confidence intervals. This figure is identical to Figure 3 except that the sample is restricted to respondents age 50 and above. The Sell-Buy Spread is measured as the absolute value of the difference between the log EV-Sell valuation and the log EV-Buy valuation of a $100 change in monthly Social Security benefits.

Table A.1: Further Summary Statistics

	(1) Mean	(2) Std. Dev.	(3) N	(4) Source
Annuity Valuation Measures				
CV-Sell (log of category midpoint)	10.02	1.56	2090	Q.2.3
CV-Sell if $100 increment is shown first	9.67	1.51	1046	Q.2.3
EV-Sell (log of category midpoint)	9.48	1.71	2089	Q.6.3
CV-Buy (log of category midpoint)	8.34	2.06	2086	Q.6.3
EV-Buy (log of category midpoint)	8.51	2.17	2082	Q.6.3
Average of CV-Sell and CV-Buy (in logs)	9.18	1.22	2065	
CV Sell-Buy Spread (in logs)	2.58	1.85	2065	
Log actuarial value	9.68	0.20	2112	See note
Log theoretical utility-based annuity value	9.38	0.79	2112	See note
Randomization Variables				
Log of starting value	9.80	0.45	2112	
Asked after larger version	0.50	0.50	2112	
Asked in wave 1	0.47	0.50	2112	
Lump-sum option shown last	0.52	0.50	2112	
Control Variables Not Already Listed in Table 1				
Financial literacy index	2.12	0.80	2112	Q.3.2.1 - Q.3.2.3
Financial literacy index = 0	0.04	0.20	2112	
Financial literacy index = 1	0.14	0.34	2112	
Financial literacy index = 2	0.47	0.50	2112	
Financial literacy index = 3	0.35	0.48	2112	
Education index, 1-5 scale	3.42	1.05	2112	Preloaded from ALP
Number series score (standardized)	0.00	1.00	2112	Preloaded from ALP
Log family income (annual)	10.89	0.93	2104	Preloaded from ALP
Owns an annuity	0.50	0.50	2110	Q.3.5.1, Q.3.5.3
Owns home	0.75	0.43	1885	Preloaded from ALP
Log financial wealth (if financial wealth ≥ $1000)	11.71	1.51	1468	Preloaded from ALP
Self-reported health index, 1-5 scale	3.56	0.89	2109	Q.3.1
Ever had kids	0.73	0.45	2090	Preloaded from ALP
Risk aversion (standardized)	0.00	1.00	2098	Q.3.3.1 - Q3.3.6
Precaution (standardized)	0.00	1.00	2104	Q.3.3.7 - Q3.3.8
Expects returns greater than 3% p.a.	0.41	0.49	2103	Q.3.8.3
Confident SS will pay promised benefits, 1-4 scale	2.34	0.84	2109	Q.3.7

Notes: The upperbound of the top category is assumed to be $1 million. Log actuarial value is calculated by us based on cohort mortality tables, age at annuitization, and sex, assuming a real interest rate of three percent per year. To calculate the theoretical utility-based annuity value, we solve the lifecycle dynamic programming problem for a household that matches the respondent on age, gender, marital status, spousal age (if married), start date of the annuity, financial wealth, existing annuity wealth, and coefficient of risk aversion assuming a real discount rate of three percent per year. We solve this lifecycle dynamic programming problem twice: once for the CV-Sell equivalent wealth and once for the CV-Buy equivalent wealth. We take the log of both amounts and average them. The education index corresponds to the education categories in Table 1, with higher values corresponding to higher levels of eduction. The number series score is based on six questions where a respondent was shown an incomplete sequence of numbers and asked to complete the sequence. Missing values (14% of observations) are set equal to the mean and variable is standized. "Owns an annuity" equals one for anyone who currently receives or in the future expects to receive annuity income other than from Social Security. Higher values of the self-reported health index correspond to better health. Risk aversion is the standardized sum of Q.3.3.1 to Q.3.3.6 (with Q.3.3.3, Q.3.3.5, and Q3.3.6 reverse coded). Precaution is the standardized sum of Q.3.3.7. and Q.3.3.8. Higher values of the variable "confidence that Social Security will pay promised benefits" correspond to greater levels of confidence.

Table A.2: Uncorrected Correlations between Annuity Valuation Measures

Pairwise correlations	CV-Sell (in logs)	EV-Sell (in logs)	CV-Buy (in logs)	EV-Buy (in logs)
CV-Sell (in logs)	1			
EV-Sell (in logs)	0.32***	1		
CV-Buy (in logs)	-0.10***	-0.16***	1	
EV-Buy (in logs)	-0.10***	-0.14***	0.72***	1

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Each entry gives the pairwise correlation between the variable listed in the column and in the row. This table shows that the results in Table 2 are not sensitive to the corrections for common experimental manipulations that were applied to the correlations in Table 2.

Table A.3: Full Regressions Explaining the Sell-Buy Spread

Explanatory Variables	Dependent Variable: Absolute Value of Difference between Log CV-Sell and Log CV-Buy (1)	Dependent Variable: Absolute Value of Difference between Log EV-Sell and Log EV-Buy (2)	Dependent Variable: Winsorized CV Sell-Buy Spread (3)
Age 35 to 49	0.22	0.29*	0.22*
	(0.13)	(0.15)	(0.12)
Age 50 to 64	0.42***	0.48***	0.41***
	(0.13)	(0.15)	(0.12)
Age 65 and older	0.66***	0.56***	0.65***
	(0.16)	(0.19)	(0.14)
Cognition index, standardized	-0.42***	-0.65***	-0.40***
	(0.07)	(0.08)	(0.06)
Female	0.26***	0.30***	0.20***
	(0.08)	(0.09)	(0.07)
Married	0.08	-0.02	-0.01
	(0.13)	(0.10)	(0.08)
Black	0.48***	0.35*	0.32**
	(0.18)	(0.19)	(0.15)
Hispanic	0.27*	0.53***	0.21
	(0.15)	(0.18)	(0.13)
Other	0.68***	0.28	0.45**
	(0.23)	(0.28)	(0.19)
Log family income	-0.05	-0.03	-0.04
	(0.06)	(0.06)	(0.05)
Owns an annuity	-0.03	-0.07	-0.02
	(0.08)	(0.10)	(0.07)
Owns home	-0.06	-0.28**	-0.07
	(0.11)	(0.13)	(0.10)
Self-reported health index, 1-5 scale	-0.10**	0.07	-0.07*
	(0.05)	(0.05)	(0.04)
Ever had kids	-0.14	-0.10	-0.08
	(0.09)	(0.11)	(0.08)
Risk aversion (standardized)	-0.21***	-0.13***	-0.20***
	(0.04)	(0.05)	(0.04)
Precaution (standardized)	0.01	0.00	0.01
	(0.04)	(0.05)	(0.04)
Expects returns greater than 3% p.a.	-0.15*	-0.18**	-0.15**
	(0.08)	(0.09)	(0.07)
Confident SS will pay promised benefits,	0.17***	0.17***	0.14***
1-4 scale	(0.05)	(0.06)	(0.04)
Controls for experimental variation	Yes	Yes	Yes
Adjusted R^2	0.1677	0.1577	0.1727
Number of observations	2065	2067	2065
Mean of dependent variable	2.58	2.27	2.49
Standard deviation of dependent variable	1.85	2.10	1.63

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Each column contains an OLS regression of the Sell-Buy Spread listed in the column heading on the explanatory variables listed in the rows. Column 1 shows all the coefficients of the regression in Table 3 column 4. Column 2 shows all the coefficients of the regression in Online Appendix Table A.4 column 4. Column 3 shows all the coefficients of the regression in Online Appendix Table A.9 column 3.

Table A.4: Explaining the Sell-Buy Spread within EV Valuations

	Dependent Variable: Absolute Value of Difference between Log EV-Sell and Log EV-Buy			
Explanatory Variables	(1)	(2)	(3)	(4)
Age 35 to 49	-0.20	0.03	0.05	0.29*
	(0.15)	(0.14)	(0.14)	(0.15)
Age 50 to 64	-0.14	0.22*	0.25*	0.48**
	(0.14)	(0.13)	(0.13)	(0.15)
Age 65 and older	0.03	0.32**	0.35**	0.56**
	(0.16)	(0.15)	(0.15)	(0.19)
Cognition index, standardized			-0.76***	-0.65***
			(0.05)	(0.08)
Financial literacy index, 0-3 scale		-0.38***		
		(0.06)		
Education index, 1-5 scale		-0.30***		
		(0.05)		
Number series score, standardized		-0.43***		
		(0.06)		
Controls for demographics and preferences	No	No	No	Yes
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0039	0.1327	0.1318	0.1577
Number of observations	2067	2067	2067	2067
Mean of dependent variable	2.27	2.27	2.27	2.27
Standard deviation of dependent variable	2.10	2.10	2.10	2.10

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 3, except that this table is based on EV valuations whereas Table 3 was based on CV valuations. Each column contains an OLS regression of the Sell-Buy Spread (absolute value of the difference between log EV-Sell and log EV-Buy) on the explanatory variables listed in the rows. EV-Sell is the lump-sum amount equivalent to a $100 increase in monthly Social Security benefits. EV-Buy is the lump-sum amount the individual is just willing to pay in lieu of a $100 decrease in monthly Social Security benefits. For further details, see the note to Table 3. The coefficients on the demographic and preference variables of the regression in column 4 are shown in Online Appendix Table A.3 column 2.

Table A.5: Explaining the Spread Between CV-Sell and EV-Sell

Explanatory Variables	Dependent Variable: Absolute Value of Difference between Log CV-Sell and Log EV-Sell (1)	(2)	(3)	(4)
Age 35 to 49	-0.02	0.06	0.07	0.13
	(0.10)	(0.10)	(0.10)	(0.11)
Age 50 to 64	0.06	0.19**	0.19**	0.28**
	(0.09)	(0.09)	(0.09)	(0.11)
Age 65 and older	0.14	0.24**	0.25**	0.33**
	(0.11)	(0.11)	(0.10)	(0.13)
Cognition index, standardized			-0.27***	-0.22***
			(0.03)	(0.05)
Financial literacy index, 0-3 scale		-0.14***		
		(0.05)		
Education index, 1-5 scale		-0.13***		
		(0.03)		
Number series score, standardized		-0.13***		
		(0.03)		
Controls for demographics and preferences	No	No	No	Yes
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0189	0.0537	0.0546	0.0588
Number of observations	2068	2068	2068	2068
Mean of dependent variable	1.42	2.49	2.49	2.49
Standard deviation of dependent variable	1.39	1.63	1.63	1.63

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 3, except that this table examines the spread between CV and EV sell valuations whereas Table 3 examined the CV Sell-Buy Spread. Each column contains an OLS regression of the absolute value of the difference between log CV-Sell and log EV-Sell on the explanatory variables listed in the rows. CV-Sell is the lump-sum amount given to the individual that would exactly compensate the individual for a $100 decrease in monthly Social Security benefits. EV-Sell is the lump-sum amount equivalent to a $100 increase in monthly Social Security benefits. For further details, see the note to Table 3.

Table A.6: Cognition Index and Correlations Between Valuations

Explanatory Variables	Dependent Variable: CV-Buy (1)	Dependent Variable: Average of CV-Buy and EV-Buy (2)	Dependent Variable: EV-Sell (3)	Dependent Variable: Average of EV-Sell and EV-Buy (4)
CV-Sell	-0.13***		0.35***	
	(0.03)		(0.03)	
CV-Sell × Cognition Index, standardized	0.06		0.02	
	(0.03)		(0.03)	
Average of CV-Sell and EV-Sell		-0.23***		
		(0.03)		
Average of CV-Sell and EV-Sell × Cognition Index, standardized		0.18***		
		(0.03)		
Average of CV-Sell and CV-Buy				0.55***
				(0.02)
Average of CV-Sell and CV-Buy × Cognition Index, standardized				0.10***
				(0.02)
Cognition index, standardized	-0.06	-0.14***	-0.10**	-0.10***
	(0.05)	(0.04)	(0.04)	(0.03)
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0320	0.0731	0.1109	0.2800
Number of observations	2065	2105	2068	2028
Mean of dependent variable	8.33	8.43	9.47	8.98
Standard deviation of dependent variable	2.05	1.97	1.71	1.28

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Each column contains an OLS regression of the variable listed in the column heading on the explanatory variables listed in the rows. All annuity valuation measures are in logs. All regressions include controls for experimental variation, namely: log of starting value, asked after larger version, asked in wave 1, lump-sum option shown last. All variables interacted with the cognition index are demeaned so that the coefficient on the cognition index can be interpreted as the effect of the cognition literacy index when the interaction variables are equal to their sample means. Columns 1 and 2 show that the negative correlation between buy and sell valuations decreases in size for higher values of the Cognition Index, though only significantly so in column 2. Columns 3 and 4 show that the positive correlation between CV and EV valuations increases in size for higher values of the Cognition Index, though only significantly so in column 4.

Table A.7: Robustness of Predictive Power of Actuarial Value

	(1) Dependent Variable	(2) Coefficient on log actuarial value	(3) p-value on coefficient =1	(4) Controls	(5) Root MSE	(6) Adjusted R^2	(7) N
1.	Mean of CV-Sell and CV-Buy	1.02*** (0.25)	0.940	Basic	1.187	0.0543	2065
2.	CV-Sell	1.05*** (0.34)	0.883	Basic	1.496	0.0816	2090
3.	CV-Buy	0.98** (0.44)	0.955	Basic	2.026	0.0315	2086
4.	EV-Sell	0.74** (0.37)	0.492	Basic	1.692	0.0190	2089
5.	EV-Buy	0.84* (0.48)	0.734	Basic	2.140	0.0269	2082
6.	Mean of CV-Sell and CV-Buy	0.84*** (0.26)	0.536	Extensive	1.180	0.0649	2065
7.	CV-Sell	0.63* (0.34)	0.281	Extensive	1.478	0.1034	2090
8.	CV-Buy	1.03** (0.45)	0.945	Extensive	2.012	0.0455	2086
9.	EV-Sell	0.36 (0.38)	0.095	Extensive	1.680	0.0330	2089
10.	EV-Buy	0.96* (0.49)	0.930	Extensive	2.129	0.0370	2082

Notes: Robust standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Each row contains an OLS regression of the log annuity valuation measure listed in column 1 on the log actuarial value and additional controls. The annuity valuation measures CV-Sell, CV-Buy, EV-Sell, and EV-Buy are defined in the text. All valuations are expressed in logs of the midpoint between the upper and lower bounds. Additional controls in rows 1-5 are those in specification 1 of Table 5, whereas the additional controls in rows 6-10 are those in specification 3 of Table 5. Rows 1 and 6 replicate columns 1 and 3 of Table 5, respectively.

Table A.8: Correlations Between Winsorized Annuity Valuation Measures

Pairwise correlations	CV-Sell (in logs)	EV-Sell (in logs)	CV-Buy (in logs)	EV-Buy (in logs)
CV-Sell (in logs)	1			
EV-Sell (in logs)	0.32***	1		
CV-Buy (in logs)	-0.10***	-0.14***	1	
EV-Buy (in logs)	-0.09***	-0.12***	0.72***	1

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 2 except that all annuity valuation measures are winsorized at the 10th and 90th percentiles. For further details, see the note to Table 2

Table A.9: Explaining the Winsorized Sell-Buy Spread

	Dependent Variable: Absolute Value of Difference between Log CV-Sell (winsorized) and Log CV-Buy (winsorized)			
Explanatory Variables	(1)	(2)	(3)	(4)
Age 35 to 49	-0.05	0.11	0.11	0.22**
	(0.12)	(0.11)	(0.11)	(0.12)
Age 50 to 64	0.09	0.34***	0.35***	0.41***
	(0.11)	(0.10)	(0.10)	(0.12)
Age 65 and older	0.48***	0.68***	0.69***	0.65***
	(0.12)	(0.12)	(0.12)	(0.14)
Cognition index, standardized			-0.53***	-0.40***
			(0.04)	(0.06)
Financial literacy index, 0-3 scale		-0.29***		
		(0.05)		
Education index, 1-5 scale		-0.22***		
		(0.03)		
Number series score, standardized		-0.28***		
		(0.04)		
Controls for demographics and preferences	No	No	No	Yes
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0354	0.1349	0.1351	0.1727
Number of observations	2065	2065	2065	2065
Mean of dependent variable	2.49	2.49	2.49	2.49
Standard deviation of dependent variable	1.63	1.63	1.63	1.63

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 3 except that the Sell-Buy spead was calculated based on annuity valuation measures that were winsorized at the 10th and 90th percentiles. For further details, see the note to Table 3. The coefficients on the demographic and preference variables of the regression in column 4 are shown in Online Appendix Table A.3 column 3.

Table A.10: Effects of Randomizations for Winsorized CV-Sell Annuity Valuation

	(1)	(2)	(3)	(4)
	Dependent Variable: Winsorized Log CV-Sell			
Explanatory Variables	Entire sample	Top quintile of cognition index	Bottom quintile of cognition index	Entire sample
Log of starting value	0.30***	0.19*	0.70***	0.31***
	(0.06)	(0.11)	(0.14)	(0.05)
Asked after larger version	0.62***	0.68***	0.62***	0.61***
	(0.05)	(0.10)	(0.13)	(0.05)
Asked in wave 1	0.05	0.04	0.24*	0.05
	(0.05)	(0.10)	(0.13)	(0.05)
Lump-sum option shown last	0.07	0.04	0.01	0.06
	(0.05)	(0.10)	(0.13)	(0.05)
Log of starting value				-0.11**
× Cognition index				(0.06)
Asked after larger version				-0.03
× Cognition index				(0.05)
Asked in wave 1				0.00
× Cognition index				(0.05)
Lump-sum option shown last				0.04
× Cognition index				(0.05)
Cognition index				-0.15***
				(0.03)
Adjusted R^2	0.0783	0.1089	0.0991	0.0933
N	2090	385	412	2090
Mean of dependent variable	10.01	9.82	10.27	10.01
Standard deviation of dependent variable	1.20	1.19	1.96	1.20

Notes: Robust standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 4 except that the dependent variable is winsorized at the 10th and 90th percentiles. For further details, see the note to Table 4.

Table A.11: Explaining Winsorized Annuity Valuations

	Dependent Variable: Mean of Windsorized Log CV-Sell and Winsorized Log CV-Buy			
Explanatory Variables	(1)	(2)	(3)	(4)
Log actuarial value	0.93***		0.79***	
	(0.23)		(0.24)	
Log theoretical utility-based annuity value		0.04		0.17
		(0.03)		(0.12)
Age	-0.05***	-0.02*	-0.04***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Age squared/100	0.06***	0.02	0.04***	0.01
	(0.01)	(0.01)	(0.02)	(0.01)
Female	-0.08	-0.01	-0.04	0.00
	(0.05)	(0.05)	(0.06)	(0.06)
Married	0.06	0.05	0.08	0.13*
	(0.05)	(0.05)	(0.06)	(0.07)
Black	0.09	0.12	0.09	0.09
	(0.11)	(0.11)	(0.11)	(0.11)
Hispanic	0.32***	0.35***	0.33***	0.33***
	(0.10)	(0.11)	(0.11)	(0.11)
Other	-0.01	-0.02	-0.02	-0.03
	(0.12)	(0.12)	(0.11)	(0.12)
Education index, 1-5 scale			-0.02	-0.02
			(0.03)	(0.03)
Log family income			0.02	0.02
			(0.04)	(0.04)
Owns an annuity			-0.06	-0.03
			(0.06)	(0.06)
Owns home			-0.15**	-0.16**
			(0.08)	(0.08)
Log financial wealth			0.01	-0.01
			(0.02)	(0.03)
Self-reported health index, 1-5 scale			-0.02	-0.03
			(0.03)	(0.03)
Ever had kids			-0.03	-0.04
			(0.06)	(0.06)
Risk aversion (standardized)			0.02	0.02
			(0.03)	(0.03)
Precaution (standardized)			-0.07**	-0.07**
			(0.03)	(0.03)
Expects returns greater than 3% p.a.			0.12**	0.12**
			(0.05)	(0.05)
Confident SS will pay promised benefits, 1-4 scale			0.11***	0.12***
			(0.03)	(0.03)
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0529	0.0463	0.0633	0.0590
Number of observations	2065	2065	2065	2065
Mean of dependent variable	9.17	9.17	9.17	9.17
Standard deviation of dependent variable	1.13	1.13	1.13	1.13

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 5 except that the dependent variable was calculated based on annuity valuation measures that were winsorized at the 10th and 90th percentiles. For further details, see the note to Table 5.

Table A.12: Predictive Power of Actuarial Value by the Cognition Index for Winsorized Outcomes

	(1)	(2)	(3)	(4)	(5)
Dependent Variable: Mean of log CV-Sell and log CV-Buy	Coefficient on log actuarial value	p-value on coefficient =1	Root MSE	Adjusted R^2	N
Sample split by quintiles of the cognition index					
1. *Bottom quintile*	0.44	0.431	1.373	0.0847	404
	(0.71)				
2. *Second quintile*	0.45	0.309	1.135	0.0186	451
	(0.54)				
3. *Third quintile*	1.27***	0.559	1.085	0.0194	392
	(0.45)				
4. *Fourth quintile*	0.83*	0.720	0.973	0.0520	433
	(0.46)				
5. *Fifth quintile*	1.32***	0.492	0.847	0.0703	385
	(0.47)				

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 6 except that the dependent variable was calculated based on annuity valuation measures that were winsorized at the 10th and 90th percentiles. For further details, see the note to Table 6.

Table A.13: Correlations between Annuity Valuation Measures for the Age 50+ Sample

Pairwise correlations	CV-Sell (in logs)	EV-Sell (in logs)	CV-Buy (in logs)	EV-Buy (in logs)
CV-Sell (in logs)	1			
EV-Sell (in logs)	0.29***	1		
CV-Buy (in logs)	-0.11***	-0.17***	1	
EV-Buy (in logs)	-0.11***	-0.17***	0.72***	1

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 2 except that the sample is restricted to respondents age 50 and above. For further details, see the note to Table 2

Table A.14: Explaining the Sell-Buy Spread for the Age 50+ Sample

	Dependent Variable: Absolute Value of Difference between Log CV-Sell and Log CV-Buy			
Explanatory Variables	(1)	(2)	(3)	(4)
Age 65 and older	0.39***	0.33***	0.34***	0.20*
	(0.11)	(0.11)	(0.11)	(0.12)
Cognition index, standardized			-0.58***	-0.46***
			(0.05)	(0.08)
Financial literacy index, 0-3 scale		-0.25***		
		(0.08)		
Education index, 1-5 scale		-0.23***		
		(0.05)		
Number series score, standardized		-0.36***		
		(0.06)		
Controls for demographics and preferences	No	No	No	Yes
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0468	0.1374	0.1358	0.1807
Number of observations	1223	1223	1223	1223
Mean of dependent variable	2.68	2.68	2.68	2.68
Standard deviation of dependent variable	1.82	1.82	1.82	1.82

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 3 except that the sample is restricted to respondents age 50 and above. For further details, see the note to Table 3.

Table A.15: Effects of Randomizations for the Age 50+ Sample

	(1)	(2)	(3)	(4)
	Dependent Variable: log CV-Sell			
Explanatory Variables	Entire sample	Top quintile of cognition index	Bottom quintile of cognition index	Entire sample
Log of starting value	0.36***	0.20	0.92***	0.40***
	(0.10)	(0.15)	(0.29)	(0.10)
Asked after larger version	0.78***	0.92***	0.88***	0.75***
	(0.08)	(0.14)	(0.27)	(0.09)
Asked in wave 1	0.02	0.04	0.44*	0.03
	(0.08)	(0.14)	(0.26)	(0.09)
Lump-sum option shown last	0.00	0.00	-0.27	-0.03
	(0.08)	(0.14)	(0.27)	(0.09)
Log of starting value				-0.16
× Cognition index				(0.10)
Asked after larger version				-0.04
× Cognition index				(0.09)
Asked in wave 1				-0.08
× Cognition index				(0.09)
Lump-sum option shown last				0.13
× Cognition index				(0.09)
Cognition index				-0.20***
				(0.05)
Adjusted R^2	0.0729	0.1384	0.0881	0.0900
N	1236	262	200	1236
Mean of dependent variable	10.12	9.89	10.55	10.12
Standard deviation of dependent variable	1.53	1.20	1.94	1.53

Notes: Robust standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 4 except that the sample is restricted to respondents age 50 and above. For further details, see the note to Table 4.

Table A.16: Explaining Annuity Valuations for the Age 50+ Sample

Explanatory Variables	Dependent Variable: Mean of Log CV-Sell and Log CV-Buy (1)	(2)	(3)	(4)
Log actuarial value	1.61***		1.61***	
	(0.49)		(0.50)	
Log theoretical utility-based annuity value		0.10**		0.33**
		(0.05)		(0.16)
Age	-0.17*	0.07	-0.18**	0.04
	(0.09)	(0.05)	(0.09)	(0.05)
Age squared/100	0.16**	-0.05	0.17**	-0.02
	(0.08)	(0.04)	(0.08)	(0.04)
Female	-0.05	0.08	-0.03	0.05
	(0.08)	(0.07)	(0.08)	(0.07)
Married	0.05	0.06	0.06	0.17*
	(0.07)	(0.07)	(0.08)	(0.10)
Black	0.09	0.15	0.10	0.11
	(0.18)	(0.18)	(0.17)	(0.17)
Hispanic	0.13	0.21	0.10	0.13
	(0.20)	(0.20)	(0.21)	(0.21)
Other	-0.30	-0.26	-0.28	-0.26
	(0.22)	(0.21)	(0.22)	(0.22)
Education index, 1-5 scale			0.01	0.01
			(0.04)	(0.04)
Log family income			0.05	0.06
			(0.05)	(0.05)
Owns an annuity			-0.03	0.00
			(0.08)	(0.08)
Owns home			-0.21*	-0.19*
			(0.11)	(0.11)
Log financial wealth			0.02	-0.03
			(0.03)	(0.04)
Self-reported health index, 1-5 scale			-0.01	-0.02
			(0.04)	(0.04)
Ever had kids			-0.09	-0.09
			(0.08)	(0.08)
Risk aversion (standardized)			-0.02	-0.03
			(0.04)	(0.04)
Precaution (standardized)			-0.07*	-0.07*
			(0.04)	(0.04)
Expects returns greater than 3% p.a.			0.10	0.09
			(0.07)	(0.07)
Confident SS will pay promised benefits, 1-4 scale			0.12***	0.13***
			(0.04)	(0.04)
Controls for experimental variation	Yes	Yes	Yes	Yes
Adjusted R^2	0.0584	0.0534	0.0710	0.0661
Number of observations	1223	1223	1223	1223
Mean of dependent variable	9.17	9.17	9.17	9.17
Standard deviation of dependent variable	1.19	1.19	1.19	1.19

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 5 except that the sample is restricted to respondents age 50 and above. For further details, see the note to Table 5.

Table A.17: Predictive Power of Actuarial Value by the Cognition Index for the Age 50+ Sample

Dependent Variable: Mean of log CV-Sell and log CV-Buy	(1) Coefficient on log actuarial value	(2) p-value on coefficient =1	(3) Root MSE	(4) Adjusted R^2	(5) N
Sample split by quintiles of the cognition index					
1. *Bottom quintile*	2.52*	0.297	1.429	0.1055	196
	(1.45)				
2. *Second quintile*	3.55***	0.035	1.196	0.0530	256
	(1.20)				
3. *Third quintile*	1.16	0.889	1.198	0.0211	239
	(1.17)				
4. *Fourth quintile*	0.74	0.757	1.017	0.0999	270
	(0.84)				
5. *Fifth quintile*	0.22	0.364	0.899	0.0531	262
	(0.86)				

Notes: Robust standard errors between parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. This table is identical to Table 6 except that the sample is restricted to respondents age 50 and above. For further details, see the note to Table 6.

Online Appendix A: The Rand American Life Panel

Sample Construction

Our survey was conducted in the RAND American Life Panel (ALP). The ALP consists of a panel of U.S. households that regularly takes surveys over the Internet. An advantage over most other Internet panels is that the respondents to the ALP need not have Internet when they get recruited (as described in more detail below) and thus can be based on a probability sample of the U.S. population.[1] This is in contrast with so-called convenience Internet samples, where respondents are volunteers who already have Internet and, for example, respond to banners placed on frequently visited web-sites, in which they are invited to complete surveys and earn money by doing so. The problem with convenience Internet samples is that their statistical properties are unknown. There is fairly extensive literature comparing probability Internet samples like the ALP to convenience Internet samples, as well as literature seeking to establish if convenience samples can somehow be made population-representative by reweighting.

For instance, Chang and Krosnick (2009) simultaneously administered the same questionnaire (on politics) to an RDD (random digit dialing) telephone sample, an Internet probability sample, and a non-probability sample of volunteers who do Internet surveys for money. They found that the telephone sample had the most random measurement error, while the non-probability sample had the least. At the same time, the latter sample exhibited the most bias (also after reweighting), producing the most accurate self-reports from the most biased sample. The probability Internet sample exhibited more random measurement error than the non-probability sample (but less than the telephone sample) and less bias than the non-probability Internet sample. On balance, the probability Internet sample produced the most accurate results. Yeager et al. (2009) conducted a follow-up study comparing one probability Internet sample, one RDD telephone sample, and seven non-probability Internet samples and a wider array of outcomes. Their conclusions were the same: both the telephone sample and the probability Internet sample showed the least bias; reweighting the non-probability samples did not help (for some outcomes, the bias got worse; for others, better). They also found that response rates do not appear critical for bias. Even with relatively low response rates, the probability samples yielded

[1] Other probability Internet surveys include the Knowledge Networks panel in the U.S. (http://www.knowledgenetworks.com/knpanel/index.html), and the CentERpanel and LISS panel in the Netherlands (http://www.centerdata.nl/en/centerpanel and http://www.centerdata.nl/en/MESS). Of these panels, the CentERpanel is the oldest (founded in 1991).

unbiased estimates. It is not clear *a priori* why non-probability samples do so much worse. As the authors note, it appears that there are some fundamental differences between Internet users and non-Internet users that cannot be redressed by reweighting. Indeed, Couper et al. (2007) and Schonlau et al. (2009) show that weighting and matching do not eliminate differences between estimates based on samples of respondents with and without Internet access. Several other studies point at equally mixed results, including Vehovar et al. (1999); Duffy et al. (2005); Malhotra and Krosnick (2007); Taylor (2000); and Loosveldt and Sonck (2008).

ALP respondents have been recruited in one of four ways. Most were recruited from respondents ages 18+ to the Monthly Survey (MS) of the University of Michigan's Survey Research Center (SRC). The MS is the leading consumer sentiment survey that incorporates the long-standing Survey of Consumer Attitudes and produces, among others, the widely used Index of Consumer Expectations. Each month, the MS interviews approximately 500 households, 300 of which are a random-digit-dial (RDD) sample and 200 of which are re-interviewed from the RDD sample surveyed six months previously. Until August 2008, SRC screened MS respondents by asking them if they would be willing to participate in a long-term research project (with approximate response categories "no, certainly not," "probably not," "maybe," "probably," "yes, definitely"). If the response category is not "no, certainly not," respondents were told that the University of Michigan is undertaking a joint project with RAND. They were asked if they would object to SRC sharing information about them with RAND so that they could be contacted later and asked if they would be willing to actually participate in an Internet survey. Respondents who did not have Internet were told that RAND would provide them with free Internet. Many MS respondents were interviewed twice. At the end of the second interview, an attempt was made to convert respondents who refused in the first round. This attempt included mentioning the fact that participation in follow-up research carries a reward of $20 for each half-hour interview. Respondents from the Michigan monthly survey without Internet were provided with so-called WebTVs (http://www.webtv.com/pc/), which allowed them to access the Internet using their television and a telephone line. The technology enabled respondents who lacked Internet access to participate in the panel and, further, use the WebTVs for browsing the Internet or email. The ALP has also recruited respondents through a snowball sample (respondents suggesting friends or acquaintances who might also want to participate), but we do not use any respondents recruited through the snowball sample in our paper. A new group of respondents (approximately 500) has been recruited after participating in the National Survey Project created at Stanford University with SRBI. This sample was recruited in person, and at the end of their one-year participation, respondents were asked whether they were interested in joining the RAND American Life Panel. Most of these respondents were given a laptop and broadband Internet access. Recently, the American Life Panel has begun recruiting based on a random mail and telephone sample using the Dillman et al. method (2008), with a goal of achieving 5,000 active panel members, including a 1,000-person Spanish language subsample. If these new participants do not yet have Internet access, they are also provided with a laptop and broadband Internet access.

Calculation of Social Security Benefits

For most ALP respondents, we have previously estimated monthly Social Security benefits (described in Brown et al., 2013). To do so, we took respondents through a fairly detailed set of questions asking about years in which they had labor earnings and an approximation of earnings in those years. We then fed these earnings through a benefit calculator provided by SSA to calculate individuals' "Primary Insurance Amount" (PIA), which is equivalent to the benefit the individual would receive if he were to retire at his normal retirement age. Next, we applied SSA's actuarial adjustment for earlier or later claiming. We also asked respondents if the estimated benefit amount seemed reasonable to them, and we gave them an opportunity to change this estimate if they believed it was not a good approximation. All subsequent lump-sum and annuity questions then pivot off this estimated monthly Social Security benefit amount.

For the few respondents who indicated they did not expect to receive benefits (nor expect one from a living or deceased spouse), we imputed "standard monthly benefit amounts" based on age, sex, and educational level. We then asked these respondents to assume, for the purposes of the questions to follow, that they would receive this benefit, as follows:

> *Even though we understand that you are not eligible to receive Social Security benefits, we would like to ask you to complete this survey assuming you would be eligible. In other words, please answer in this survey what you would have done or chosen if you would be eligible for Social Security benefits.*

Online Appendix References

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Online Appendix B – Survey Instrument

Introduction for users of this survey instrument

- **The survey instrument was fielded as well-being modules 179 and 180 on the RAND American Life Panel (ALP)**
- **Items which are bolded are instructions to programmer or comments to the reader.**
- **Items which are non-bolded are asked of respondents.**
- **Items shown on the screen in bold are marked by for the start of the bolded text and by at the end of the bolded text.**
- **We changed the names of the four elicitation methods in the written up version of the paper compared to the names used in this survey instrument. CV-minus corresponds to CV-Buy, EV-minus to EV-Buy, CV-plus to CV-Sell, and EV-plus to EV-Sell.**

A. Randomizations

We independently randomize the following variables:

1. **VERSION_A [0, 1]: whether we ask CV-plus in wave 1 or wave 2**
   1 if we ask CV-Plus in wave 1 of the survey (survey version A)
   0 otherwise
2. **VAR_ORDER [1, 6]: Order of CV-minus**
   1. **Order: CV-minus, EV-plus, EV-minus**
   2. **Order: CV-minus, EV-minus, EV-plus**
   3. **Order: EV-plus, CV-minus, EV-minus**
   4. **Order: EV-plus, EV-minus, CV-minus**
   5. **Order: EV-minus, CV-minus, EV-plus**
   6. **Order: EV-minus, EV-plus, CV-minus**
3. **LS_FIRST [0, 1]: whether we ask the option that mentions the lumpsum amount first**
   1 if we ask the option with the lumpsum amount first
   0 otherwise
4. **SMALLTOLARGE [0, 1]: the order in which we present the changes in SS**
   1 if we show the ΔSS from smallest to largest
   0 otherwise
5. **LS_STARTVALUE [1, 3]: Size of the first lumpsum amount shown**
   1. **low starting value ($10,000)**
   2. **medium starting value ($20,000)**
   3. **high starting value ($30,000)**
6. **ORDER_STOCK [1,2]: Order of choices in Q.3.2.3**
   1. **List "single company stock" first**
   2. **List "stock mutual fund" first**

If VAR_ORDER=1 OR VAR_ORDER=2, we set CVM_ORDER = 1
If VAR_ORDER=3 OR VAR_ORDER=5, we set CVM_ORDER = 2
If VAR_ORDER=4 OR VAR_ORDER=6, we set CVM_ORDER = 3

If VAR_ORDER=3 OR VAR_ORDER=4, we set EVP_ORDER = 1
If VAR_ORDER=1 OR VAR_ORDER=6, we set EVP_ORDER = 2
If VAR_ORDER=2 OR VAR_ORDER=5, we set EVP_ORDER = 3

If VAR_ORDER=5 OR VAR_ORDER=6, we set EVM_ORDER = 1
If VAR_ORDER=2 OR VAR_ORDER=4, we set EVM_ORDER = 2
If VAR_ORDER=1 OR VAR_ORDER=3, we set EVM_ORDER = 3

B. Survey waves and versions A and B

We fielded the survey in two waves. We have two versions, version A and version B. The only difference between these versions is that in version B the order of sections 2 and 6 is switched (compared to version A). The survey instrument below is for version A. The following table specifies the order for the sections for versions A and B.

	Version A	Version B
Wave 1	Section 1 ("Intro wave 1")	Section 1 ("Intro wave 1")
	Section 2 ("CVPlus")	Section 6 ("Other tradeoffs")
	Section 3 ("Background")	Section 3 ("Background")
	Section 4 ("Close wave 1")	Section 4 ("Close wave 1")
Wave 2	Section 5 ("Intro wave 2")	Section 5 ("Intro wave 2")
	Section 6 ("Other tradeoffs")	Section 2 ("CVPlus")
	Section 7 ("No Political Risk")	Section 7 ("No Political Risk")
	Section 8 ("Close wave 2")	Section 8 ("Close wave 2")

Respondents with the VERSION_A=1 are given version A and respondents with VERSION_A=0 are given version B.

C. Syntax

Note:

- **The number between parentheses before a choice box was not displayed on the screen. It only indicates how that choice should be coded.**
- **Comments between square brackets are programming notes.**
- **Variable names between square brackets were replaced by the contents of the variable.**

D. Lookup tables (matrices) for Lumpsum amounts and BEN_DEFAULT

The following tables show lumpsum (one-time Social Security payment) amounts for three different starting values: low, medium and high, which are randomized as mentioned above.

10,000	4,000	2,000	1,000	500	Row 1
				1,500	Row 2
			3,000	2,500	Row 3
				3,500	Row 4
		7,000	5,500	4,750	Row 5
				6,250	Row 6
			8,500	7,750	Row 7
				9,250	Row 8
	30,000	20,000	15,000	12,500	Row 9
				17,500	Row 10
			25,000	22,500	Row 11
				27,500	Row 12
		60,000	40,000	35,000	Row 13
				50,000	Row 14
			100,000	80,000	Row 15
				200,000	Row 16
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	

Table1: Lumpsum amounts for LOW starting value

We put the values of the table 1 in the 16x5 matrix LS_LOW. The i^{th} row and j^{th} column of this matrix is denoted by LS_LOW[i,j]

20,000	**4,000**	**2,000**	**1,000**	**500**	**Row 1**
				1,500	**Row 2**
			3,000	**2,500**	**Row 3**
				3,500	**Row 4**
		10,000	**7,000**	**5,500**	**Row 5**
				8,500	**Row 6**
			15,000	**12,500**	**Row 7**
				17,500	**Row 8**
	60,000	**30,000**	**25,000**	**22,500**	**Row 9**
				27,500	**Row 10**
			40,000	**35,000**	**Row 11**
				50,000	**Row 12**
		100,000	**80,000**	**70,000**	**Row 13**
				90,000	**Row 14**
			200,000	**150,000**	**Row 15**
				500,000	**Row 16**
Col. 1	**Col. 2**	**Col. 3**	**Col. 4**	**Col. 5**	

Table2: Lumpsum amounts for MEDIUM starting value

We put the values of the table 2 in the 16x5 matrix LS_MED. The i^{th} row and j^{th} column of this matrix is denoted by LS_MED[i,j]

30,000	10,000	4,000	2,000	1,000	Row 1
				3,000	Row 2
			7,000	5,500	Row 3
				8,500	Row 4
		20,000	15,000	12,500	Row 5
				17,500	Row 6
			25,000	22,500	Row 7
				27,500	Row 8
	60,000	40,000	35,000	32,500	Row 9
				37,500	Row 10
			50,000	45,000	Row 11
				55,000	Row 12
		100,000	80,000	70,000	Row 13
				90,000	Row 14
			200,000	150,000	Row 15
				500,000	Row 16
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	

Table3: Lumpsum amounts for HIGH starting value

We put the values of the table 3 in the 16x5 matrix LS_HIGH. The i^{th} row and j^{th} column of this matrix is denoted by LS_HIGH[i,j]

The following code was used for the BEN_DEFAULT value table:

EDUCATION	**1 = less than high school (< 12 years)**
	2= high school degree (12 years),
	3=some college (>12 and < 16 years)
	4 = college degree (= 16 years)
	5 = more than college (>16 years)

The variable BEN_DEFAULT was created and set to the following values:

Education	Gender	Marital status	BEN_DEFAULT
1 (<12 years)	Female	Married	660
2 (12 years)	Female	Married	790
3 (> 12 years and <16 years)	Female	Married	850
4 (16 years)	Female	Married	830
5 (>16 years)	Female	Married	850
1 (<12 years)	Male	Married	1070
2 (12 years)	Male	Married	1280
3 (> 12 years and <16 years)	Male	Married	1270
4 (16 years)	Male	Married	1330
5 (>16 years)	Male	Married	1360
1 (<12 years)	Female	Not Married	920
2 (12 years)	Female	Not Married	1080
3 (> 12 years and <16 years)	Female	Not Married	1120
4 (16 years)	Female	Not Married	1230
5 (>16 years)	Female	Not Married	1160
1 (<12 years)	Male	Not Married	1040
2 (12 years)	Male	Not Married	1190
3 (> 12 years and <16 years)	Male	Not Married	1130
4 (16 years)	Male	Not Married	1350
5 (>16 years)	Male	Not Married	1380

INITIALIZATIONS: BEGINNING OF SURVEY

[NOTE: THIS IS THE BEGINNING OF THE SURVEY.]

Preloaded variables from previous waves that are used in skip patterns are:

GENDER	1 = male; 2 = female
AGE	The respondent's current age in years
HIGHESTEDUCATION	1 Less than 1st grade
	2 1st, 2nd, 3rd, or 4th grade
	3 5th or 6th grade
	4 7th or 8th grade
	5 9th grade
	6 10th grade
	7 11th grade
	8 12th grade NO DIPLOMA
	9 HIGH SCHOOL GRADUATE high school DIPLOMA or the equivalent (For example: GED)
	10 Some college but no degree
	11 Associate degree in college Occupational/vocational program
	12 Associate degree in college Academic program
	13 Bachelor's degree (For example: BA,AB,BS)
	14 Master's degree (For example: MA,MS,MEng,MEd,MSW,MBA)
	15 Professional School Degree (For example: MD,DDS,DVM,LLB,JD)
	16 Doctorate degree (For example: PhD,EdD)

For missing values/ answers for variables mentioned above, the questions were asked again in the beginning of wave 1. The variable "MARRIED" was collected regardless of whether data was available. The following question was asked to all respondents in the beginning of wave 1.

[MARRIED] Married

Are you currently married?

(0) Not Currently Married

(1) Currently married

Other preloaded questions include:

PIA_EST Estimated PIA (Social Security Primary Insurance Amount) based on previous questions asked about earnings history. So this is the Social Security benefit one would get if one claimed at full retirement age.

WORK_FOR_PAY 1 YES; 2 NO. This is a standard variable that records whether the respondent has <u>ever</u> worked for pay. If this variable was missing for any respondent then they were asked the following question:

[WORK_FOR_PAY] Work For Pay

Did you work for pay more than 10 years?

(1) Yes

(2) No

A new data-only variable SPOUSE was created:
Set SPOUSE = "husband" if GENDER=="female"
Set SPOUSE = "wife" if GENDER=="male"

A new data only variable FLAGHYPO was created and set FLAGHYPO=0.
A new data only variable USE_DEFAULT was created and set USE_DEFAULT=0.

SECTION 1: INTRODUCTION TO WAVE 1

[NOTE: THIS SECTION FINDS THE SOCIAL SECURITY STATUS, ELIGIBILITY, AND CLAIM AGE OF RESPONDENTS. IT ESTIMATES THE SOCIAL SECURITY BENEFIT AMOUNT OF RESPONDENTS BASED ON THEIR AGE, EARNINGS HISTORY, AND YEARS IN THE WORK FORCE AND PROVIDES RESPONDENTS AN OPPORTUNITY TO CORRECT THE ESTIMATE. THIS SECTION WAS ASKED OF ALL RESPONDENTS.]

[**WAIT_WARNING]** Wait Warning
The page after this may take several seconds to load. Please click the next button now, and do not click your browser's back button while the page is loading. Thank you.

Q.1.1: [INTRODUCTION TO SECTION 1]
We are interested in understanding how and when people would like to receive their Social Security benefits.

In this survey, we sometimes ask questions that are difficult to answer exactly. Please take time to consider the questions and give us your best guess even if you do not know the exact answer. Having your best guess will be very helpful to us.

Thank you very much for your participation!

Q.1.2: [SS_STATUS] Social Security Status

In this survey, we mean by "Social Security benefits" any benefits that you yourself receive or will receive from the Social Security program, including retiree, disability, spouse, or survivor benefits.

Which of the following statements best describes you?

(1) ☐ I receive Social Security benefits now.
(2) ☐ I don't receive Social Security benefits now but, under current law, I will be eligible to receive them in the future.
(3) ☐ I will never be eligible under current law to receive Social Security benefits.

[Create new variable SS_STATUS_ORIG, and set SS_STATUS_ORIG=SS_STATUS]

[ASK IF SS_STATUS=3]
Q.1.3: [SS_ELIG] Social Security Eligibility

Why do you think you will never be eligible to receive Social Security benefits?

(1) ☐ My main job was/is not covered by Social Security.
(2) ☐ I don't have or will not have a sufficient work history to become eligible for Social Security benefits.
(3) ☐ I do not think Social Security will be around by the time I would start claiming benefits
(4) ☐ Other: ________________ [Give open-ended text box]

[SHOW IF SS_ELIG=3]
Q.1.4: [SS_AROUND] Assume Social Security will still be around

Please answer the questions in this survey assuming that current Social Security rules still apply when you first claim Social Security benefits. Thank you.

[IF SS_ELIG=3, SET SS_STATUS=2]

[ASK IF SS_STATUS=3]
Q.1.5: [SSEL_SPOUSE] Eligible For Social Security Based on Spouse

People who are not eligible to receive Social Security based on their own work history may receive Social Security benefits based on the earnings history of their spouse, late spouse, or ex-spouse.

Do you think you may be eligible to receive benefits based on the past or future earnings of your **[SPOUSE]**, late **[SPOUSE]**, ex-**[SPOUSE]**, or perhaps a future **[SPOUSE]**?

(1) ◘ Yes
(2) ◘ No

[If SSEL_SPOUSE==1 and SS_STATUS==3: set SS_STATUS=2]
[If (SSEL_SPOUSE==2 or SSEL_SPOUSE=missing) and SS_STATUS==3: set FLAGHYPO=1]

[ASK IF FLAGHYPO=1]
[If FLAGHYPO=1 AND AGE>=62, SET SS_STATUS=1] /* if eligible, they would be claiming */
[If FLAGHYPO=1 AND AGE<62, SET SS_STATUS=2] /* if eligible, they would not yet have claimed */
[If FLAGHYPO=1, SET CLAIM_AGE=62]
[If FLAGHYPO=1, SET BEN_EST=BEN_DEFAULT]
Q.1.6: [HYPOELIGIBLE] Hypothetically Eligible

Even though we understand that you are not eligible to receive Social Security benefits, we would like to ask you to complete this survey assuming you would be eligible. In other words, please answer in this survey what you would have done or chosen if you would be eligible for Social Security benefits.

The typical Social Security benefit for **[If MARRIED=1, insert** "a married"**; if MARRIED=0, insert** "an unmarried"**] [If GENDER="male" insert** "man"**; if GENDER="female" insert** "woman"**]** with **[insert the respondent's educational attainment based on the categories in EDUCATION]** is $[BEN_DEFAULT] per month.

For the purpose of this survey, let's assume that you **[If SS_STATUS==2, insert** "are supposed to"**]** get a Social Security benefit of $[BEN_DEFAULT] per month, and that you **[If SS_STATUS==1, insert** "started receiving"; **If SS_STATUS==2, insert** "would start receiving"**]** Social Security benefits at age 62.

[If FLAGHYPO=1, GO TO SECTION 2]

Q.1.7.1: [CLAIM_AGE] Social Security benefits claim age
[Ask if SS_STATUS==1 (receiving benefits):]

At what age did you start receiving Social Security benefits?

At age: _________

Q.1.7.2: [CHECKCLAIM_AGE1] Check Claim Age
[Ask if SS_STATUS==1 and CLAIMING AGE > CALCULATED AGE]

You told us earlier that you are already receiving Social Security benefits. Therefore, the age at which you started receiving Social Security benefits cannot be higher than your current age. Please go back and revise your answer.

Q.1.7.3: **[CLAIM_AGE] Social Security benefits claim age**
[Ask if SS_STATUS==2 (not receiving benefits yet)]:

At what age do you plan to start receiving Social Security benefits?

At age: __________

Q.1.7.4: [**CHECKCLAIM_AGE1] Check Claim Age**
[Ask if SS_STATUS==2 (not receiving benefits yet) and CLAIMING AGE < CALCULATED AGE]:
You told us earlier that you are not currently receiving Social Security benefits. Therefore, the age at which you plan to start receiving Social Security benefits cannot be lower than your current age. Please go back and revise your answer.

[Always: (the code below ensures CLAIM_AGE will never be missing)]
[Set CLAIM_AGE_ORIG=CLAIM_AGE]
[Set CLAIM_AGE=Max(AGE+1, 62) if CLAIM_AGE=missing AND SS_STATUS==2]
[Set CLAIM_AGE=Min(AGE, 62) if CLAIM_AGE=missing AND SS_STATUS==1]

[Note: The series of questions 1.8.1-1.8.6 below were only asked if the variable PIA_EST was missing (and therefore could not be preloaded). The variable PIA_EST contains the estimated Social Security monthly benefits if the person claims benefits at the full retirement age, and is based on a series of questions asked

PREVIOUSLY IN THE AMERICAN LIFE PANEL ABOUT THE PERSON'S WORK HISTORY. THE SERIES OF QUESTIONS AND THE SKIP LOGIC BELOW IS IDENTICAL TO THE EARLIER SERIES OF QUESTIONS ASKED TO ESTIMATE PIA_EST.]

[IF WORK_FOR_PAY ≠ "YES" OR PIA_EST ≠ missing, Skip Q1.8.1 through Q.1.8.6]

Q.1.8.1: [YEAR_START_WORK] Year Start Work For Pay

In what year did you first start to work for pay?

[Note to programmer: Insert "a drop down box from 1900 to 2011"]

[ASK IF YEAR_ START_WORK < YEAR_OF_BIRTH + 14]

Q.1.8.2: [WORKED_TO_EARLY] Start Working Before 14

You said you started working before you were 14 years old. You indicated that you started working before you were 14 years old. For what follows, we will just assume that pay from age 14 on counts. If you believe you made an error in entering the date you began working, you may go back and change it.

Q.1.8.3: [INCOME_INTRO] Income Introduction

We would now like to ask you some more information about the period when you started working for pay (in [YEAR_START_WORK]) up to now.

[Note to Programmer: LOOP FROM 1 TO [number of questions INCOME_CAT] DO: /* number of periods loop */

Q.1.8.4: [INCOME_NOT_WORK] Income Not Work

[Insert "[income cat start year fill] - [income cat end year fill]"**]** Was there ever a time when you did not work in the "[income cat start year fill] - [income cat end year fill]" period?

---

(1) ☐ Yes
(2) ☐ No

[ASK IF INCOME_NOT_WORK=YES]

Q.1.8.5: [INCOME_NOT_WORK_HOW_LONG] Income Not Work Months

[Insert "[income cat start year fill] - [income cat end year fill]"**]** How many months in total do you estimate not working for pay in the "[income cat start year fill] - [income cat end year fill]" period?

(1) ☐ _________________ [Give open-ended text box allowing only integers]

[ASK IF INCOME_CAT fill amount 1 = and INCOME_CAT fill amount 2 = and INCOME_CAT fill amount 3]

Q.1.8.6: [INCOME_CAT] Income categories

[Insert "[income cat start year fill] - [income cat end year fill]"**]** Could you please give us an estimate of how much you were making on average per year in the "[income cat start year fill] - [income cat end year fill]" period "[fill for income cat question]?

(1) ☐ More than $[INCOME_CAT fill amount 1]
(2) ☐ Between $[INCOME_CAT fill amount 2] and $[INCOME_CAT fill amount 1]
(3) ☐ Between $[INCOME_CAT fill amount 3] and $[INCOME_CAT fill amount 2]
(4) ☐ Less than $[INCOME_CAT fill amount 3]

End Do /* End of number of periods loop */

[Note to programmers: based on the responses to Q1.8.1 through Q1.8.6, calculate PIA_EST using the same algorithm as used in the earlier ALP module]

[NOTE TO PROGRAMMERS: PLEASE USE THE VARIABLE PIA_EST (PRELOADED OR CALCULATED FROM Q.1.8.1-Q.1.8.6) AND THE VARIABLE CLAIM_AGE ASKED ABOVE TO COMPUTE THE ESTIMATED MONTHLY SOCIAL SECURITY BENEFITS FOR EACH RESPONDENT IF THEY START CLAIMING AT CLAIM_AGE. PLEASE USE THE SOCIAL SECURITY AGE ADJUSTMENT RULES

APPROPRIATE FOR THE BIRTH COHORT THAT THE RESPONDENT BELONGS TO IN THIS CALCULATION. PLEASE NAME THE RESULTING VARIABLE BEN_EST_ORIG1.]

IF BEN_EST_ORIG1 ≥ 200, THEN SET BEN_EST_ORIG=BEN_EST_ORIG1.
IF BEN_EST_ORIG1 < 200, THEN SET BEN_EST_ORIG=200
IF BEN_EST_ORIG1 = MISSING, THEN SET BEN_EST_ORIG=MISSING.

[SHOW IF SS_STATUS==1 (CURRENTLY RECEIVING BENEFITS) AND (AGE ≥ 60 OR BEN_EST_ORIG=MISSING)]
Q.1.9: [BEN_LEVEL] Social Security Benefits Level

Approximately how much are your monthly Social Security benefits?

Even if you do not know exactly, please give your best guess.

(As before, please report any Social Security benefits paid to you yourself (by check or direct deposit), not benefits paid to any other member in your household).

$________ **[NUMBER BOX WITH RANGE 0-3500]** per month.

[Note to programmers: please record the first answer to this question in BEN_LEVEL1.

[Display If BEN_LEVEL1 (social security benefits level) > 3500]
[checkBEN_LEVEL3500] Social Security Benefits Level Check > 3500

> Due to how Social Security calculates your benefits, it is very unlikely that your monthly benefit will be this high. Please go back and change your answer to something between $0 and $3500 per month.

[Display If BEN_LEVEL1 (social security benefits level) < 0]
[checkBEN_LEVEL0] Social Security Benefits Level Check <0

> Monthly Social Security benefits cannot be negative. Please go back and change your answer to something between $0 and $3500 per month.

The final response for all respondents should be recorded in the variable BEN_LEVEL.]

[SET BEN_EST=BEN_LEVEL]
[GO TO Q.1.13, "USE_DEFAULT"]

[Ask if BEN_EST_ORIG ≠ missing:]
Q.1.10: [BEN_OVERRIDE, BEN_NEW] ESTIMATED SOCIAL SECURITY BENEFITS

Based on the information you have provided to us about your own earnings history, we estimate that, under current Social Security Law, you are supposed to get a Social Security retirement benefit of approximately $[BEN_EST_ORIG] per month if you claim benefits at age [CLAIM_AGE].

Think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

Our estimate does not take into account Social Security benefits you may receive based on the earnings of a past or current spouse.

Do you think our estimate is about right for benefits you yourself are supposed to get from the Social Security program whether these benefits are retiree, disability, spouse, or survivor benefits?

(1) ☐ Yes, I believe the Social Security benefits I am supposed to get are roughly $[BEN_EST_ORIG] per month.
(2) ☐ No, I believe the Social Security benefits I am supposed to get are roughly $________ **[NUMBER BOX WITH RANGE 0-6000, variable name: BEN_NEW]** per month.

The instrument made sure that those who check option 2 fill in the number box; and they were reminded once if they left it blank. The first answer to their question was recorded in BEN_NEW1.

[DISPLAY IF BEN_NEW1 (benefits new) > 6000]
[checkBEN_NEW6000] Benefits New Check > 6000

Due to how Social Security calculates your benefits, it is very unlikely that your monthly benefit will be this high. Please go back and change your answer to something between $0 and $6000 per month.

[DISPLAY If BEN_NEW1 (benefits new) < 0]
[checkBEN_NEW0] Benefits New Check < 0

Monthly Social Security benefits cannot be negative. Please go back and change your answer to something between $0 and $6000 per month.

[DISPLAY IF BEN_OVERRIDE==2 and BEN_NEW == missing]
[checkBEN_NEWempty] Benefits New Check Value Empty

You selected the second option but did not fill in a value. Your answers are important to us. Please go back and fill in a value.

The final response for the number box for each respondent was recorded in the variable BEN_NEW.]

IF BEN_OVERRIDE==1, SET BEN_EST=BEN_EST_ORIG
IF BEN_OVERRIDE==2, SET BEN_EST=BEN_NEW

[ASK IF BEN_OVERRIDE==2]
Q.1.11 [OVERRIDE_WHY] Reason why R changed our estimate

Thank you for correcting our estimate of your Social Security benefits. We are interested in knowing what this correction was based on. Please check all boxes that apply.

(1) ☐ I know the amount of Social Security that I am supposed to get from my annual Social Security mailing
(2) ☐ I included Social Security survivor benefits that you did not include in your estimate
(3) ☐ I included Social Security spousal benefits that you did not include in your estimate
(4) ☐ I included Social Security disability benefits that you did not include in your estimate
(5) ☐ Your estimate simply didn't appear right to me
(6) ☐ Other ________________________ [Give open-ended text box]

[Note to programmer: Respondent is allowed to select multiple options]

[Ask if BEN_EST_ORIG=missing:]
Q.1.12: [BEN_EST_OWN]

In this question, we would like get your estimate of the Social Security benefits you are supposed to get under current law if you claim benefits at age [CLAIM_AGE].

As a point of reference, the typical Social Security benefit for **[If MARRIED=1, insert** "a married"**; if MARRIED=0, insert** "an unmarried"**] [If GENDER="male" insert** "man"**; if GENDER="female" insert** "woman"**]** with **[insert the respondent's educational attainment based on the categories in EDUCATION]** is $[BEN_DEFAULT] per month.

Please give your answer in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation). Please report benefits you yourself are supposed to get from the Social Security program whether these benefits are retiree, disability, spouse, or survivor benefits?

Even if you do not know exactly, please give your best guess.

I believe the Social Security benefits I am supposed to get are roughly $________ **[NUMBER BOX WITH RANGE 0-6000, variable name: BEN_EST_OWN]** per month if I claim benefits at age [CLAIM_AGE].

[DISPLAY IF BEN_EST_OWN1 (benefits estimate own) > 6000]
[checkBEN_EST_OWN6000] Benefits Estimate Own Check > 6000

Due to how Social Security calculates your benefits, it is very unlikely that your monthly benefit will be this high. Please go back and change your answer to something between $0 and $6000 per month.

[DISPLAY IF BEN_EST_OWN1 (benefits estimate own) <0]
[checkBEN_EST_OWN0 benefits estimate own check < 0]

Monthly Social Security benefits cannot be negative. Please go back and change your answer to something between $0 and $6000 per month.

The final response for the number box for all respondents were recorded in the variable BEN_EST_OWN.]

[Set BEN_EST=BEN_EST_OWN]

[Ask if BEN_EST=missing]
Q.1.13 [USE_DEFAULT, BEN_EST_RAW]: Tell respondent that we are using a default amount for his/her SS benefits

The typical Social Security benefit for **[If MARRIED=1, insert** "a married"**; if MARRIED=0, insert** "an unmarried"**] [If GENDER="male" insert** "man"**; if GENDER="female" insert** "woman"**]** with **[insert the respondent's educational attainment based on the categories in EDUCATION]** is $[BEN_DEFAULT] per month. For the rest of the survey, let's assume that you **[If SS_STATUS==2, insert** "are supposed to"**]** get a Social Security benefit of $[BEN_DEFAULT] per month.

[Ask if BEN_EST<200]
Q.1.14 [USE_DEFAULT, BEN_EST_RAW]: Tell respondent that we are using a default amount for his/her SS benefits

Thank you for providing us with your estimated Social Security benefits of $[BEN_DEFAULT] per month. Some of the questions that follow only apply for Social Security benefits of at least $200 per month. For purposes of answering the remaining questions in this survey, we would therefore like to ask you to please assume that your Social Security benefits would be $200 per month.

[Set BEN_EST_RAW=BEN_EST]
[Set BEN_EST=BEN_DEFAULT]
[Set USE_DEFAULT=1]

SECTION 2: CV-PLUS ANNUITY TRADE-OFF QUESTIONS

[NOTE: A COMPENSATING VARIATION (CV-PLUS) MEASURE IS ELICITED IN THIS SECTION. HERE RESPONDENTS ARE ASKED TO MAKE A TRADE-OFF CHOICE BETWEEN REPONDENTS' EXISITING SOCIAL SECURITY MONTHLY BENEFIT LEVEL AND THEIR EXISTING SOCIAL SECURITY MONTLY BENENIT AMOUNT MINUS A VARYING AMOUNT (SS_VARAMT) AND AN ADDITION OF A ONE-TIME PAYMENT /LUMPSUM AMOUNT (LS_AMT).]

Q.2.1. [TRADEOFF – INTRO]. Introduction to annuity tradeoff questions

In the next few questions, we are going to ask you to make a number of choices about Social Security benefits.

Please assume that all amounts shown are after tax (i.e., you don't owe any tax on any of the amounts we will show you).

Think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

[WAIT_WARNING] Wait Warning
The page after this may take several seconds to load. Please click the next button now, and do not click your browser's back button while the page is loading. Thank you.

[Notes to programmers:

There are two nested loops in this section.

1. **The outer loop has 2, 3 or 4 iterations and loops over the change in the Social Security amount: SS_VARAMT. The outerloop is indexed by the variable i.   (The number of iterations depends on the respondent's estimated Social Security benefits. For most respondents there are four iterations, but the number is lower for a few respondents with very low benefit amounts).**

2. **The inner loop has 4 or 5 iterations and loops over the amount of the one-time payment offered: LS. The inner loop is indexed by the variable j. (The number if iterations is generally 4. It is only 5 when we set SS_VARAMT=100)**

Let the variable SS_VARAMT be a vector of length N_VARAMT. Let SS_VARAMT[i] denote the i^{th} element of SS_VARAMT.

Initialization of SS_VARAMT

If BEN_EST < 300
Set N_VARAMT=2
SS_VARAMT={100, BEN_EST}
Endif

If BEN_EST ≥ 300 AND BEN_EST<600
Set N_VARAMT=3
Create the vector AMT={200, 300, 400}
Delete elements of AMT that are greater than (BEN_EST-100)
Pick at random one element of AMT, call this element AMTRND
Set SS_VARAMT={100, BEN_EST, AMTRND}
Endif

If BEN_EST ≥ 600
Set N_VARAMT=4

Create the vector AMT={200, 300, 400, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000} /* Note that the amount 500 is missing from this list on purpose */
Delete elements of AMT that are greater than (BEN_EST-100)
Pick at random one element of AMT, call this element AMTRND
Set SS_VARAMT={100, 500, BEN_EST, AMTRND}
Endif

If SMALLTOLARGE==1
Sort the elements if SS_VARAMT from smallest to largest (i.e. such that SS_VARAMT[i] < SS_VARAMT[i+1] for all i)
Else
Sort the elements if SS_VARAMT from largest to smallest (i.e. such that SS_VARAMT[i] > SS_VARAMT[i+1] for all i)
Endif

Initialization of LS_AMT
If LS_STARTVALUE ==1
Set the 16x5 matrix LS_AMT=LS_LOW
Elseif LS_STARTVALUE ==3
Set the 16x5 matrix LS_AMT=LS_HIGH
Else
Set the 16x5 matrix LS_AMT=LS_MED
Endif

Start of the nested loops that ask CV-PLUS

For i=1 to N_VARAMT /* START OF THE OUTER LOOP FOR CVPLUS */

If SS_VARAMT=100
Set N_LS=5
Else
Set N_LS=4
Endif

[Show if i>1]
Q.2.2:[CV-Plus Roadmap] Roadmap to new series of CV-plus tradeoff question.

Now we would like to show a similar series of questions about choices between two money amounts, but the amount of the Social Security benefits in one of the options is different from before.

As before, please assume that all amounts shown are after tax (i.e., you don't owe any tax on any of the amounts we will show you).

As before, please think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

Q.2.3: [CVPLUS]: CV-PLUS TRADE-OFF QUESTION
Set ROW=1
For j=1 to N_LS /* START OF THE INNER LOOP FOR CVPLUS*/

[If j = 1, Display:]
In this question, we are going to ask you to make a choice between two money amounts.
[Else, Display:]
Now we ask you the same question but with a different amount for the one-time payment.
[Endif]

Please click on the option that you would prefer.
[SHOW IF MARRIED==1:] Benefits paid to your [SPOUSE] will stay the same for either choice.

Suppose Social Security gave you a choice between:

[If LS_FIRST=0, Display:]
(1) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month.
or
[If BEN_EST ≤ SS_VARAMT, Display:]
(2) ☐ Receiving no Social Security benefits but receiving a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age [CLAIM_AGE]"**; else insert** "one year from now"**]**.
[Else Display:]
(2) ☐ Receiving a Social Security benefit of $[BEN_EST - SS_VARAMT[i]] per month <u>and</u> receiving a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age [CLAIM_AGE]"**; else insert** "one year from now"**]**.
[Endif]

[Else Display:]

[If BEN_EST ≤ SS_VARAMT, Display:]
(2) ☐ Receiving no Social Security benefits but receiving a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age [CLAIM_AGE]"**; else insert** "one year from now"**]**.
[Else Display:]
(2) ☐ Receiving a Social Security benefit of $[BEN_EST - SS_VARAMT[i]] per month <u>and</u> receiving a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age [CLAIM_AGE]"**; else insert** "one year from now"**]**.
[Endif]
or
(1) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month.

[Endif]

[If Respondent selects option 1 (so NOT the one-time payment)]
[Set ROW=ROW+2^(4-j)] /* Note: this will increase the offered one-time payment in the next iteration */
[Endif]

[If the respondent does not check either option, prompt once using the standard ALP language in situations like these (something along the lines of "Are just sure you do not want to choose between these two options."). If the respondent still does not answer, set j=5 so that we skip out of the inner loop to the next iteration of the outer loop]

j=j+1 /* END OF THE INNERLOOP FOR CV PLUS */
EndFor
i=i+1
EndFor /* END OF THE OUTERLOOP FOR CV PLUS */

SECTION 3: BACKGROUND QUESTIONS

[NOTE: THIS SECTION ASKS QUESITONS IN ORDER TO COLLECT CONTROL VARIABLES SUCH AS SUBJECTIVE HEALTH, FINANCIAL LITERACY, RISK AVERSION, ANNUITY HOLDINGS, MORTALITY EXPECTATIONS, PERCEPTION OF POLITICAL RISK, AND LIQUIDITY CONSTRAINTS.]

Q.3.1: [HEALTH] Subjective Health *[ms1_C901]*
Would you say your health is . . .?
(1) Excellent
(2) Very good
(3) Good
(4) Fair
(5) Poor

Financial Literacy

Q 3.2.1 [INT_RATE_LITERACY] Interest rate literacy *[ms5_L001]*
Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
(1) More than $102
(2) Exactly $102
(3) Less than $102
(4) Don't Know

Q 3.2.2 [INFLATION] Inflation Literacy *(ms5_L003)*
Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?

(1) More than today
(2) Exactly the same as today
(3) Less than today
(4) Don't Know

Q 3.2.3 [SAFER] Stock literacy *[ms5_P002]*
Please tell us whether this statement is true or false? Buying a **[If ORDER_STOCK=1, insert "**single company stock**"; else insert "**stock mutual fund**"]** usually provides a safer return than a **[If ORDER_STOCK=1, insert "**stock mutual fund**"; else insert "**single company stock**"]**.
(1) True
(2) False
(3) Don't know

Q 3.2.4 [FINKNOWL] Self-rated Financial Knowledge *[ms33_FINKNOWL]*
How would you rate your knowledge about financial matters?
(1) Very High
(2) High
(3) Moderate
(4) Low
(5) Very Low

Q 3.2.5 [HS_FIN_EDUC_PROGRAM] High school financial education programs *[ms5_B003]*
Did your high school offer financial education programs?
(1) Yes
(2) No

Q 3.2.6 [EMP_FIN_EDUC_PROGRAM] Employer's financial education program *[ms5_Z001]*
Did any of the employers you work for or worked for offer financial education programs (for example retirement seminars)?
(1) Yes
(2) No
(3) Don't know

Q 3.2.7 [RET_SAV_PLAN] Retirement savings plan [JV357 in HRS]
Have you developed a plan for retirement saving?
(1) Yes
(2) More or less
(3) No

[IF RET_SAV_PLAN = 1 skip to Q3.2.8, IF RET_SAV_PLAN = 2 skip to Q3.2.8, IF RET_SAV_PLAN = 3 skip to Q3.3.1]

Q 3.2.8 [RET_SAV_PLAN_1] Able to stick to retirement saving plan *[JV358 in HRS]*
How often have you stuck to this plan: would you say always, mostly, rarely, or never?
(1) Always
(2) Mostly
(3) Rarely
(4) Never

Questions on Risk Aversion and Precautionary Savings Motives

[NOTE: Options from 1 to 7 are included for the following questions where 1 indicates "completely agree" and 7 indicates "completely disagree".]

[RISKAVERSION_INTRO]: The following statements concern saving and taking risks. Please indicate for each statement to what extent you agree or disagree, on a scale from 1 to 7. Here 1 indicates you "completely agree" and 7 indicates you "completely disagree."

Q 3.3.1 [SPAAR1] Safe investments 1
I think it is more important to have safe investments and guaranteed returns, than to take a risk to have a chance to get the highest possible returns.

Q 3.3.2 [SPAAR2] Safe investments 2
I would never consider investing in the stock market because I find it too risky.

Q 3.3.3 [SPAAR3] Safe investments 3
If I think an investment will be profitable, I am prepared to borrow money to make this investment.

Q 3.3.4 [SPAAR4] Safe investments 4
I want to be certain that my investments are safe.

Q 3.3.5 [SPAAR5] Safe investments 5
I think I should take greater financial risks to improve my financial position.

Q 3.3.6 [RISKREWARD] Risk Reward
I am prepared to take the risk to lose money, when there is also a chance to gain money.

Q 3.3.7 [PRE_MOTIVES1] Precautionary motives 1
I save to have some money to cover unforeseen expenses

Q 3.3.8 [PRE_MOTIVES2] Precautionary motives 2
I save to have enough money in my bank account to be sure I will be able to meet my financial liabilities

---

Planning Horizon

Q 3.4 [FIN_PLAN] Financial planning methods *[MS16_FD004]*
In deciding how much of their income to spend or save, people are likely to think about different financial planning periods. In planning your household saving and spending, which time period is most important to you?

(1) Next few months
(2) Next year
(3) Next few years
(4) Next 5-10 years
(5) Longer than 10 years
(6) I don't plan

Annuity Holdings

Q 3.5.1 [ANNUITY_NOW] Any receipt of pension or annuity benefits now
Not including Social Security benefits, do you **[If MARRIED=1, insert "** and your [SPOUSE]**"]** currently receive any monthly pension or benefits that will continue for as long as you live?

(7) Yes
(8) No
(9) Other _____________

[IF ANNUITY_NOW = 1, skip to 3.5.2, IF ANNUITY_NOW = 2, skip to 3.5.3, IF ANNUITY_NOW = 3, skip to 3.5.3]

Q 3.5.2 [ANNUITY_NOW1] Current monthly pension or annuity benefits
If you add it all up, about how much is the total amount per month? $ ________________

Q 3.5.3 [ANNUITY_LATER] Monthly pension or annuity benefits later
Not including Social Security benefits, do you **[If MARRIED=1, insert "** and your [SPOUSE]**"]** anticipate receiving in the future any monthly pension or payments that will continue for as long as you live?

(1) Yes
(2) No
(3) Other _____________

[IF ANNUITY_LATER = 1 skip to 3.5.4, IF ANNUITY_LATER = 2 skip to 3.6.1, IF ANNUITY_LATER = 3 skip to 3.6.1]

Q 3.5.4 [ANNUITY_LATER1] Monthly pension or annuity benefits 1
Adding it all up, about how much will the total amount be per month? $ ________________

Mortality Expectations

[Note to Programmer: ASK Q3.6.1 IF AGE < 65, ELSE GO TO Q3.6.2]

Q 3.6.1 [MORT_EXP1] Mortality expectations 1 [HRS LP028]
What is the percent chance that you will live to be 75 or more? Please move the slider below to indicate what you think will be the chance that you will live to be 75 or more where 0 means "absolutely no chance" and 100 means "absolutely certain".

[Note to Programmer: Slider is inserted as shown below:]

|---|
00---10---20---30---40---50---60---70---80---90---100
Absolutely No chance — Absolutely Certain

[ASK Q3.6.2 IF AGE < 90, ELSE GO TO Q3.7]
Q 3.6.2 [MORT_EXP2] Mortality expectations 2 [HRS LP029]
[Note to Programmer:
Fill values assigned as follows
85 (IF AGE IS LESS THAN 65) /* note: this non-monotonic pattern follows the HRS version of this question */
80 (IF AGE IS 65-69)
85 (IF AGE IS 70-74)
90 (IF AGE IS 75-79)
95 (IF AGE IS 80-84)
100 (IF AGE IS 85+)]

What is the percent chance that you will live to be **[FILLVALUE]** or more? Please move the slider below to indicate what you think will be the chance that you will live to be **[FILLVALUE]** or more, where 0 means “absolutely no chance” and 100 means “absolutely certain”.

[Note to Programmer: Slider inserted as shown below:]

```
 |-----------------------------------------------------------------|
00---10---20---30---40---50---60---70---80---90---100
Absolutely                                        Absolutely
No chance                                          Certain
```

Q.3.7: [PLCTCL_TRST] Perception of political risk *[Greenwald language]*
How confident are you that the Social Security system will be able to provide you with the level of future benefits you are supposed to get under current law?

(1) Very confident
(2) Somewhat confident
(3) Not too confident
(4) Not at all confident

Expected Returns
[The following questions are displayed as a table]
Q 3.8.1 [SAV_PLAN_1] Saving Plan 1
Suppose you received an additional $10,000 this year. Thinking about your household financial situation, how do you think you would use it?

Please type how much of the $10,000 you would use for each action in the boxes below. You can put the money in as many or as few categories as you wish.

About how much of it do you think you would use to:

(1)	spend	$_____
(2)	pay off credit cards	$_____
(3)	pay off other debt	$_____
(4)	save	$_____
(5)	other	$_____

Respondents are prompted to make sure the amounts add to $10,000
[DISPLAY IF total <> 10000]
[checkSAV_PLAN_1total] check total
Your total adds up to $[]. Please go back and change the numbers in the table so they add up to $10,000 or choose next to continue.

[The following questions are displayed as a table]
Q 3.8.2 [SAV_PLAN_2] Saving Plan 2
Now assume that you cannot spend the $10,000, but have to save it for the future. How would you do that?

Please type how much of the $10,000 you would use for each action in the boxes below. You can put the money in as many or as few categories as you wish. Please do not use commas, dollar signs or decimal points.

(1) Put some in the bank $_____
(2) Invest some in bonds $_____
(3) Invest some in CDs $_____
(4) Invest some in stocks $_____
(5) Buy property/real estate $_____
(6) Other $_____

[NOTE: Respondents are prompted to make sure the amounts add to $10,000.]
[DISPLAY IF total <> 10000]
[checkSAV_PLAN_2total] check total
Your total adds up to $[] Please go back and change the numbers in the table so they add up to $10,000 or choose next to continue.]

Q 3.8.3 [SAV_PLAN_3] Saving Plan 3
Of the $10,000 that you had to save, about how much do you think you might earn on it per year, on average?
(1) Less than or equal to 0%,
(2) 1-3%,
(3) 4-6%,
(4) 7-9%
(5) 10-12%
(6) 13% or more

Liquidity Constraints

Q 3.9.1 [ComeUp5000] Come up with $5000

If you had to, could you come up with $5,000 **[If CLAIM_AGE>AGE+1, insert** "by age CLAIM_AGE"**; else insert** "within one year from now"**]**?

(1) Yes, I am certain I could
(2) I probably could
(3) I probably could not
(4) No, I definitely could not

[Ask if ComeUp5000=1 or ComeUp5000=2]
Q 3.9.2 [FromWhere5000_MC, FromWhere_Box] How would you get the $5000

How would you come up with this $5000?

Choose all that apply:

(1) I would use my current savings or investments
(2) I would save the money out of my income between now and **[If CLAIM_AGE>AGE+1, insert** "age CLAIM_AGE"**; else insert** "one year from now"**]**?
(3) I would borrow it from family or friends
(4) I would use one or more credit cards
(5) I would use a home equity loan or home mortgage
(6) I would take out a payday loan or use a pawnshop
(7) I would sell something that I own, not including my home
(8) I would work additional hours, now or in the future
(9) Other: ______________ [provide open-ended text box]

SECTION 4: CLOSING OF WAVE 1

[NOTE: THIS IS ASKED OF ALL RESPONDENTS AT THE END OF WAVE 1.]

Q 4.1.1: [CS_001] HOW PLEASANT INTERVIEW
Could you tell us how interesting or uninteresting you found the questions in this interview?

(1) Very interesting
(2) Interesting
(3) Neither interesting nor uninteresting
(4) Uninteresting
(5) Very uninteresting

Q 4.1.2: [CS_003] Comments
Do you have any other comments on the interview? Please type these in the box below.
[Insert Open box]

SECTION 5: INTRODUCTION TO WAVE 2

[NOTE: THIS SECTION ASKS THE EITHER THE CV-PLUS VERSION (VERSION B) OR THE OTHER VARIATIONS WHICH CONSISTS OF CV-MINUS, EV-PLUS AND EV-MINUS (VERSION A) DEPENDING ON THE RANDOMIZATION. IT ALSO ASKS THE "NO POLITICAL RISK VERSION" OF CV-PLUS TO ALL RESPONDENTS.]

[WAIT_WARNING] Wait Warning

The page after this may take several seconds to load. Please click the next button now, and do not click your browser's back button while the page is loading. Thank you.

Q.5.1. [WAVE2_INTRO] Introduction to wave 2
Recently, we asked you a number of questions about when and how you would like to receive your Social Security benefits.

We very much appreciate your help. Today, we would like to ask you some more questions about this.

Once again, please take time to consider the questions and give us your <u>best guess</u> even if you do not know the exact answer. Having your best guess will be very helpful to us.

Thank you very much for your participation!

[If SS_STATUS==2 and FLAGHYPO=0 (not currently receiving SS and not hypothetical benefits), show:]
Q5.2. [BENEFIT_REMINDER] Reminding the respondent about his/her benefits

We would like to remind you that in the prior survey we used $[BEN_EST] as the monthly Social Security benefits that your are supposed to get under current law if you claim benefits at age [CLAIM_AGE].

As before, we mean by "Social Security benefits" any benefits that you yourself receive or will receive from the Social Security program, including retiree, disability, spouse, or survivor benefits.

[IF SS_ELIG=3, DISPLAY:] /* So to those who said in wave 1 that they thought SS would no longer be around */

Please answer the questions in this survey assuming that current Social Security rules still apply when you first claim Social Security benefits. Thank you.

[ENDIF]

[If FLAGHYPO=1, Show]
Q.5.3: [ReminderHypoEligible] Reminder for those ineligble, but who answer questions hypothetically

Even though you told us in the prior survey that you are not eligible to receive Social Security benefits, we would like to again ask you to complete our survey assuming you would be eligible. In other words, please answer in this survey what you would have done or chosen if you would be eligible for Social Security benefits.

The typical Social Security benefit for **[If MARRIED=1, insert** "a married"**; if MARRIED=0, insert** "an unmarried"**] [If GENDER="male" insert** "man"**; if GENDER="female" insert** "woman"**]** with **[insert the respondent's educational attainment based on the categories in EDUCATION]** is $[BEN_DEFAULT] per month.

For the purpose of this survey, let's assume that you **[If SS_STATUS==2, insert** "are supposed to"**]** get a Social Security benefit of $[BEN_DEFAULT] per month, and that you **[If SS_STATUS==1, insert** "started receiving"; **If SS_STATUS==2, insert** "would start receiving"**]** Social Security benefits at age 62.

SECTION 6: CV-MINUS AND EV ANNUITY TRADE-OFF QUESTIONS

[NOTE: COMPENSATING VARIATION (CV-MINUS) AND EQUILVALENT VARIATION (EV-PLUS/EV-MINUS) MEASURES ARE ELICITED IN THIS SECTION. SPECIFICALLY, RESPONDENTS ARE ASKED TO MAKE A TRADE-OFF CHOICE BETWEEN:

1) CV-MINUS: REPONDENTS' EXISITING SOCIAL SECURITY MONTHLY BENEFIT LEVEL <u>AND</u> THEIR EXISTING SOCIAL SECURITY MONTLY BENENIT AMOUNT WITH AN INCREMENT OF A VARYING AMOUNT (SS_VARAMT) <u>MINUS</u> A ONE-TIME PAYMENT /LUMPSUM AMOUNT (LS_AMT).

2) EV-PLUS: REPONDENTS' EXISITING SOCIAL SECURITY MONTHLY BENEFIT LEVEL WITH A ONE-TIME PAYMENT/LUMPSUM AMOUNT (LS_AMT) <u>AND</u> REPONDENTS' EXISITING SOCIAL SECURITY MONTHLY BENEFIT LEVEL WITH AN INCREMENT OF A VARYING AMOUNT (SS_VARAMT)

3) EV-MINUS: REPONDENTS' EXISITING SOCIAL SECURITY MONTHLY BENEFIT LEVEL <u>MINUS</u> A ONE-TIME PAYMENT/LUMPSUM AMOUNT (LS_AMT) <u>AND</u> REPONDENTS' EXISITING SOCIAL SECURITY MONTHLY BENEFIT LEVEL WITH A DECREMENT OF A VARYING AMOUNT (SS_VARAMT).]

Q.6.1. [TRADEOFF – INTRO]. Introduction to annuity tradeoff questions

In the next few questions, we are going to ask you to make a number of choices about Social Security benefits.

Please assume that all amounts shown are after tax (i.e., you don't owe any tax on any of the amounts we will show you).

Think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

[WAIT_WARNING] Wait Warning

The page after this may take several seconds to load. Please click the next button now, and do not click your browser's back button while the page is loading. Thank you.

[Note to programmer:

There are two nested loops in this section.

1. **The outer loop has 3 iterations and loops over the version of the tradeoff question that is asked (either CV-Minus, EV-Plus, or EV-minus). The outerloop is indexed by the variable i.**

2. **The inner loop has 4 iterations and loops over the amount of the one-time payment offered: LS. The inner loop is indexed by the variable j.**

<u>Initialization of SS_VARAMT</u>
Set SS_VARAMT=100

<u>Initialization of LS_AMT</u>
If LS_STARTVALUE ==1
Set the 16x5 matrix LS_AMT=LS_LOW
Elseif LS_STARTVALUE ==3
Set the 16x5 matrix LS_AMT=LS_HIGH
Else
Set the 16x5 matrix LS_AMT=LS_MED
Endif

<u>Start of the nested loops that ask other versions of the tradeoff questions</u>

For i=1 to 3 /* START OF THE OUTER LOOP FOR OTHER TRADEOFF QUESTIONS */

[Show if i>1]
Q.6.2: [Roadmap other versions] Roadmap to other tradeoff questions.
Now we would like to show a different series of questions about choices about Social Security benefits.

As before, please assume that all amounts shown are after tax (i.e., you don't owe any tax on any of the amounts we will show you).

As before, think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

Q.6.3: [OtherTradeoff]: OTHER VERSIONS OF TRADE-OFF QUESTION

Set ROW=1

For j=1 to 4 /* START OF THE INNER LOOP FOR OTHER TRADEOFF QUESTIONS */

[If j = 1, Display:]
In this question, we are going to ask you to make a choice between two money amounts.
[Else, Display:]
Now we ask you the same question but with a different amount for the one-time payment.
[Endif]

Please click on the option that you would prefer.

[SHOW IF MARRIED==1:] Benefits paid to your [SPOUSE] will stay the same for either choice.

Suppose Social Security gave you a choice between:

[If CVM_ORDER==i]   /* THIS GIVES THE CV-MINUS VERSION */

[Note to programmer: The way the ROW variable is updated depends on how each option is numbered]

[If LS_FIRST=0, Display:]

(2) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month.
or
(1) ☐ Receiving a Social Security benefit of $[BEN_EST + SS_VARAMT] per month <u>and</u> making a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to Social Security.

[Else Display:]

(1) ☐ Receiving a Social Security benefit of $[BEN_EST + SS_VARAMT] per month <u>and</u> making a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to Social Security.
or
(2) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month.

[Endif]
[Endif]   /* End of CV-Minus version */

[If EVP_ORDER==i]   /* THIS GIVES THE EV-PLUS VERSION */

[Note to programmer: The way the ROW variable is updated depends on how each option is numbered]

[If LS_FIRST=0, Display:]

(1) ☐ Receiving a Social Security benefit of $[BEN_EST + SS_VARAMT] per month.
or
(2) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month <u>and</u> receiving a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**.

[Else Display:]

(2) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month <u>and</u> receiving a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**.
or
(1) ☐ Receiving a Social Security benefit of $[BEN_EST + SS_VARAMT] per month.

[Endif]
[Endif]   /* End of EV-Plus Version */

[If EVM_ORDER==i]   /* THIS GIVES THE EV-MINUS VERSION */

[Note to programmers: The way the ROW variable is updated depends on how each option is numbered]

[If LS_FIRST=0, Display:]

[If BEN_EST ≤ SS_VARAMT, Display:]
(2) ◻ Receiving no Social Security benefits.
[Else Display:]
(2) ◻ Receiving a Social Security benefit of $[BEN_EST - SS_VARAMT] per month.
[Endif]
or
(1) ◻ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month <u>and</u> making a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to Social Security.

[Else Display:]

(1) ◻ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month <u>and</u> making a <u>one-time</u> payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to Social Security.
or
[If BEN_EST ≤ SS_VARAMT, Display:]
(2) ◻ Receiving no Social Security benefits.
[Else Display:]
(2) ◻ Receiving a Social Security benefit of $[BEN_EST - SS_VARAMT] per month.
[Endif]

[Endif]
[Endif] /* End of EV-Minus version */

[If Respondent selects option 1] /*so making the one-time payment (for CV-minus and EV-minus) or NOT receiving the one-time payment (for EV-plus) */
[Set ROW=ROW+2^(4-j)] /* Note: this will increase the size of one-time payment in the next iteration, so it makes option 1 less attractive */
[Endif]

[If the respondent does not check either option, prompt once using the standard ALP language in situations like these (something along the lines of "Are you sure you do not want to choose between these two options."). If the respondent still does not answer, set j=5 so that we skip out of the inner loop to the next iteration of the outer loop]

j=j+1 /* END OF THE INNERLOOP FOR OTHER TRADEOFF QUESTIONS */
EndFor
i=i+1
EndFor /* END OF THE OUTERLOOP FOR OTHER TRADEOFF QUESTIONS */

SECTION 7: NO-POLITICAL-RISK TRADE-OFF QUESTION

[NOTE: THIS SECTION REPLICATES ONE OF THE COMPENSATION VARIATION MEASURES (CV-PLUS) BUT ASSUMING THAT THERE IS NO POLITICAL RISK. IT IS ASKED OF ALL RESPONDENTS AT THE END OF WAVE 2.]

Q.7.1. [NOPOLRISK – INTRO]. Introduction to annuity tradeoff question without political risk

The next few questions are similar to the questions we have asked before about choices about Social Security benefits but with one difference:
 From now on, please assume that you are absolutely certain to receive all income promised as future Social Security benefits or as a future one-time payment. In other words, please assume that it is absolutely certain that Social Security will make payments as promised, and that there is no chance at all of any benefit changes in the future other than the trade-offs discussed in the question below.

As before, please assume that all amounts shown are after tax (i.e., you don't owe any tax on any of the amounts we will show you).

As before, think of any dollar amount mentioned in this survey in terms of what a dollar buys you today (because Social Security will adjust future dollar amounts for inflation).

[NOTE TO PROGRAMMER:
Initialization of SS_VARAMT

Set SS_VARAMT=100

Initialization of LS_AMT
If LS_STARTVALUE ==1
Set the 16x5 matrix LS_AMT=LS_LOW
Elseif LS_STARTVALUE ==3
Set the 16x5 matrix LS_AMT=LS_HIGH
Else
Set the 16x5 matrix LS_AMT=LS_MED
Endif]

Q.7.2: [NOPOLRISK]: NO-POLITICAL-RISK VERSION OF CV-PLUS TRADE-OFF QUESTION
Set ROW=1
For j=1 to 4 /* START OF THE NOPOLRISK LOOP */
[If j = 1, Display:]
In this question, we are going to ask you to compare and make a choice between two money amounts.
[Else, Display:]
Now we ask you the same question but with a different amount for the one-time payment.
[Endif]

Reminder: <b> Please assume that you are absolutely certain to receive all income promised as future Social Security benefits or as a future one-time payment. In other words, please assume that it is absolutely certain that Social Security will make payments as promised, and that there is no chance at all of any benefit changes in the future other than the trade-offs discussed in the question below. **<end b>**

Please click on the option that you would prefer.
[SHOW IF MARRIED==1:] Benefits paid to your [SPOUSE] will stay the same for either choice.

Suppose Social Security gave you a choice between:

[If LS_FIRST=0, Display:]

(1) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month.

or

[If BEN_EST ≤ SS_VARAMT, Display:]

(2) ☐ Receiving no Social Security benefits but receiving a one-time payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**.

[Else Display:]

(2) ☐ Receiving a Social Security benefit of $[BEN_EST - SS_VARAMT] per month and receiving a one-time payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**.

[Endif]

[Else Display:]

[If BEN_EST ≤ SS_VARAMT, Display:]

(2) ☐ Receiving no Social Security benefits but receiving a one-time payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**.

[Else Display:]

(2) ☐ Receiving a Social Security benefit of $[BEN_EST - SS_VARAMT] per month and receiving a one-time payment of $[LS_AMT[ROW,j]] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**.

[Endif]

or

(1) ☐ Receiving your **[If SS_STATUS==1, insert** "current"**; if SS_STATUS==2, insert** "expected"**]** Social Security benefit of $[BEN_EST] per month.

[Endif]

[If Respondent selects option 1 (so NOT the one-time payment)]

[Set ROW=ROW+2^(4-j)] /* Note: this will increase the offered one-time payment in the next iteration */

[Endif]

[If the respondent does not check either option, prompt once using the standard ALP language in situations like these (something along the lines of "Are just sure you do not want to choose between these two options."). If the respondent still does not answer, set j=5 so that we skip out of the inner loop to the next iteration of the outer loop]

j=j+1 /* END OF THE NOPOLRISK LOOP */

EndFor

Liquidity Constraints

[ASK Q 7.3.1 – Q 7.3.4 IF lowest value of lumpsum amount in CV MINUS respondent was unwilling to pay <100000]
Q 7.3.1 [CanPayLS] Could respondent pay the lumpsum in CV-Minus
[Generate a variable CVM_MIN that is equal to the lowest value of the lumpsum amount in the CV-MINUS question that the respondent was unwilling to pay. So, CVM_MIN is the minimum of the sequence of [LS_AMT[ROW,j]] displayed in CVMINUS restricted to those j where the respondent chose option (2).]

Previously, you told us you would rather receive your [**If SS_STATUS==1, insert** "current"; **if SS_STATUS==2, insert** "expected"] Social Security benefit of **$[**BEN_EST] per month than make a one-time payment of **$[**CVM_MIN] **[If CLAIM_AGE>AGE+1, insert "**at age CLAIM_AGE**"; else insert "**one year from now**"]** to receive a Social Security benefit of $**[**BEN_EST + SS_VARAMT] per month.

Please indicate your reason for this choice:

(1) I cannot come up with $[CVM_MIN] [If CLAIM_AGE>AGE+1, insert "by age CLAIM_AGE"; else insert "within one year from now"].
(2) I could come up with $[CVM_MIN] but I do not want to use the money this way.

[ASK IF Could respondent pay the lumpsum in CV-Minus = I cannot come up with $^FLCVM_MIN ^FLCanPayLS3]
[Ask if CanPayLS=1 :]
Q 7.3.2 [PayIfHadMoney] Would R pay the LS if R had the money?

Suppose you had an additional $[CVM_MIN] in savings **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]**, do you think you would make a <u>one-time</u> payment of $[CVM_MIN] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to receive a Social Security benefit of $[BEN_EST + SS_VARAMT] per month (instead of receiving your **[If SS_STATUS==1, insert "**current**"; if SS_STATUS==2, insert "**expected**"]** Social Security benefit of $[BEN_EST] per month)?

(1) Yes
(2) No

[ASK IF Would R pay the LS if R had the money = No]
[Ask if PayIfHadMoney =2 :]
[The following questions are displayed as a table]

Q.7.3.3: [WhyNotHypo] Why not pay LS even if R had the money

Why do you choose not to make a <u>one-time</u> payment of $[CVM_MIN] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to receive a Social Security benefit of $[BEN_EST + SS_VARAMT] per month even if you had at least $[CVM_MIN] in savings?

Why do you choose not to make a <u>one-time</u> payment of $[CVM_MIN] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to receive a Social Security benefit of $[BEN_EST + SS_VARAMT] per month even if you had an additional $[CVM_MIN] in savings?

Please choose the main reason:

(1) I don't expect to live long enough for this to be a good deal
(2) I believe I can invest the money better on my own
(3) I would prefer to spend more money now rather than having more to spend later
(4) I would prefer to use the money to help pay for an upcoming large expense
(5) I would prefer to save the money for an emergency
(6) I would prefer to leave the money to my family
(7) I don't trust that the government will make good on the deal
(8) Other:_______________ [provide open-ended text box]

Else

[The following questions are displayed as a table]
[Ask if CanPayLS=2 :]
Q 7.3.4 [WhyNotActual] Why not pay LS even if R had the money

Why do you choose not to make a <u>one-time</u> payment of $[CVM_MIN] [If CLAIM_AGE>AGE+1, insert "at age CLAIM_AGE"; else insert "one year from now"] to receive a Social Security benefit of $[BEN_EST + SS_VARAMT] per month even though you can come up with $[CVM_MIN]?

Why do you choose not to make a <u>one-time</u> payment of $[CVM_MIN] **[If CLAIM_AGE>AGE+1, insert** "at age CLAIM_AGE"**; else insert** "one year from now"**]** to receive a Social Security benefit of $[BEN_EST + SS_VARAMT] per month even though you can come up with $[CVM_MIN]?

Please choose the main reason:

(1) I don't expect to live long enough for this to be a good deal
(2) I believe I can invest the money better on my own
(3) I would prefer to spend more money now rather than having more to spend later
(4) I would prefer to use the money to help pay for an upcoming large expense
(5) I would prefer to save the money for an emergency
(6) I would prefer to leave the money to my family
(7) I don't trust that the government will make good on the deal
(8) Other:_______________ [provide open-ended text box]

[ASK IF CALCULATED AGE < 65]
Q.7.4.1: [P028] Die Before 75

What is the percent chance that you will die before age 75? Please move the slider below to indicate what you think will be the chance that you will die before age 75, where 0 means "absolutely no chance" and 100 means "absolutely certain".

[ASK IF CALCULATED AGE < 90]
Q.7.4.2: [P029] Die Before [85, 90, 95, 100]

What is the percent chance that you will die before age [85/90/95/100]? Please move the slider below to indicate what you think will be the chance that you will die before age [85/90/95/100], where 0 means "absolutely no chance" and 100 means "absolutely certain".

SECTION 8. CLOSING OF WAVE 2

[NOTE: THIS IS ASKED OF ALL RESPONDENTS AT THE END OF WAVE 2.]

Q 8.1: [CS_001] HOW PLEASANT INTERVIEW
Could you tell us how interesting or uninteresting you found the questions in this interview?

(1) Very interesting
(2) Interesting
(3) Neither interesting nor uninteresting
(4) Uninteresting
(5) Very uninteresting

Q 8.2: [CS_003] Comments
Do you have any other comments on the interview? Please type these in the box below.
[Insert Open box]
