

The Illusion of Wealth and its Reversal

Daniel G. Goldstein¹, Hal E. Hershfield², Shlomo Benartzi³

¹Microsoft Research

²New York University

³University of California, Los Angeles

ABSTRACT:

Research on choice architecture is now shaping policy around the world, touching on areas ranging from retirement economics to environmental issues. Recently, researchers and policy makers have started to pay more attention not just to choice architecture but also to information architecture: the format in which information is presented to people. Here, we investigate information architecture as it applies to economic consumption in retirement. Specifically, in three experiments, we examine how people react to lump sums versus equivalent streams of monthly income. Our primary question of interest is whether people exhibit an “illusion of wealth” by which a lump sum at retirement age (e.g., \$100,000) seems larger than its monthly equivalent (e.g., \$500 per month for life). We predict and test whether people exhibit the illusion of wealth as well as the opposite effect, by which lump sums seem smaller than their monthly equivalents. We conclude by discussing how format-dependent perceptions of wealth might drive retirees to claim social security benefits too early, avoid purchasing an annuity, or to cash out their defined benefit pensions.

Key words: judgment and decision making, annuities, prospect theory, illusion of wealth

1. Introduction

Research on choice architecture is now shaping policy around the world (Thaler & Sunstein 2008; Goldstein et al. 2008) touching on areas ranging from retirement economics (Benartzi & Thaler 2013), organ donation (Johnson & Goldstein 2003; Boseley 2013), end-of-life care (Halpern, Ubel, Asch 2007; Halpern et al. 2013), to environmental issues (Pichert & Katsikopoulos 2008). Recently, researchers and

policy makers have started to pay more attention not just to choice architecture but also to information architecture: the format in which information is presented to people (Johnson et al. 2012). Research in information architecture has shown, for example, that the caloric content of food can be well appreciated in terms of the amount of exercise it would take to work calories off (Bleich & Rutkow 2013; Dorway et al. 2013), and the comprehension of cars' energy efficiency can be enhanced by presenting information in terms of gallons per 100 miles instead of miles per gallon (Larrick & Soll 2008). This paper investigates information architecture, though instead of consuming calories or gasoline, we address economic consumption in retirement.

A timely policy debate concerns the information provided to the owners of approximately 80 million 401k retirement accounts. We focus on the Department of Labor (DOL) proposal that 401k statements display the money's worth of the account in terms of the projected lifetime *income* that the account can buy (Lifetime Income Disclosure Act 2011).

From a research perspective, our motivation is to investigate how people react to lump sums versus equivalent streams of monthly income. One question of interest is whether people exhibit an "illusion of wealth" by which a lump sum at retirement age (e.g., \$100,000) seems larger than its monthly equivalent (e.g., \$500 per month for life). We predict and test whether people exhibit the illusion of wealth as well as the opposite effect, by which lump sums seem smaller than their monthly equivalents. Observing the illusion of wealth and its reversal are not crucial for validating the hypothesis we shall present, they are simply side effects of the underlying cognitive process and will exist only in the right market conditions. Nonetheless, the illusion of wealth is of practical interest, as it should apply to the situation faced by many people saving for retirement.

From a policy perspective, our motivation is to inform policy makers about how different information architectures affect investor behavior. Does one form of disclosure result in an illusion of wealth for many people? And, does such an illusion of wealth result in people planning to save less?

The paper is organized as follows: We first propose a simple psychophysical account of how people make format-dependent judgments of adequacy of wealth in retirement, and present three

empirical studies which lend support to the predictions. We conclude the paper by discussing how format-dependent perceptions of wealth might drive retirees to claim social security benefits too early, avoid purchasing an annuity, or to cash-out their defined benefit pensions.

2. A psychophysical view of retirement income perceptions

It is common in behavioral-economic models that perceptions of monetary amounts are discounted by taking logs or powers, such as through the Weber-Fechner law (Fechner 1860) or Stevens' (1975) law from psychophysics. For example, in a host of models of intertemporal choice (see Doyle 2013) and risky choice (e.g., Prospect Theory, Kahneman & Tversky 1979), valuations of gains are convex functions of their monetary amounts. In this way, people are assumed to perceive changes in amounts of money much as they perceive changes in brightness, loudness, weight and other sensory stimuli. Some authors (e.g., Dehaene 2003) extend this assumption of log or power perception to the mental number line in general. Following in this tradition, if W is an amount of wealth, V is its perceived value, and c and k are free parameters, we assume $V = c + k \log(W)$, in the Weber-Fechner spirit. We make use of the log relationship for simplicity but a host of other functional forms (e.g., Steven's law) would serve our purposes just as well. The parameter k in the log model reflects sensitivity to changes in log wealth and might vary from domain to domain. In domains in which k is low, people are less sensitive to changes in log wealth compared to domains in which k is higher.

We next observe that a given amount of wealth at retirement age can be thought of as a lump sum (e.g., \$100,000) or an equivalent annuity payment (e.g., \$500 per month for life). We hypothesize the format of monetary information, monthly payment or lump sum, should matter for judgments of adequacy for retirement. Specifically, people should be more sensitive (higher k) to changes in wealth expressed as monthly amounts because many everyday financial obligations (e.g., rent, loan repayments, car payments, phone, cable, and utility bills) are expressed in monthly amounts and entertaining changes in monthly income would entail giving up or adding identifiable expenditures. Income levels near current

consumption may serve as a baseline, consistent with the notion of reference dependence in behavioral economics, such as in the gain-loss distinction in Prospect Theory (Kahneman & Tversky 1979). For instance, a person might easily judge \$500 per month to be too little to live on in retirement if their current rent alone is \$1,000. Similarly, they might judge \$5,000 per month to be more than adequate as it would enable them to upgrade their apartment while keeping other expenses constant. If asked, they could confidently rate \$500 as insufficient and \$5,000 as quite satisfactory, and one would expect to see elevated sensitivity to changes in wealth over this critical region from \$500 to \$5,000 per month. In a simple model such as $V = c + k \log(W)$, k would be predicted to be relatively high in the monthly payment format, reflecting greater sensitivity to changes in wealth, compared to the lump sum format, which we consider next.

It is not straightforward to interpret a lump sum like \$100,000 in terms of adequacy for retirement. A person might hope to translate the lump sum into a monthly income amount and compare it to current expenditures, but doing so would require an annuity calculator. Unable to convert lump sums to monthly amounts, people should be unaware of the baseline lump sum that would enable them to maintain their present level of monthly spending. Without a reference point, people should necessarily be less reference dependent. That is, without the ability to understand what various lump sums mean in terms of giving up or adding identifiable expenditures, people are predicted to be less sensitive to changes in wealth in the critical region of \$100,000 to \$1,000,000 (i.e., the \$500 to \$5,000 per month presented above). In the above log model, k is predicted to be lower than in the monthly income format, reflecting lower sensitivity.

This simple prediction is expressed in Figure 1. More wealth is more satisfactory regardless of how it is expressed; however, people are more sensitive to changes in wealth when it is expressed in monthly terms. This greater sensitivity is reflected in a steeper function of log wealth (higher k) relative to the flatter response (lower k) for the lump sum. In a critical region near a reference point on the horizontal axis, such as near current or anticipated consumption, the greater sensitivity in response for monthly amounts can create the unusual situation in which monthly amounts are perceived as less attractive than

lump sums at low levels of wealth, while they are at the same time seen as more attractive at high levels of wealth. Our primary prediction concerns the sensitivity (change in satisfaction) at intermediate wealth levels for lump sums as compared to monthly amounts. The positioning of the curves relative to each other (including any crossing over to create an illusion of wealth) is of secondary interest as it depends on the current price of annuities. Nonetheless, such crossing over could exist in realistic settings, as we shall show, and could be consistent with observed patterns of saving for retirement.

Figure 1 depicts S-shaped response curves because in the experiments that follow we make use of Likert scales that impose a floor and ceiling on possible responses. People may always have greater utility for greater amounts of money (as implied by power or log models), but the Likert scale encourages people to assign all amounts beyond a certain threshold to the highest response category. While we find that logistic-response and concave-convex models like Prospect Theory do fit the sigmoid nature of our data well, in what follows we make use of the log model for simplicity and ease of interpretation.

Our prediction of greater sensitivity for monthly presentation formats is consistent with a recent empirical result by Goda, Manchester, and Sojourner (2013), who presented 17,000 employees with projected effects of increasing savings rates, expressed either in terms of monthly income or total accumulation at retirement. They found that people presented with projected monthly incomes increased saving rates more than those who saw projected total accumulations. If people are more sensitive to changes in monthly presentation formats, it would follow that the benefits of increased saving would seem greater when expressed in monthly amounts as opposed to lump sums, to which people should be relatively insensitive.

Our prediction that people should be more sensitive to easy-to-imagine monthly amounts draws upon psychological research on the role of *elaboration* in thinking about the future. Theorizing on excessive discounting in intertemporal choice settings has posited that it is effortful to arrive at vivid depictions of the future. Hershfield et al. (2011) list a number of reasons why it is difficult to imagine the future self, including that a self-generated representation of the future may be vague, incomplete, and untrustworthy. In Query Theory (Weber et al. 2007), it is assumed that imagining uses of money or goods

in the future is effortful and goes against a natural inclination to think about uses of money or goods in the present. Via “think aloud” protocols, for instance, studies find that people naturally consider present uses before future ones, but that causing them to invest the effort of thinking about the future reduces future discounting. Research by Nenkov, Inman and Hurland (2008) finds that having people engage in the effortful act of mentally elaborating upon future outcomes leads to more future-oriented choices in financial and other domains. In addition to having people elaborate on future outcomes themselves, researchers have used technology to do some of the elaboration for people. Work on information acceleration (Urban, et al. 1997) finds that people’s preferences for new products are better predicted when they are provided simulations of how life would be like with the new product. And Hershfield et al. (2011) used computer simulations to assist people’s thinking about the future by showing them how they might appear in the future.

In this paper, we follow a similar path, offloading the difficult task of interpreting lump sums to the information architect, and arriving at a representation of the future (monthly payments) that is much easier to visualize. We predict the vivid depictions will lead to stronger opinions about what is satisfactory (increased sensitivity) and will align present consumption with future needs: those who can visualize a detailed future in which their needs are not met should be incented to save more than those who see a future in which they have more than enough.

3. Overview of Experiments

In the following experiments, we investigated whether different presentation modes would affect 1) perceived adequacy with retirement income and 2) intentions to change saving behavior. In particular, we compare perceived adequacy and intentions to save under the current practice of disclosing account balances to the proposed Lifetime Income Disclosure Act where balances will be translated into an equivalent monthly stream of income. Importantly, we examine the impact of presentation mode at a variety of income levels to determine whether the illusion of wealth holds regardless of monetary amount,

or whether it reverses at higher levels. Our research question could have significant policy implications, given that approximately 80 million 401(k) account statements are sent every quarter.

3.1 Study 1: Within-Participant Perceptions of Adequacy

As an initial examination into format-dependent perceptions of wealth, we asked a sample of adults how adequate they thought a series of increasing monetary amounts would be for retirement. Crucially, one group of participants saw monetary amounts expressed as a lump sum, and the other half saw these same monetary amounts expressed as monthly annuities that they could receive in retirement.

3.1.1. Method

A sample of 310 adults was recruited via Mechanical Turk ($Mage = 28.37$, $SD = 10.21$, Range 18-68, 40.3% women). Participants were paid \$.20 for completing the survey. We used a 2(Presentation: lump sum, annuity) x 7(Amount: \$25,000, \$50,000, \$100,000, \$200,000, \$400,000, \$800,000, \$1,600,000) mixed design, with presentation as the between-subjects factor and amount as a within-subjects factor. All participants were asked to imagine that for each listed amount of money, they had that amount – and only that amount – of money to spend during retirement. They were also asked to assume that they did not own a house, and did not have any money or assets to spend beyond what was listed. Participants were then shown a table with seven monetary amounts (as noted above), and asked to rate how adequate each amount would be on a seven-point scale (anchored at “totally inadequate” and “totally adequate”).

In the lump sum condition, participants were asked to imagine that they would have a total of \$25k/ \$50k/100k/\$200k/\$400k/\$800k/\$1.6m. In the annuity condition, however, participants were asked to imagine that they would have \$160/\$319/\$639/\$1,277/\$2,554/\$5,108/\$10,217 per month in retirement. To calculate annuity amounts, we used an online annuity calculator, which solves for monthly periodic payment with a given premium amount (e.g., \$25,000, \$50,000, etc.) and an interest rate of 3%. Payments are assumed to be made until the death of the annuitant. For uniformity, we fixed the age of the person receiving the annuity quote in all cases to be 68. From the 310 respondents, we eliminate 32 participants who provided ratings that were not monotonically increasing (e.g., rating \$25,000 as more adequate than \$50,000), leaving the sample of 278 we analyze.

3.1.2 Study 1 Results

Figure 2 depicts the means and standard errors at all 7 wealth levels and 2 presentation formats. In line with predictions, the response curve is flatter for lump sums and more responsive for annuities. At the lower wealth levels, there is a pronounced “illusion of wealth” with annuities associated with lower satisfaction. Also as predicted, this effect reverses at higher wealth levels, where annuities are perceived as more satisfactory. The steeper slope associated with annuities is apparent in a simple regression in which there is a positive interaction between wealth level and presentation format, as shown in Models 2 and 3 in Table 1. A further ANOVA model comparison shows that the Model 2 (and necessarily Model 3) fits significantly better than Model 1, which lacks a presentation format dummy ($p < 10^{-6}$); Model 2 also fits better than a model that does not interact presentation format and lump sum equivalent ($p < 10^{-6}$).

3.2. Study 2: Between-Participant Perceptions of Adequacy

In Study 2, we sought to replicate the findings of Study 1, but with four changes. First, the within-subjects nature of Study 1 could have caused participants to falsely report different levels of adequacy among monetary amounts. That is, having to make explicit comparisons among monetary amounts may have inflated any perceived differences in adequacy. Accordingly, Study 2 was conducted as a between-subjects experiment. Second, in Study 2 we sought to recruit participants who were close to retirement age, and for whom such decisions were meaningful. Third, rather than excluding participants based on their responses, we instead employed an instructional manipulation check to more objectively measure attention. Fourth, we used a simple but accurate rule for converting between lump sum and annuity amounts that presents both as round numbers (multiple of at least \$500) to remove the confound between presentation format and roundness of numerical figures, which could be problematic because round numbers have been shown to appeal to investors (Bhattacharya, Holden & Jacobsen 2012).

3.2.1. Method

A sample of 960 middle-aged respondents was recruited via a national survey panel ($M_{\text{age}} = 53.70$, $SD = 5.28$, Range 45-64, 52% women). Participants were paid \$5 for completing the study online. To be

eligible for participation, participants needed to have an annual household income between \$40,000 and \$150,000.

All participants first responded to demographic questions: gender, age, amount of household income (16 categories: “\$0-\$9,999”, ..., “More than \$160,000”). To minimize the effects of careless responding, an attention filter (Oppenheimer, Meyvis, & Davidenko 2009) was administered next. If participants were outside of the specified income or age range, or failed the attention filter, they were not permitted to continue with the survey (and were paid \$.10 for their time). The 960 participants we analyze are those who were in the specified age ranges and passed the attention filter.

Participants were then randomly assigned to one of eight conditions. We used a 2(Presentation: lump sum, annuity) x 4(Amount: \$100,000, \$200,000, \$1,000,000, \$2,000,000) between-subjects factorial design. In all conditions, participants were asked to imagine that they had saved enough money over time to have a specified amount to spend in retirement. Namely, in the four lump sum conditions, participants were asked to imagine that they would have “a total of \$100k/\$200k/\$1m/\$2m – and only this amount – to spend in retirement.” In the four annuity conditions, however, participants were asked to imagine that they would have “\$500/\$1k/\$5k/\$10k – and only this amount – to spend each month during your retirement.” As mentioned, we calculated annuity amounts using a simpler formula than we did in Study 1. We divided each lump sum payment by 200, a well-fitting approximation ($R^2 = .99$) based on quotes we collected from 5 online annuity calculators, including one from the U.S. Government’s Thrift Savings Plan. To allay concerns that quoted annuity rates may reflect considerable fees on the part of providers, we found that quotes from various providers were highly similar to each other and to the government’s quotes. For example, the average commercial quote for a 2 million dollar annuity was within 1 percent of the government calculator’s quote.

After reading the description of how much money they would hypothetically have in retirement, all participants were asked to indicate how adequate they thought this amount was using a seven-point scale that ranged from “totally inadequate” to “totally adequate”.

3.2.2. Study 2 Results

Figure 3 depicts the means and standard errors at all 4 wealth levels and 2 presentation formats. The results are consistent with those of the within-participant analysis. In particular, as predicted, annuities are more sensitive than lump sums as the underlying value changes. As before, there is an “illusion of wealth” at low wealth levels: annuities seem less satisfactory than equivalent lump sums. And as before, the illusion reverses at higher wealth levels where lump sums are perceived as less satisfactory. The higher sensitivity to annuities can be seen in a regression analysis. Models 5 and 6 in Table 2 show that there is a strong interaction between wealth level and presentation format. The only notable difference between the between- and within- participant studies is the crossover point, which occurs at around \$200,000 in Study 1 (Figure 2) but somewhat higher in Study 2 (Figure 3). This may be due to participants in the within-participants study attempting to distribute Likert-scale responses across the possible range (Parducci & Perrett 1971). For example, \$200,000 is the middle value presented to participants in the within-participant study, where it received a middling response of about 3.8, however participants in the between-participants study rated it lower. The exact location of the crossover point will depend on market rates for annuities and as we see here, response format. We note that our prediction concerns differences in sensitivity to annuities as compared to lump sums, not if and where a crossover occurs. As it turns out, crossovers do seem to occur for the market rates and presentation formats we test, making the illusion of wealth and its reversal relevant policy concerns.

We conducted a further ANOVA model comparison and found that Model 5 (and necessarily Model 6) fits significantly better than Model 4, which lacks a presentation format dummy ($p < 10^{-6}$) or a model that does not interact presentation format and lump sum equivalent ($p < 10^{-6}$).

3.3. Study 3: Saving Intentions

Having demonstrated that presentation format affects perceptions of adequacy, we next examined whether potential monetary amounts expressed as lump sums or annuities would also influence saving intentions.

3.3.1. Method

A sample of 960 middle-aged respondents was recruited via a national survey panel ($M_{\text{age}} = 54.21$, $SD = 5.79$, Range 45-65, 17% women). Participants were paid \$5 for completing the study online. As a pre-

requisite, participants could not have taken part in Study 1. Further, as in Study 1, to be eligible for participation, participants needed to have an annual household income between \$40,000 and \$150,000, pass an attention filter, and be between 45 and 65 years old. Due to server error, one participant was prematurely exited from the survey, leaving a total sample of 959 participants.

After responding to demographic questions (age, household income) and the attention filter, participants were randomly assigned to one of eight conditions. As in Study 1, we used a 2(Presentation: lump sum, annuity) x 4(Amount: \$100,000, \$200,000, \$1,000,000, \$2,000,000) between-subjects factorial design. In the lump sum conditions, participants were asked to “Suppose that at your current savings rate you would have saved \$100k / \$200k / \$1m / \$2m for retirement in your 401(k) plan by age 65.” The question was identical in the annuity conditions, except that participants were asked to imagine they had saved enough to pay them “\$500 / \$1k / \$5k / \$10k per month for as long as you live.” All participants were asked if they would want to increase their savings rate, keep it the same, or decrease it on a five-point scale (“decrease it a lot,” “decrease it a bit,” “keep it the same,” “increase it a bit,” or “increase it a lot”).

3.3.2. Study 3 Results

Figure 4 shows savings intentions as they relate to amounts of wealth expressed as either a lump sum or as an annuity. Here, higher values indicate greater intentions to increase savings. As would be expected from the results on perceived adequacy, peoples’ saving intentions are more sensitive to wealth expressed as monthly amounts (the steeper negative slope in the annuities curve) relative to lump sums. When presenting information in the annuity format, intentions to save are greater at low wealth levels and lower at high wealth levels. That is, we see an effect corresponding to the illusion of wealth and its reversal with savings intentions. Mean saving intentions values run from just above 3 to just below 4.5. Because the third response category corresponded to keeping savings levels the same, we see that, on average, people in all conditions intended to increase savings somewhat, consistent with the notion that many people feel they are saving too little for retirement.

When modeling the intention to save, Models 8 and 9 in Table 3 show a significant interaction between the presentation format and the lump sum equivalent. A model comparison ANOVA finds that Model 8 (and necessarily Model 9) fits better than Model 7 ($p = .02$), which lacks a presentation format term. Model 8 also fits better than a model that does not interact presentation format and lump sum equivalent ($p = .02$).

4. Conclusion

These results support the possibility of an illusion of wealth and its reversal at higher monetary amounts. For smaller amounts of money, we found that middle-aged adults 1) felt that a lump sum would be more adequate for retirement than an equivalent monthly annuity and 2) were less likely to want to increase their saving behavior when exposed to a lump sum rather than an annuitized amount. We predicted and found a reversal of this pattern for larger amounts of money, consistent with the view that people are more sensitive to amounts expressed as annuities, and less sensitive to lump sums, which they tend to assign intermediate ratings.

Additional research is needed to explore the effect of these findings not just on saving intentions, but also on key decisions around the point of retirement, such as whether or not to cash out one's defined benefit pension. We speculate that some retirees at lower wealth levels opt to forego annuities in exchange for lump sums because the lump sum appears larger than the monthly pension payments. Clearly more research is needed in this area given that: i) people are living longer than they have before, ii) many defined benefit pensions now offer benefits as a large lump sum, and iii) the fact that about 50 percent of retirees do cash out their pensions (Benartzi et al. 2011).

The results on the perceived adequacy of lump sums versus equivalent monthly stream of income streams might contribute to our understanding on the so-called "annuity puzzle" (Yaari 1965; Benartzi, Previtro & Thaler 2011). If people perceive small lump sums as much bigger than they are, then exchanging them for what seems to be very-small monthly payments would be unappealing. Some

stylized facts are consistent with the reversal of the illusion of wealth affecting annuity purchase decisions. For example, we predict that annuities become more attractive the larger the amount at stake. An analysis of archival data from defined benefit plans shows that retirees are less likely to cash out their benefits as a lump sum payment, if their total benefits are rather large (Previtero, forthcoming). An increase in the benefit amount of \$100,000 increases the likelihood of annuitization by 3.3 percentage points. Of course, more research is needed to determine whether those cashing out their pensions as a lump sum are making a mistake in cashing out their pensions and to what extent such a potential mistake is driven by the illusion of wealth or other factors. This is an important and timely question, given many firms are offering retirees the choice to cash out their defined benefit pensions as a lump sum.

Lastly, and of social importance, the illusion of wealth might also contribute to the tendency of Americans to claim their social security benefits early on with over 40-50% claiming at 62, the earliest possible age (Social Security Administration 2012, Table 6.B5). Given the very attractive economics of claiming later (Sass 2012), one wonders if the elderly are making a mistake in claiming too early. Until not too long ago, the social security administration had a tool that attempted to help older Americans decide when to claim their social security benefits by displaying the amount forfeited by not claiming at 62 and waiting a year to age 63 (say \$21,492) versus the monthly increase for those waiting till 63 (say \$119 per month). Applying the illusion of wealth, the lump sum loss of \$21,492 is perceived much larger than the monthly increase in lifetime payments of \$119. Again, further research is needed to better understand the role of the illusion of wealth in annuitization decisions and social security claiming decisions.

In sum, this is a work on information architecture. Information about wealth in retirement can be presented in two forms, lump sums or equivalent monthly annuities. Going beyond the basic annuity puzzle, we find that the relative attractiveness of annuities and lump sums depends on underlying wealth levels in a way that is consistent with how people perceive numbers of small and large magnitudes. Information architects may wish to consider this perceptual regularity when presenting information to those saving for retirement. Can one way of representing the information be said to be superior to the other? While this will always be open to debate, we do speculate that perceptions of the annuity framing

are more likely to lead to satisfactory choices as it is easier to estimate a month's expenses than those for all of retirement. In terms of helping people to reason better about spending in retirement, it may be helpful to provide people with projected monthly income at retirement based on their current saving behavior instead of the current practice of providing just account balances. We recommend that projected monthly income be presented before, and therefore be made more salient than, any information on account balances that is presented in one's 401(k) statement. A similar idea has already been voluntarily implemented by at least a few retirement plan administrators, including TIAA-CREF and Vanguard, and is being considered by the U.S. Congress under the Lifetime Income Disclosure Act.

References

- Agarwal, S., Driscoll, J., Gabaix, X., Laibson, D. 2009. The age of reason: Financial decisions over the life cycle with implications for regulation. *Brookings Pap. Econ. Ac.*, **Fall**, 51-117.
- Arias, E. 2011. United States life tables. 2007. *National Vital Statistics Reports*, **59(9)**, 1-60.
- Benartzi, S, Previtro, A., Thaler, R.H. 2011. Annuitization puzzles. *J. Econ. Perspect.*, **25(4)**, 143 – 64.
- Benartzi, S., Thaler., R.H. 2013. Behavioral economics and the retirement savings crisis. *Science*, **339(6124)**, 1152-1153.
- Bleich, S.N., Rutkow, L. 2013. Improving obesity prevention at the local level – emerging opportunities. *New Engl. J. Med.*, **368(19)**, 1761-1763
- Bhattacharya, U., Holden, C.W., Jacobsen, S. 2012. Penny wise, dollar foolish: Buy-sell imbalances on and around round numbers. *Manage. Sci.*, **58(2)**, 413-431.
- Boseley, S. 2013. Opt-out organ donation scheme given go-ahead in Wales. *The Guardian*, July 2, 2013, Main Section, p. 15. London: Guardian News and Media.
<http://www.theguardian.com/society/2013/jul/02/opt-out-organ-donation-wales>
- Brown, J.R., Kapteyn, A., Mitchell, O.S. (in press). Framing and Claiming: How Information-Framing Affects Expected Social Security Claiming Behavior. *J. Risk Insur.* (NBER Working Paper 17018).
- Brown, J.R., Kling, J.R., Mullainathan, S., Wrobel, M.V. 2008. Why don't people insure late life consumption: A framing explanation of the under-annuitization puzzle. *Am. Econ. Rev.*, **98(2)**, 304-09.
- Dehaene, S. 2003. The neural basis of the Weber-Fechner law: a logarithmic mental number line. *Trends Cogn. Sci.*, **7(4)**, 145-147.
- Dowray, S., Swartz, J.J., Braxton, D., Anthony J.V. 2013. Potential effect of physical activity based menu labels on the calorie content of selected fast food meals. *Appetite*, **62(1)**, 173-181.

- Doyle, J.R. 2013. Survey of time preference, delay discounting models. *Judgm. Decis. Mak.*, **8**(2), 116–135.
- Fechner, G.T. 1860. *Elemente der Psychophysik*. Leipzig: Breitkopf und Härtel.
- Gale, W., Iwry, J.M., John, D.C., Walker, L. 2008. Increasing Annuitization of 401(k) Plans with Automatic Trial Income. Hamilton Project Discussion Paper. Washington, D.C.: The Retirement Security Project.
- Goda, G.S., Manchester, C.F., Sojourner, A. 2013. What will my account really be worth? Experimental Evidence on how retirement income projections affect saving. Working paper, Rand Corporation, WR-873.
- Goldstein, D.G., Johnson, E.J., Sharpe, W.F. 2008. Choosing Outcomes Versus Choosing Products: Consumer-Focused Retirement Investment Advice. *J. Consum. Res.*, **35**(October), 440-456.
- Goldstein, D.G., Johnson, E.J., Herrmann, A., Heitmann, M. 2008. Nudge Your Customers Toward Better Choices. *Harvard Bus. Rev.*, **86**(12), 99-105.
- Halpern, S.D., Ubel, P.A., Asch, D.A. 2007. Harnessing the power of default options to improve health care. *New Engl. J. Med.*, **357**(13), 1340.
- Halpern, S.D., Loewenstein, G., Volpp, K.G., Cooney, E., Vranas, K., Quill, C.M., McKenzie, M.S., Harhay, M.O., Gabler, N.B., Silva, T., Arnold, R., Angus, D.C., Bryce, C. 2013. Default Options In Advance Directives Influence How Patients Set Goals For End-Of-Life Care. *Health Affairs.*, **32**(2), 408-417.
- Hershfield, H.E., Goldstein, D.G., Sharpe, W.F., Fox, J., Yeykelis, L., Carstensen, L.L., & Bailenson, J.N. (2011). Increasing saving behavior through age-progressed renderings of the future self. *J. Marketing Res.*, **48**, S23-S37.
- Hu, W.-Y., Scott, J.S. 2007. Behavioral obstacles in the annuity market. *Financial Analysts Journal*, **63**(6), 71-82.
- Johnson, E.J. & Goldstein, D.G. 2003. Do defaults save lives? *Science*, **302**, 1338-1339.

- Johnson, E.J., Shu, S.B., Dellaert, B.G.C., Fox, C., Goldstein, D.G., Häubl, G., Larrick, R.P., Payne, J.W., Peters, E., Schkade, E., Wansink, B., Weber, E.U. 2012. Beyond nudges: Tools of a choice architecture. *Market. Lett.*, **23**(2), 487-504.
- Kahneman, D., Tversky, A. 1979. Prospect Theory: An Analysis of Decision Under Risk. *Econometrica*. *XLVII*, 263-291.
- Larrick, R.P., Soll, J.B. 2008. The MPG illusion. *Science*, **320**, 1593-1594.
- Lifetime Income Disclosure Act (S. 267; H.R. 677). 2011. Washington, DC: U.S. Government Printing Office.
- Moyer, R.S., Landauer, T.K. 1967. Time required for judgements of numerical inequality. *Nature*, **215**, 1519–1520.
- Nenkov, G.Y., Inman, J.J., Hulland, J. 2008. Considering the future: The conceptualization and measurement of elaboration on potential outcomes. *J. Consum. Res.*, **35**(1), 126-141.
- Oppenheimer, D., Meyvis, T, Davidenko, N. 2009. Instructional Manipulation Checks: Detecting Satisficing to Increase Statistical Power, *J. Exp. Soc. Psychol.*, **45**, 867-872.
- Parducci, A., Perrett, L.F. 1971. Category rating scales: Effects of relative spacing and frequency of stimulus values. *J. Exp. Psychol.*, **89**(2):427-452, 1971
- Pichert, D., Katsikopoulos, K.V. 2008. Green defaults: Information presentation and pro-environmental behaviour. *J. Environ. Psychol.*, **28**(1), 63-73.
- Previtero, A. In Press. Stock Market Returns and Annuitization, *J. Finance. Econ.*
- Sass, S.A. 2012. Should You Buy an Annuity From Social Security? *Center for Retirement Research Working Paper No. 2012 - 10*. Chestnut Hill, MA: Center for Retirement Research, Boston College, pp. 12 - 60.
- Social Security Administration. 2012. Social Security Bulletin: Annual Statistical Supplement 2012. United States Government Printing Office.
- Stevens, S. S. 1975. *Psychophysics*. New York: Wiley.

- Thaler, R.H., Sunstein, C.R. *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press, 2008.
- Thaler, R.H., Benartzi, S. (2004). Save More Tomorrow: Using Behavioral Economics to Increase Employee Saving. *J. Polit. Econ.*, **112**(1), S164-S187.
- U.S. Government Accountability Office. (2011). *Retirement Income: Ensuring Income Throughout Retirement Requires Difficult Choices*. Washington, D.C.: United States Government Accountability Office.
- Urban, G.L., Hauser, J.R., Qualls, W.J., Weinberg, B.D., Bohlmann, J.D., Chicos, R.A. 1997. Information acceleration: Validation and lessons from the field. *J. Marketing Res.*, **34** (February), 143-153.
- Weber, E.U., Johnson, E.J., Milch, K.F., Chang, H., Brodscholl, J.C. & Goldstein, D.G. 2007. Asymmetric discounting in intertemporal choice: A Query Theory account. *Psychol. Sci.*, **18**(6), 516-523.

Table 1.

	Model 1	Model 2	Model 3
(Intercept)	-13.33 (.25)***	-14.79 (.36)***	-14.62 (.35)***
Log Lump Sum Equivalent	1.41 (.02)***	1.53 (.03)***	1.53 (.03)***
Presentation Format (lump)		2.87 (.50)***	2.91 (.50)***
Log Lump Sum Equivalent x Presentation Format		-.23 (.04)***	-.24 (.04)***
Age			-.02 (.00)***
Gender			.01 (.06)
R ²	0.709	0.714	0.728
Adj. R ²	0.710	0.714	0.727
Num. obs.	1946	1946	1883

*** p < 0.001, ** p < 0.01, * p < 0.05

Within-participant study. Perceived satisfaction on a seven-point scale regressed on lump sum equivalent, presentation format, and their interaction and demographics. Gender is coded such that 1 is male and 2 is female.

Table 2.

	Model 4	Model 5	Model 6
(Intercept)	-14.23 (.55) ***	-17.58 (.76) ***	-17.48 (.96) ***
Log Lump Sum Equivalent	1.39 (.04) ***	1.65 (.06) ***	1.62 (.06) ***
Presentation Format (lump)		6.68 (1.08) ***	6.24 (1.11) ***
Log Lump Sum Equivalent x Presentation Format		-.51 (.08) ***	-.47 (.08) ***
Age			.02 (.01)
Gender			.23 (.10) *
Income			-.09 (.02) ***
R ²	0.534	0.552	0.562
Adj. R ²	0.533	0.551	0.559
Num. obs.	960	960	890

*** p < 0.001, ** p < 0.01, * p < 0.05

Table 2: Between-participant study. Perceived satisfaction on a seven-point scale regressed on lump sum equivalent, presentation format, and their interaction and demographics. Age is in years. Gender is coded such that 1 is male and 2 is female. Income was coded on a 17-point scale, with each point representing a \$9,999 increment ranging from 1 (\$-\$9,999) to 17 (more than \$160,000).

Table 3.

	Model 7	Model 8	Model 9
(Intercept)	8.79 (.30)***	9.53 (.42)***	10.14 (.55)***
Log Lump Sum Equivalent	-.38 (.02)***	-.43 (.03)***	-.45 (.03)***
Presentation Format (lump)		-1.47 (.59)*	-1.37 (.59)*
Log Lump Sum Equivalent x Presentation Format		.11 (.05)*	.10 (.04)*
Age			-.01 (.00)
Gender			-.17 (.08)*
Income			.03 (.01)**
R ²	0.227	0.233	0.247
Adj. R ²	0.226	0.231	0.243
Num. obs.	954	954	953

*** p < 0.001, ** p < 0.01, * p < 0.05

Between-participant study on saving intentions. Savings intentions on a five-point scale (with 5 being the intention to increase saving the most) are regressed on lump sum equivalent, presentation format, and their interaction and demographics. Age is in years. Gender is coded such that 1 is male and 2 is female. Income was coded on a 17-point scale, with each point representing a \$9,999 increment ranging from 1 (\$-\$9,999) to 17 (more than \$160,000).

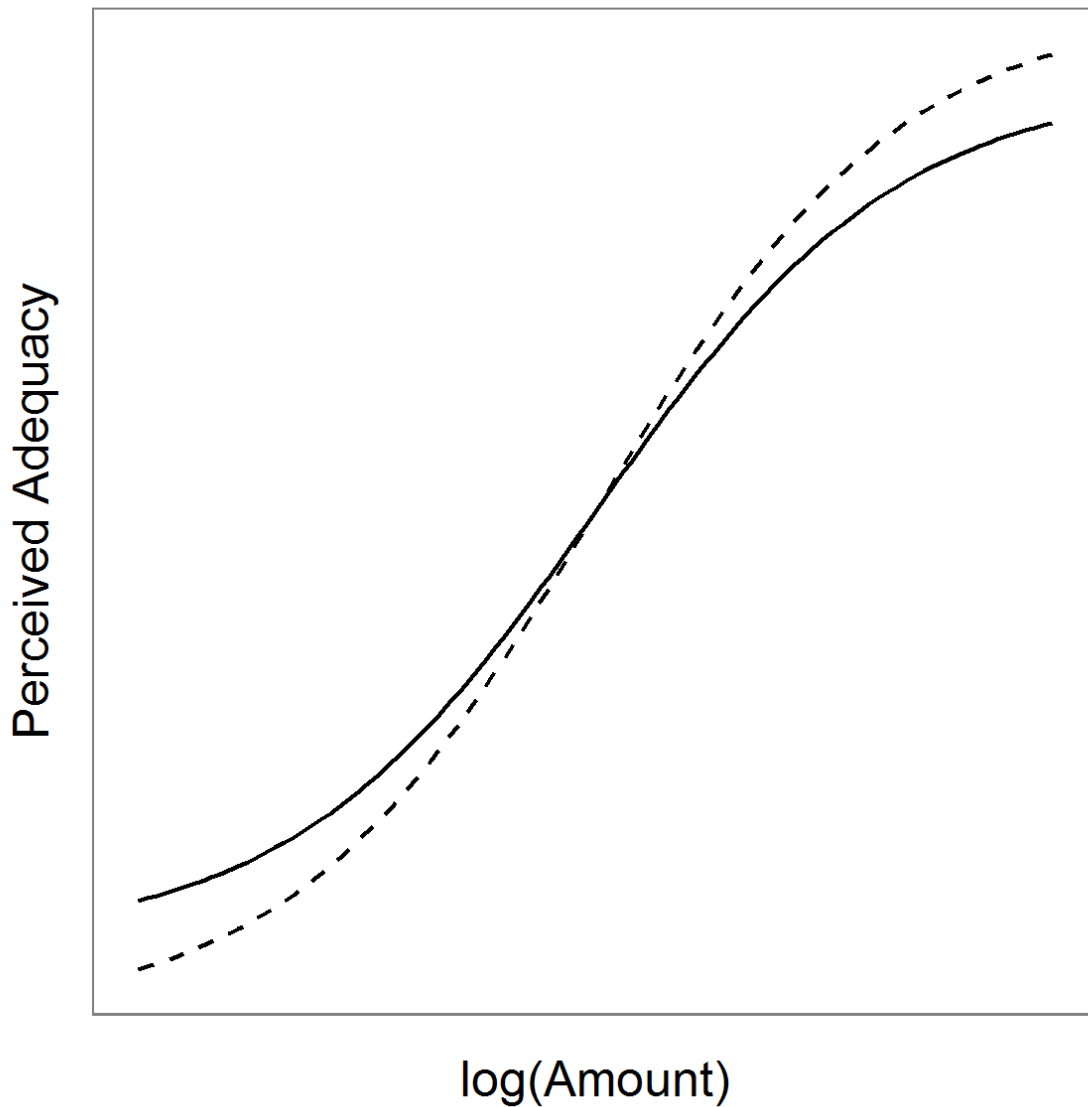


Figure 1. Predicted perceptions of adequacy for retirement of varying amounts of wealth depending on whether they are expressed as a lump sum (dotted line) or an equivalent monthly annuity payment (solid line). Savers are predicted to be more sensitive to changes in monthly payments than to changes in lump sums.

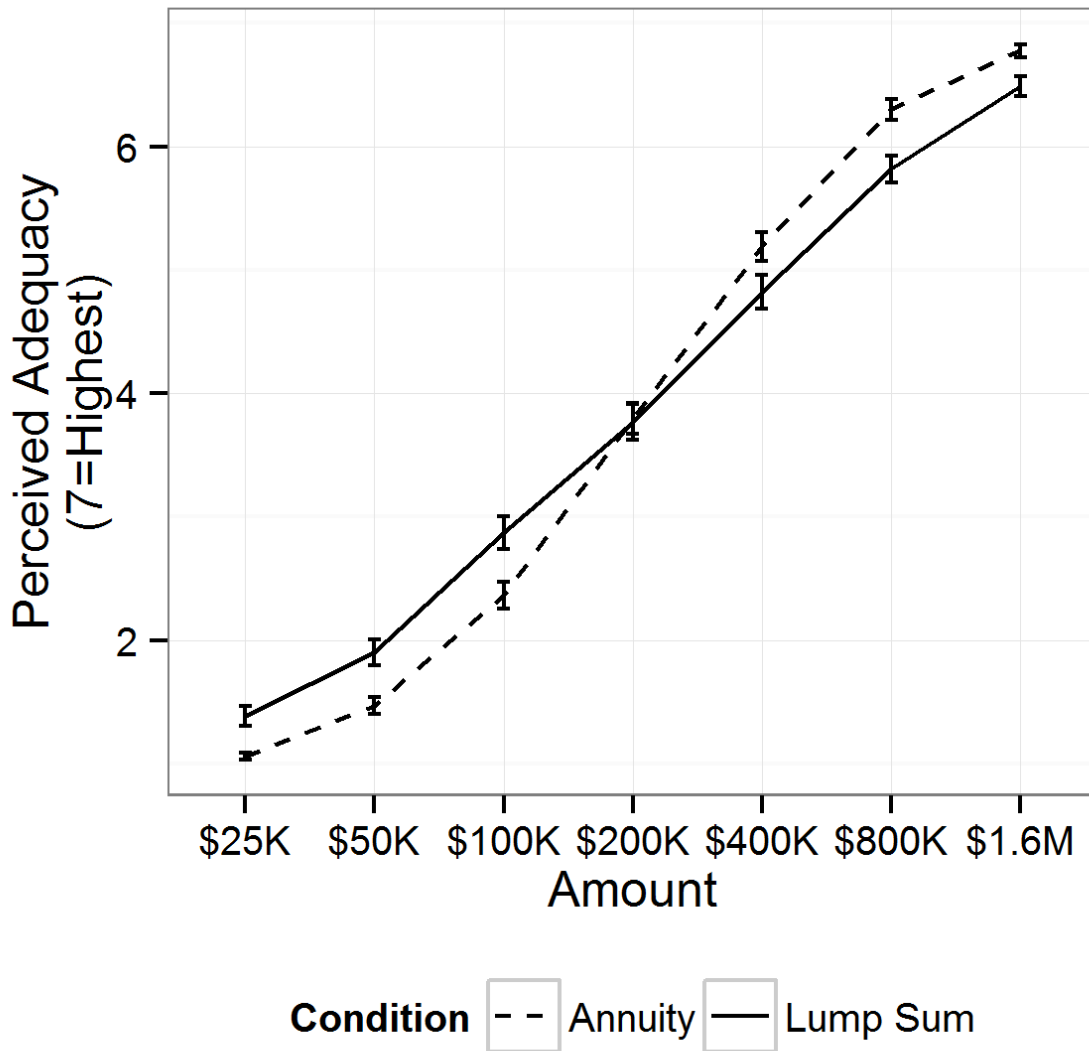


Figure 2. Perceived adequacy of varying amounts of wealth in retirement depending on whether they are expressed as a lump sum (dotted line) or an equivalent monthly annuity payment (solid line). Error bars extend one standard error above and below the means.

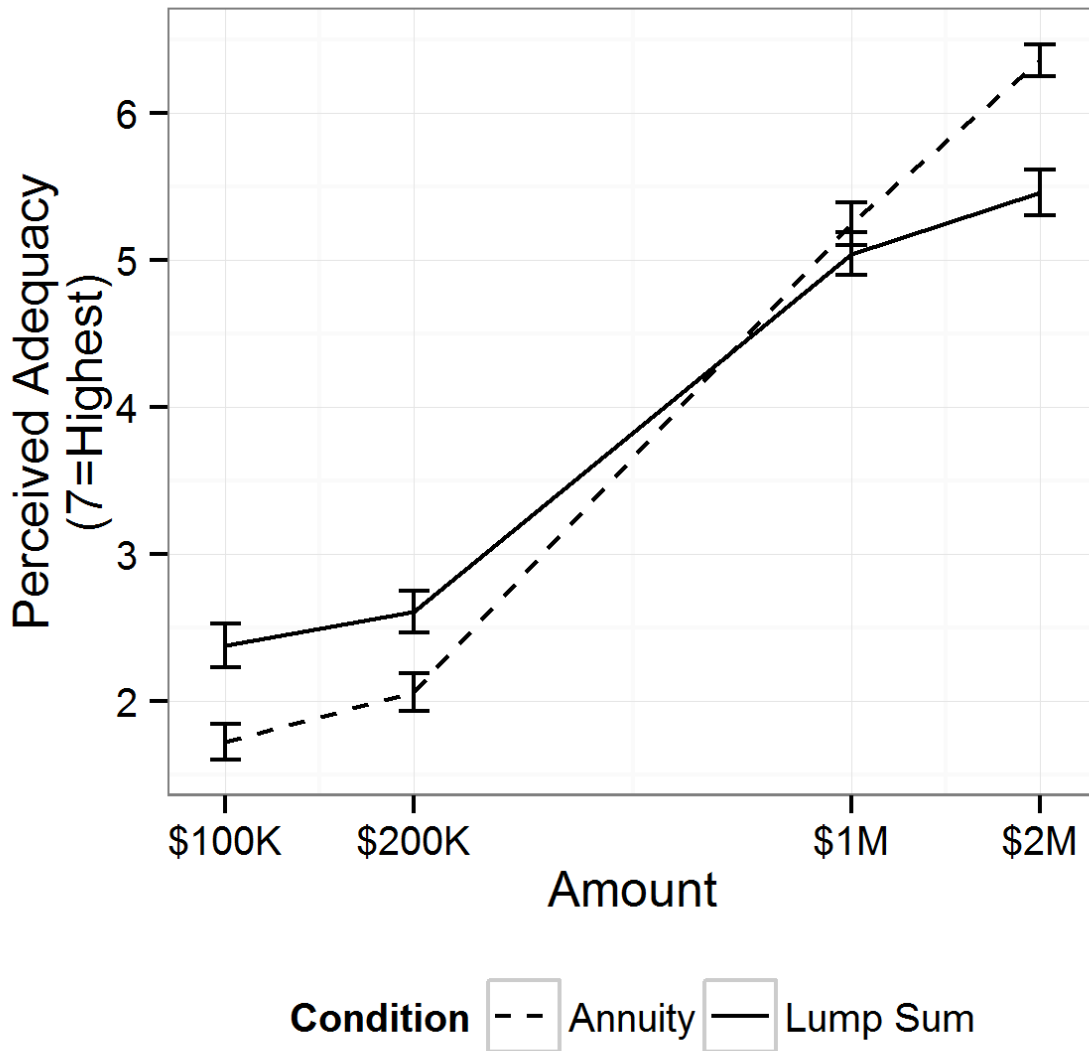


Figure 3. Perceived adequacy (between participants) to amounts of money in 401(k) plan. Error bars extend one standard error above and below the means.

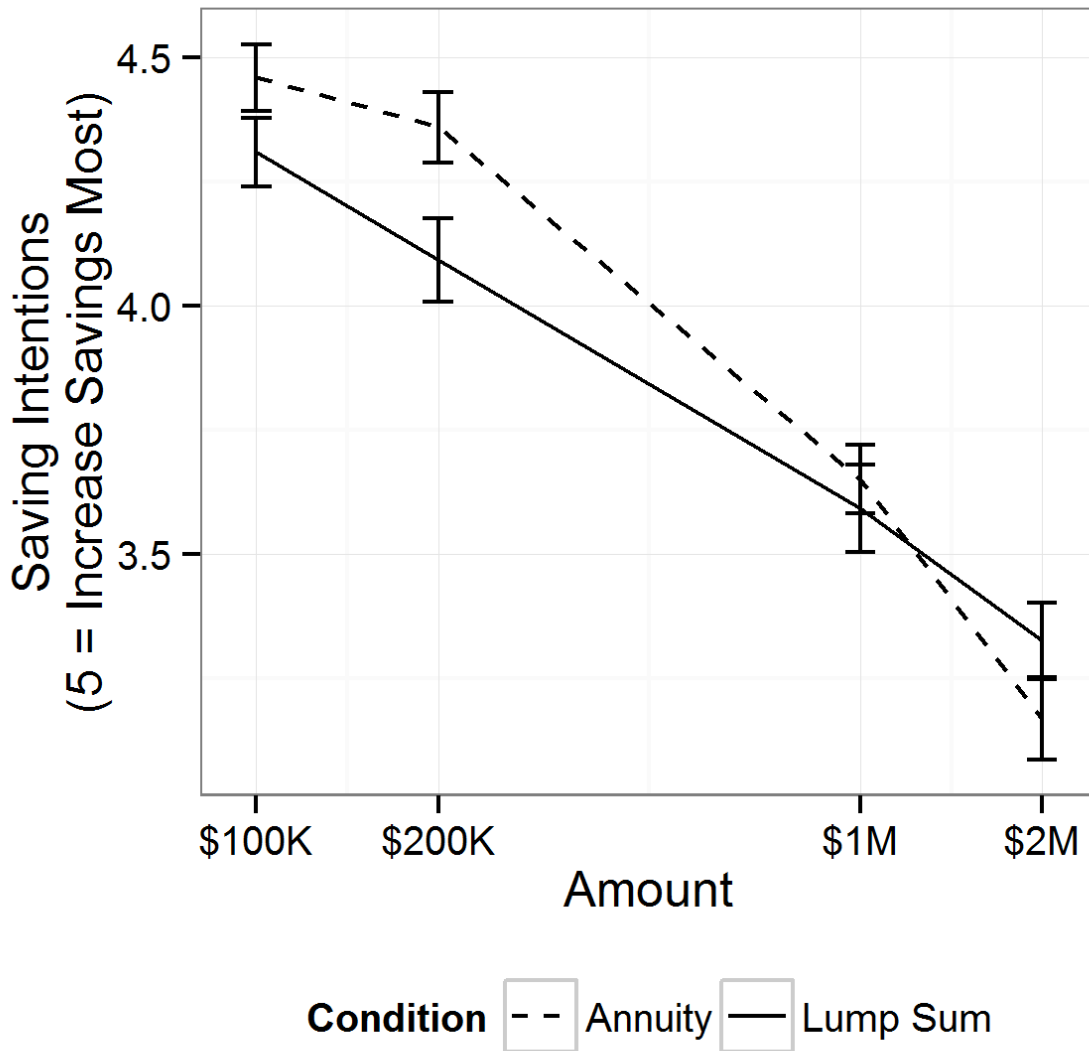


Figure 4. Intended change in savings rate (between participants) by condition. Higher numbers are associated with a greater tendency to increase savings. Error bars extend one standard error above and below the means.