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Research on choice architecture is shaping policy around the world, touching on areas ranging from retirement economics to environmental issues. Recently, researchers and policy makers have begun paying more attention not just to choice architecture but also to information architecture, or the format in which information is presented to people. In this article, the authors investigate information architecture as it applies to consumption in retirement. Specifically, in three experiments, they examine how people react to lump sums versus equivalent streams of monthly income. Their primary question of interest is whether people exhibit more or less sensitivity to changes in retirement wealth expressed as lump sums (e.g., \$100,000) or monthly equivalents (e.g., \$500 per month for life). They also test whether people exhibit an “illusion of wealth,” by which lump sums seem more adequate than monthly amounts in certain conditions, as well as the opposite effect, in which lump sums seem less adequate. They conclude by discussing how format-dependent perceptions of wealth can affect policy and consumers’ financial decision making.

*Keywords:* judgment, decision making, annuities, prospect theory, illusion of wealth

## The Illusion of Wealth and Its Reversal

Research on choice architecture is now shaping policy around the world (Goldstein et al. 2008; Thaler and Sunstein 2008), touching on areas such as retirement economics (Benartzi and Thaler 2013; Choi et al. 2006), organ donation (Boseley 2013; Johnson and Goldstein 2003), end-of-life care (Halpern, Ubel, and Asch 2007; Halpern et al. 2013), and environmental issues (Pichert and Katsikopoulos 2008). Recently, researchers and policy makers have begun paying more attention not just to choice architecture but also to information architecture, or the format in which information is presented to people (Johnson et al. 2012). Research on information architecture has shown, for example, that the caloric content of food can be well understood by the amount of exercise it would take to work off the calories (Bleich and Rutkow 2013; Dowray et al. 2013) and that comprehension of cars’ energy efficiency can be

enhanced by presenting information in terms of gallons per 100 miles instead of miles per gallon (Larrick and Soll 2008). This article investigates information architecture; however, instead of addressing the consumption of calories or gasoline, we focus on economic consumption in retirement.

A timely policy debate surrounds the information provided to the owners of approximately 80 million 401(k) retirement accounts. We focus on the Department of Labor proposal that 401(k) statements display the account’s worth in terms of the projected lifetime income that the account can buy (Lifetime Income Disclosure Act 2011), rather than simply presenting the account’s worth as a lump sum. A lump sum can be exchanged for a monthly annuity, making the two formats of information financially equivalent. In what follows, we test whether they are psychologically equivalent.

From a research perspective, our motivation is to test whether people are more or less sensitive to changes in wealth presented as lump sums (e.g., \$100,000) or equivalent monthly amounts (e.g., \$500 per month for life from age 68). If they are less sensitive to lump sums and certain market conditions hold, we would expect to find an “illusion of wealth,” by which lump sums seem more adequate than their monthly equivalents at low wealth levels, but a reversal of this pattern at high wealth levels.

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Understanding how information format affects perceptions of wealth may shed light on the current retirement savings crisis in the United States, where one-third of nonretired households have no retirement savings (Board of Governors of the Federal Reserve System 2014) and approximately half are not saving at a rate that will allow them to maintain their preretirement level of consumption in retirement (Munnell, Hou, and Webb 2014). Although many economic factors may contribute, one possible psychological reason for this insufficient savings rate is that people at lower wealth levels overestimate the adequacy of their retirement savings because of the format in which these are presented (i.e., as a lump sum), and thus they become less inclined to save. From a policy perspective, our motivation is to inform policy makers about how different information architectures affect investor behavior.

In related work, Goda, Manchester, and Sojourner (2013) presented 17,000 employees with projected effects of increasing savings rates, expressed in terms of either total accumulation at retirement or total accumulation at retirement in addition to monthly income projections. They found that the addition of projected monthly incomes increased employees' saving rates more than those who received only projected total accumulations. We build on that study by isolating the effects of lump sums and monthly amounts to test for differential sensitivity according to information format, as well as the presence and reversal of the illusion-of-wealth effect.

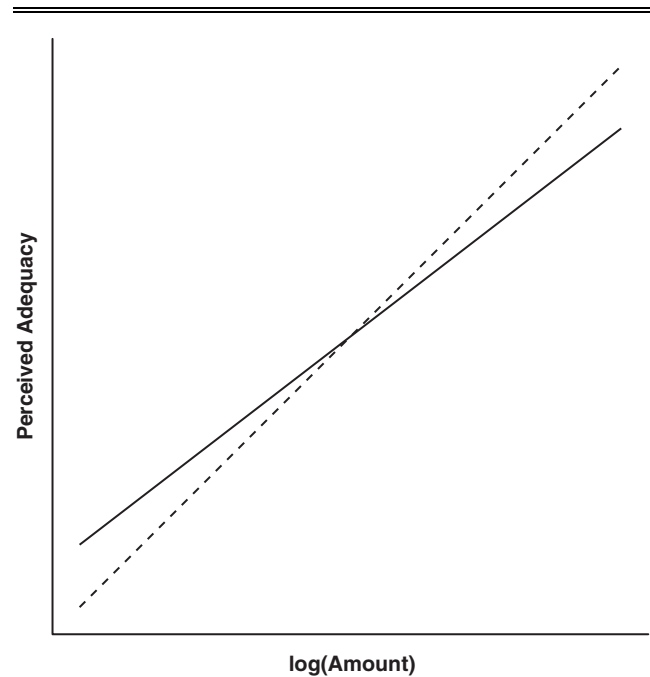
In what follows, we investigate empirically how information format (lump sum or monthly amount) affects perceived adequacy for retirement and intentions to save more. We examine the impact of presentation mode at various income levels to determine whether the illusion of wealth holds in current market conditions and whether it reverses at higher levels. We conclude by discussing potential psychological mechanisms and policy implications.

#### WEALTH PERCEIVED AS A LUMP SUM OR AS MONTHLY INCOME

We model the perceived value  $V$  of a level of wealth in retirement as  $V = c + k(\log(W))$ , where  $W$  is an amount of wealth and  $c$  and  $k$  depend on the information format in which  $W$  is presented. In behavioral-economic models of intertemporal choice and risky choice (Doyle 2013; Kahneman and Tversky 1979), researchers commonly discount perceptions of monetary amounts by taking logs or powers, such as through the Weber–Fechner law (Fechner 1860) or Stevens's (1975) law from psychophysics. Accordingly, we model value as a function of log wealth, though other functional forms (e.g., power functions) would serve our purposes just as well. Next, we fit values of  $c$  and  $k$  for lump sums and monthly equivalents, noting that in the model,  $W$  is always entered as the lump sum amount regardless of whether it is presented as a lump sum or monthly amount.

The parameter  $k$  in the model reflects sensitivity to changes in log wealth and is assumed to vary according to the format of information. In formats in which  $k$  is low, people are less sensitive to changes in wealth than in formats in which  $k$  is high. If people are more sensitive to changes in wealth expressed as monthly amounts rather than lump sums, monthly amounts would lead to a steeper change in perceived adequacy, as Figure 1 shows.

Figure 1  
PREDICTED PERCEPTIONS OF ADEQUACY FOR RETIREMENT OF VARYING AMOUNTS OF WEALTH DEPENDING ON WHETHER THEY ARE EXPRESSED AS A LUMP SUM OR AN EQUIVALENT MONTHLY ANNUITY PAYMENT



Notes: The illusion-of-wealth effect means that at low wealth levels, people perceive lump sums (solid line) as more adequate than monthly amounts (dashed line), while at high levels, the opposite is true.

Not only does Figure 1 show greater sensitivity to wealth expressed as monthly amounts, but it also shows that for low wealth levels, lump sums appear more adequate than monthly amounts, while at high wealth levels, the opposite is true. This is what we refer to as the illusion of wealth and its reversal. If market conditions were to change, however, and the monthly equivalent curve were to shift upward enough, the two curves might not produce the illusion of wealth or might produce it in a way that would not affect many people by shifting the intersection point. Therefore, we view the illusion of wealth and its reversal as side effects of our primary question—format-dependent sensitivity to how retirement wealth is presented—and market conditions. Nonetheless, we test whether the illusion of wealth is present in current market conditions because its presence could affect the perceptions and saving behavior of a considerable number of people.

#### STUDY 1: WITHIN-SUBJECT 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. One randomly assigned group of respondents saw monetary amounts expressed as lump sums, and the other saw these same base amounts expressed as monthly payments that they could receive in retirement. That is, one group rated

adequacy of lump sums such as \$25,000, \$50,000, and \$100,000, while the other group rated monthly amounts in retirement such as \$160, \$319, and \$639 per month for life. We test whether people are more sensitive to monthly amounts or lump sums and whether an illusion of wealth and its reversal emerge.

### Method

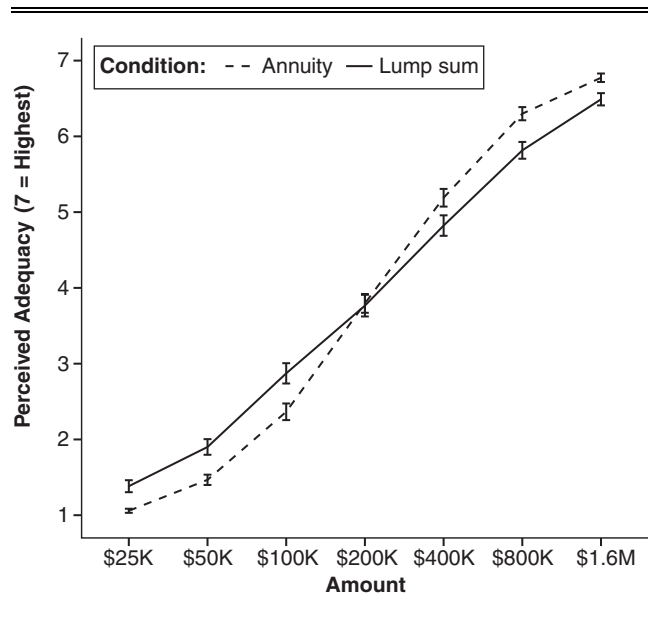
We recruited a sample of 310 adults from Amazon Mechanical Turk ( $M_{age} = 28.37$  years,  $SD = 10.21$ , range 18–68 years; 40.3% women). Respondents were paid \$.20 for completing the survey. We used a 2 (presentation: lump sum and annuity)  $\times$  7 (amount: \$25,000, \$50,000, \$100,000, \$200,000, \$400,000, \$800,000, and \$1,600,000) mixed design, with presentation as the between-subjects factor and amount as a within-subject factor. All respondents were asked to imagine that for each listed amount of money, they had that amount—and only that amount—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. Respondents were then shown a table with seven monetary amounts and asked to rate how adequate each amount would be on a seven-point scale (anchored by “totally inadequate” and “totally adequate”).

In the lump sum condition, respondents were asked to imagine that they would have totals of \$25,000, \$50,000, \$100,000, \$200,000, \$400,000, \$800,000, and \$1,600,000. In the annuity condition, in contrast, respondents were asked to imagine that they would have \$160, \$319, \$639, \$1,277, \$2,554, \$5,108, and \$10,217 per month in retirement. To calculate annuity amounts, we used an online annuity calculator that solves for monthly periodic payment for a given lump sum and a rate of annual income increase 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. Of the 310 respondents, we eliminated 32 who provided ratings that were not monotonically increasing (e.g., rating \$25,000 as more adequate than \$50,000), leaving a sample of 278 for analysis.

### Results and Discussion

Figure 2 depicts the means and standard errors at all seven wealth levels and two presentation formats. Consistent with elevated sensitivity to monthly amounts, the response curve is flatter for lump sums and steeper for annuities. The curves in Figure 2 have a slightly sigmoidal shape, owing to the seven-point Likert scale on which responses are entered. At some point, for many respondents, low wealth levels become “totally inadequate” and high wealth levels become “totally adequate.” Although these data can be fit with sigmoidal functions of greater complexity, we test hypotheses using the simple linear model for transparency and straightforward model comparison. 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 Models 2 and 3 in Table 1 show. A model comparison analysis of variance (ANOVA) shows that 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 with lump sum equivalent ( $p < 10^{-6}$ ).

Figure 2  
PERCEIVED ADEQUACY OF VARYING AMOUNTS OF WEALTH IN RETIREMENT DEPENDING ON WHETHER THEY ARE EXPRESSED AS A LUMP SUM OR AN EQUIVALENT MONTHLY ANNUITY PAYMENT



Notes: Error bars extend one standard error above and below the means.

In addition to demonstrating greater sensitivity to wealth presented as monthly amounts, Figure 2 shows the illusion of wealth and its reversal. At the three lowest wealth levels, respondents perceive lump sums as more adequate for retirement than monthly amounts, while at the three highest wealth levels, they perceive monthly amounts as more adequate than lump sums. With this basic result in hand, we aimed to replicate and improve on it in Study 2, which has several design improvements.

### STUDY 2: BETWEEN-SUBJECTS PERCEPTIONS OF ADEQUACY

In Study 2, we aimed to replicate the findings of Study 1, but with five changes. First, the within-subject nature of Study 1 could have caused respondents 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. This could also be caused by a desire to spread responses across the Likert-scale categories (Parducci 1965). Accordingly, we conducted Study 2 as a between-subjects experiment in which each person gave input on only one wealth level, as opposed to each participant responding to seven wealth levels. Second, in Study 2 we strove to recruit people who were close to retirement age and for whom such decisions were meaningful. Third, rather than excluding people depending on their responses, we 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 (multiples of at least \$500) to remove the confound between presentation

Table 1  
PERCEIVED SATISFACTION REGRESSIONS: WITHIN-SUBJECT STUDY

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
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 × Presentation format		-.23 (.04)***	-.24 (.04)***
Age			-.02 (.00)***
Gender			.01 (.06)
R <sup>2</sup>	.709	.714	.728
Adjusted R <sup>2</sup>	.710	.714	.727
Number of observations	1,946	1,946	1,883

\*\*\* $p < .001$ .

Notes: 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. Standard errors are in parentheses.

format and roundness of numerical figures, which could be problematic because round numbers tend to appeal to investors (Bhattacharya, Holden, and Jacobsen 2012). Fifth, because of the much higher cost of recruitment in Study 2, and because each respondent in Study 2 provided one-seventh the data due to the between-subjects design, we choose to include four wealth levels rather than the seven in Study 1. We test whether people are more sensitive to monthly amounts or lump sums and whether an illusion of wealth and its reversal emerge.

#### Method

We recruited a sample of 960 middle-aged adults from a national survey panel ( $M_{\text{age}} = 53.70$  years,  $SD = 5.28$ , range 45–64 years; 52% women). Respondents were paid \$5 for completing the study online. To be eligible for participation, respondents needed to have an annual household income of between \$40,000 and \$150,000.

All respondents first answered demographic questions such as gender, age, and amount of household income (16 categories: “\$0–\$9,999,” . . . , “More than \$160,000”). To minimize the effects of careless responding, we then administered an attention filter in which respondents were shown a list of emotion words but instructed to click “none of the above” to show that they were paying attention (Oppenheimer, Meyvis, and Davidenko 2009). If respondents were outside 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; 1,229 people fell into one of these categories). The 960 respondents we analyze are those who were in the specified age and income ranges and passed the attention filter.

We then randomly assigned respondents to one of eight conditions. We used a 2 (presentation: lump sum and annuity) × 4 (amount: \$100,000, \$200,000, \$1,000,000, and \$2,000,000) between-subjects factorial design. In all conditions, respondents were asked to imagine that they had saved enough money over time to have a specified amount to spend in retirement. In the four lump sum conditions, respondents were asked to imagine that they would have “a total of \$100,000 [\$200,000, \$1,000,000, or \$2,000,000]—and only this amount—to spend during your retirement.” In the four annuity conditions, however, respondents were asked to imagine that they would have “\$500 [\$1,000, \$5,000, or \$10,000]—and only this amount—to spend each month during your retirement.” As we have

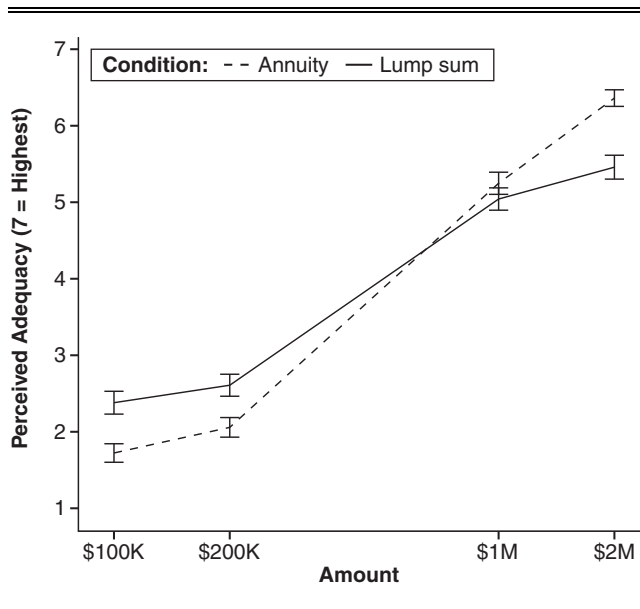
mentioned, we calculated annuity amounts using a simpler formula than that in Study 1. We divided each lump sum payment by 200, a well-fitting approximation ( $R^2 = .99$ ) based on quotes we collected from five online annuity calculators, including one from the U.S. government’s Thrift Savings Plan. 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 annuity was within 1% of the government calculator’s quote. After reading the description of how much money they would hypothetically have in retirement, all respondents were asked to indicate how adequate they thought this amount was using a seven-point scale, anchored by “totally inadequate” and “totally adequate.”

#### Results and Discussion

Figure 3 depicts the means and standard errors at all four wealth levels and two presentation formats. The results are consistent with those of the within-subject analysis. In particular, as we predicted, annuities are more sensitive than lump sums as the underlying value changes. As before, there is an illusion of wealth. At the low wealth levels of \$100,000 and \$200,000, respondents perceive annuities as less satisfactory than equivalent lump sums, but the illusion reverses at higher wealth levels, in which respondents perceive lump sums as less satisfactory.

We show the greater sensitivity to annuities in a regression analysis. Models 5 and 6 in Table 2 show that there is an interaction between wealth level and presentation format. The only notable difference in the between- and within-subject studies is the crossover point, which occurs at around \$200,000 in Study 1 (Figure 2) but is somewhat higher in Study 2 (Figure 3). This may be due to respondents in the within-subject study attempting to distribute Likert-scale responses across the possible range (Parducci 1965). For example, \$200,000 is the middle value presented in the within-subject study, in which it received a response of approximately 3.8; however respondents in the between-subjects study rated it at 2.6 or 2.1 (depending on format), a sizable difference considering that standard errors are approximately .25. The exact location of the crossover point will depend on market rates for annuities and, as we show here, response format. We note

Figure 3  
PERCEIVED ADEQUACY (BETWEEN SUBJECTS) OF AMOUNTS  
OF MONEY IN 401(K) PLAN



Notes: Error bars extend one standard error above and below the means.

again that our primary concern is the difference in sensitivity to annuities and lump sums, not if and where a crossover occurs, as this depends less on psychology and more on market conditions. As it turns out, however, crossovers do seem to occur for the market rates and presentation formats we test, making the illusion of wealth and its reversal relevant for policy makers.

A model comparison ANOVA finds 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 with lump sum equivalent ( $p < 10^{-6}$ ). Studies 1 and 2 address how people perceive amounts under different information formations, but

would different perceptions lead to changes in saving intentions? Study 3 examines this question.

### STUDY 3: SAVING INTENTIONS

Having demonstrated that presentation format affects perceptions of adequacy, we next examine whether potential monetary amounts expressed as lump sums or annuities influence saving intentions. Specifically, survey respondents are asked to imagine having saved different amounts of money for retirement, in either a lump sum or annuitized stream format, and then to indicate whether they would change their saving rate.

#### Method

We recruited a sample of 960 middle-aged adults from a national survey panel ( $M_{age} = 54.21$  years,  $SD = 5.79$ , range 45–65 years; 17% women). Respondents were paid \$5 for completing the study online. As a prerequisite, respondents could not have taken part in Study 2. Furthermore, as in Study 2, to be eligible for participation, respondents needed to have an annual household income of between \$40,000 and \$150,000, pass an attention filter (which was the same as in Study 2), and be between 45 and 65 years of age. Of the respondents, 2,221 were outside the appropriate age and income range, had participated in Study 2, or failed the attention check. People who did not meet these requirements could not continue in the experiment. One respondent prematurely exited the survey due to server error, which left a total sample of 959 respondents.

After answering demographic questions (age and household income) and the attention filter, respondents were randomly assigned to one of eight conditions. As in Study 2, we used a 2 (presentation: lump sum and annuity)  $\times$  4 (amount: \$100,000, \$200,000, \$1,000,000, and \$2,000,000) between-subjects factorial design. In the lump sum conditions, respondents were asked to “Suppose that at your current savings rate you would have saved \$100,000 [\$200,000, \$1,000,000, or \$2,000,000] for retirement in your 401(k) plan.” The question was identical in the annuity conditions, except that respondents were asked to imagine that they had saved enough to pay them

Table 2  
PERCEIVED SATISFACTION REGRESSIONS: BETWEEN-SUBJECTS STUDY

	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 $\times$ Presentation format		-.51 (.08)***	-.47 (.08)***
Age			.02 (.01)
Gender			.23 (.10)*
Income			-.09 (.02)***
R <sup>2</sup>	.534	.552	.562
Adjusted R <sup>2</sup>	.533	.551	.559
Number of observations	960	960	890

\* $p < .05$ .

\*\*\* $p < .001$ .

Notes: 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 (\$0–\$9,999) to 17 (+\$160,000). Standard errors are in parentheses.



“\$500, [\$1,000, \$5,000, or \$10,000] per month for as long as you live.” All respondents were asked if they wanted to increase their savings rate, keep it the same, or decrease it, on a five-point scale (1 = “decrease it a lot,” 2 = “decrease it a bit,” 3 = “keep it the same,” 4 = “increase it a bit,” and 5 = “increase it a lot”).

### Results and Discussion

Figure 4 shows savings intentions for amounts of wealth expressed as either a lump sum or an annuity. Here, higher values indicate greater intentions to increase savings. As we would expect from the results on perceived adequacy, saving intentions are more sensitive to wealth expressed as monthly amounts (the steeper negative slope in the annuities curve) rather than lump sums. When information is presented in the annuity format, intentions to save are greater at low wealth levels and lower at high wealth levels. That is, the effect corresponds 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 on the five-point scale, and approximately 28%, 36%, and 30% of individual responses were in the third, fourth, and fifth response categories, respectively. Because the third response category corresponded to keeping savings levels the same, we show that, on average, people in all conditions intended to increase savings somewhat, consistent with the notion that many people believe that they are saving too little for retirement.

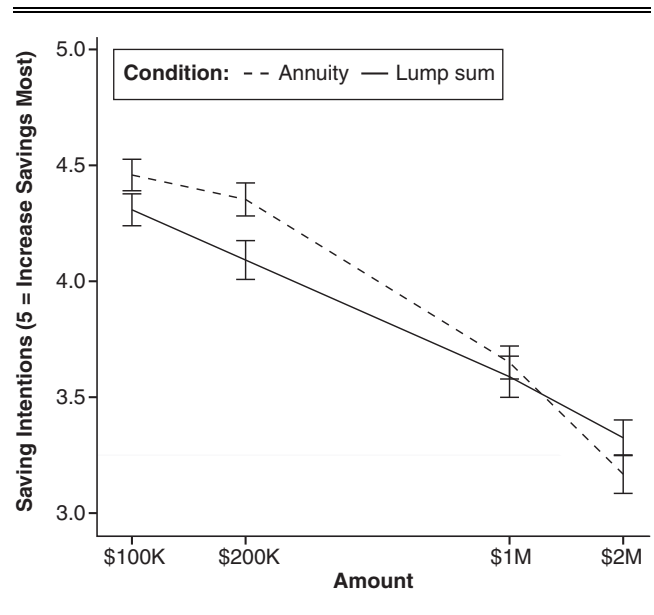
In modeling the intention to save, Models 8 and 9 in Table 3 show a significant interaction between the presentation format and the lump sum equivalent. A model comparison ANOVA finds that Model 8 (and necessarily Model 9) fits better than Model 7 ( $p = .02$ ), which lacks a presentation format term.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

### GENERAL DISCUSSION

The present studies find support for the possibility of an illusion of wealth and its reversal at higher monetary amounts. Monthly amounts of \$500 to \$5,000 have market values of \$100,000 to \$1,000,000; however, people seem to be more sensitive to the tenfold increase in monthly amounts than to the tenfold increase in lump sums. Owing to this and current market conditions, we found that middle-aged adults rated a relatively small lump sum as more adequate for retirement than an equivalent monthly amount. They were also less likely to want to increase their savings rates when exposed to a relatively small lump sum rather than an equivalent monthly annuity. We found a reversal of this pattern for larger amounts of money.

The experimental designs of each study were meant to reflect the real-world environment of retirement decision making. When presenting information to people nearing retirement age, some retirement plan providers only display account balances, making the lump sum condition from the studies similar to the real world. When providers give both account balances and lifetime income, it is often the case that they display the lifetime income number in a larger font on the first page, while account balances and fund performance appear on subsequent pages. Accordingly, the

Figure 4  
INTENDED CHANGE IN SAVINGS RATE (BETWEEN SUBJECTS)  
BY CONDITION



Notes: Higher numbers are associated with a greater tendency to increase savings. Error bars extend one standard error above and below the means.

results highlight at least two decision-making issues present in the modern retirement space: the annuity puzzle and the choice to claim social security benefits early.

### Applications to the Annuity Puzzle and Social Security Claiming

The results on the perceived adequacy of lump sums versus equivalent monthly streams of income may help shed light on the so-called annuity puzzle—that is, the tendency for consumers not to annuitize their retirement wealth even though many observers consider annuitization a smart way to insure against outliving one’s savings (Benartzi, Previtro, and Thaler 2011; Yaari 1965). If people perceive small lump sums as much larger than they are, exchanging them for what appear to be very small monthly payments would be unappealing, leading to the underannuitization currently observed in the market. Some recent empirical results 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 (Previtro 2014). An increase in the benefit amount of \$100,000 increases the likelihood of annuitization by 3.3 percentage points. Additional research is required to determine whether people cashing out their pensions as a lump sum are making a mistake and the extent to which such a potential mistake is driven by the illusion of wealth or other factors. Given that (1) people are living longer than they used to, (2) many pensions now offer benefits as a large lump sum, and (3) approximately 50% of retirees do cash out their pensions (Benartzi, Previtro, and Thaler 2011), this is a rich area of work ripe for further exploration.

Table 3  
SAVINGS INTENTIONS REGRESSIONS: BETWEEN-SUBJECTS STUDY

	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 × presentation format		.11 (.05)*	.10 (.04)*
Age			-.01 (.00)
Gender			-.17 (.08)*
Income			.03 (.01)**
R <sup>2</sup>	.227	.233	.247
Adjusted R <sup>2</sup>	.226	.231	.243
Number of observations	954	954	953

\* $p < .05$ .

\*\* $p < .01$ .

\*\*\* $p < .001$ .

Notes: Between-subjects 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 (\$0–\$9,999) to 17 (+\$160,000). Standard errors are in parentheses.

The illusion of wealth might also contribute to the tendency of U.S. adults to claim their social security benefits early, with more than 40%–50% claiming at 62 years, the earliest possible age (Social Security Administration 2012, Table 6.B5). Given the attractive economics of claiming later (Sass 2012), we suspect that these people are making a mistake in claiming too early. Not too long ago, the Social Security Administration introduced a tool that attempted to help older people determine when to claim their social security benefits by displaying the amount forfeited by claiming at 62 years old and not waiting one year until age 63 (e.g., \$21,492) versus the monthly increase for those waiting until age 63 (e.g., \$119 per month) (see [www.socialsecurity.gov/estimator](http://www.socialsecurity.gov/estimator)). If we apply the illusion of wealth, the lump sum loss of \$21,492 appears much larger than the monthly increase in lifetime payments of \$119.

#### Exploring Process

The documentation of differential sensitivity and the illusion of wealth has applied value, offering promising directions for theoretical research to provide a cognitive account of the effects observed. We explore some possible directions next, with no claims of a complete list.

*Number magnitude.* Drawing on market rates when we wrote this article, the number of dollars in monthly annuity payments was approximately 200 times smaller than the corresponding lump sums. Research on psychophysical numbing (Fetherstonhaugh et al. 1997) and the mental number line (Dehaene 2011) posits that people naturally perceive numbers as if by taking log or power transformations, resulting in greater sensitivity to differences in smaller numbers and lesser sensitivity to differences in larger numbers. Although it might be argued that the logarithmic perception of numbers explains the lesser sensitivity to changes in lump sums, in our studies, the ratios (rather than the absolute differences) between numbers are the same for both formats. For example, as monthly amounts increase ten times from \$500 to \$5,000, the lump sums increase ten times from \$100,000 to \$1,000,000, suggesting that factors beyond the logarithmic perception of numbers must underlie the differential sensitivity. Furthermore, the idea of a compressed mental number line implies how raw numbers are

perceived but is silent on the qualifications of “per month for life” in one format and “as a lump sum” in another format. Not only perceptions of the numbers but also processing of these qualifications would be necessary for our respondents to respond as they did. Thus, more than just the mental compression of large numbers seems necessary to explain format-dependent sensitivity.

*Loss aversion and reference-dependent utility.* It also could be argued that the sigmoidal response curves (e.g., in Figure 2) are similar to the value function of prospect theory (Kahneman and Tversky 1979), which is concave downward for gains and convex upward for losses. Loss aversion suggests that a steep decrease in perceived value (loss aversion) occurs when moving from the domain of perceived gains to that of perceived losses. Research has expanded this idea to the notion of reference dependence (e.g., Hardie, Johnson, and Fader 1993), in which people experience steep decreases in value when moving below perceived reference points. Monthly amounts may serve as natural reference points because they are easy to compare with current consumption. For example, a person who knows that (s)he spends \$3,000 per month would perceive a budget of \$2,500 per month as a loss relative to the reference point of current spending. At the same time, (s)he would perceive \$3,500 per month as a relative gain. Under reference dependence, sharp drops in utility would be expected when crossing reference points, which could explain the greater sensitivity to monthly amounts in the studies presented herein. In contrast, lump sums are not easily comparable to reference levels of present consumption. Without reference dependence, responses to lump sums would be expected to more gradual, as in models that characterize perceptions as proportional to log- or power-transformed wealth (Doyle 2013).

*Nonmonetary reference points.* Although people might use monetary amounts as reference points, it is also possible that they think about monthly amounts in terms of what can be purchased with them and whether such purchases would constitute a gain or a loss relative to their current standard of living. A person’s familiarity with market costs can project monthly amounts into vivid counterfactuals (Bartels and Rips 2010; Hershfield et al. 2011; Nenkov, Inman, and

Hulland 2008; Pronin, Olivola, and Kennedy 2008; Trope and Liberman 2003; Urban et al. 1997). For example, from exposure, advertising, or social contacts, people may have a good idea of how an apartment renting for 50% or 200% of their current rent might affect their budgets. Because expenses such as rent, mortgage payments, cable television, mobile phones, broadband service, and beyond are advertised widely and billed monthly, the monthly format makes it easy for people to mentally simulate how life might change at different monthly budgets. Under reference dependence, people should be especially sensitive to imagined standards of living that are somewhat better or worse than what they currently experience and thus be particularly sensitive to monthly formats. With the lump sum format, a fair amount of calculation is required to project a standard of living. Furthermore, such a projection would come with considerable uncertainty due to life expectancy and investment return differences. Owing to this difficulty and uncertainty, people may elect not to compare lump sums with present consumption and thus respond to lump sums in a less sensitive, less reference-dependent way.

*Decision by sampling.* Decision by sampling theory (Stewart, Chater, and Brown 2006) is a model of how people respond to levels of wealth that can account for a host of behavioral economic phenomena (Stewart, Reimers, and Harris 2014). It models the psychological value of a monetary amount as proportional to the percentile rank in the sample from which it is drawn; the sample differs according to context. To assess the value of a monthly income, a person would compare it with his or her subjective probability distribution of monthly income. To assess the value of a net worth, the person would compare it with his or her belief about the distribution of net worth in society. The idea that lump sums and monthly payments might be compared with different reference distributions receives support from research in marketing that finds that people presented with small or large expenditures tend to retrieve other small or large expenditures from memory (Gourville 1998). If we assume that a person's subjective distribution of monthly income more or less mirrors societal income (e.g., the income distribution according to the U.S. census in 2012), we find that moving from \$500 per month to \$8,000 per month corresponds to moving from the 10th percentile to the 90th percentile of income. If we assume that a person's subjective distribution of net worth corresponds to the distribution of net worth in society (according to the U.S. census in 2010), moving from \$100,000 to \$1.6 million (the lump sum translations of \$500 and \$8,000 per month) corresponds with moving from about the 60th percentile to near the 100th percentile. The change in percentiles is greater in the income distribution than in the net worth distribution, which would predict greater sensitivity to monthly amounts under the decision by sampling theory. As with the other theoretical directions in this section, additional research is necessary to confirm this hypothesis. For example, research might test whether the predictions bear out if people's self-reported perceptions of the income and net worth distributions are substituted for objective ones (for a method for eliciting beliefs about probability distributions, see Goldstein and Rothschild 2014).

#### *Open Empirical Questions*

Several empirical questions remain that further research could address. First, we examined people's reactions to

projected account balances versus projected income at retirement, while policy proposals suggest displaying both account balances and income streams. Indeed, retirees might find up to six different numbers on their statements, consisting of projected balances and income based on savings to date, projected balances and income based on assumed savings through retirement, and above-income numbers based on joint and survivor annuities for couples. It remains an open question how people might react to the complete set of numbers. Another open question is whether they will find income projections credible, given all the assumptions required to make long-term estimates.

Second, the current studies do not measure perceived life expectancy, and it is possible that research respondents considered how long they would need to live in the lump sum conditions (i.e., how long they would need to make that money last) but not in the annuity conditions. Although we took average life expectancy into account when setting the lump sum and annuity amounts across conditions, given that life expectancy and thoughts of mortality can play a role in annuity decisions (Salisbury and Nenkov 2015), researchers might want to explicitly quantify these thoughts when investigating this topic.

Third, future work might also examine whether the findings from the current set of studies generalize to other numerical domains as well. For example, personal financial loans (which are in some ways better suited for consumers than taking on credit card debt) might appear more attractive if the loan amounts were expressed in terms of annuitized amounts and not lump sums.

#### *CONCLUSION*

Information about wealth in retirement can be presented in two forms, lump sums or equivalent monthly income. Is one way of representing the information superior to the other? Although this question will always be open to debate, we speculate that perceptions of wealth as an annuity are more likely to lead to satisfactory choices because it is easier to estimate a month's expenses than to estimate expenses over all of retirement. In this sense, monthly amounts put lump sums in perspective (Barrio, Goldstein, and Hofman 2016). To help people reason better about spending in retirement, retirement plan providers should provide people with their projected monthly income at retirement based on their current saving behavior instead of the current practice of providing only account balances. We recommend that projected monthly income be presented before, and therefore be made more salient than, any information on account balances presented in 401(k) statements. A few retirement plan providers have already voluntarily implemented a similar idea, including Great-West Retirement Services, TIAA-Cref, and Vanguard, and the U.S. Congress is also considering this under the Lifetime Income Disclosure Act. As of April 2015, the United Kingdom has offered its citizens more flexibility in cashing out their retirement accumulations.<sup>1</sup> To help retirees manage the increased flexibility, free and impartial face-to-face guidance will be offered, but

<sup>1</sup>For a brief summary of the changes in the United Kingdom, see <https://web.archive.org/web/20151114031929/https://www.gov.uk/government/news/pensions-freedom-for-400000-hardworking-people-from-today>.



how such guidance will be framed and what information will be provided remain avenues for further research. In a world with increasing investor autonomy, understanding the role of information architecture in these key retirement decisions is crucial for public policy.

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