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The framing of options for retirement: Experimental tests for policy

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Abstract: *We hypothesise and confirm a substantial framing effect in relation to whether people opt for an annuity on retirement. Two laboratory experiments were conducted in collaboration with a national pensions regulator. Individuals demanded a higher annuity rate when pensions were initially conceived of as an accumulated lump sum – a "nest egg" or "pension pot" – than when they were initially conceived of as retirement income. The effect was recorded using both a matching and a choice procedure. Effect sizes implied more than a doubling of demand for annuities at market rates. While mindful of the need for caution in generalising from hypothetical laboratory studies, the findings have potentially strong policy implications. The framing of pension products in marketing materials and disclosures may have substantial effects on financial risks borne in later life.*

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1. Introduction

An increasing proportion of employees with an occupational or private pension are members of defined contribution (DC) as opposed to defined benefit (DB) schemes. These workers typically face options on retirement. Taking a pension in the form of an annuity provides insurance against outliving one's resources in retirement. Theoretically, annuities should be appealing for risk-averse individuals. Empirically, they are not. Annuity demand is remarkably low relative to model predictions, leading to an "annuities puzzle" (Modigliani, 1986). This paper proposes and experimentally tests whether this puzzle might be partly explained by how retirement savings are framed.

The primary hypothesis is as follows. In pension marketing material and benefit statements, as well as in ordinary discourse, the total amount that an individual has saved for retirement is often salient and presented in language that confers ownership – the proverbial "nest egg" or "pension pot". If scheme members conceive of their pension as a substantial lump sum, when offered the opportunity to convert it to an annuity they may act as if maintaining the lump sum is the default (Johnson and Goldstein, 2003) or status quo (Samuelson and Zechhauser, 1988) option or, similarly, display a form of endowment effect (Knetsch, 1989; Kahneman, Knestch and Thaler, 1990). This would manifest itself as a systematic bias against annuitisation, relative to pension scheme members who conceive of their pension as income in retirement. Members who conceive of their pension as a substantial lump sum would hence demand higher annuity rates and purchase fewer annuities at market rates.

As far as we are aware, the current study amounts to the first direct test of this possibility, although some previous work described below provides suggestive or indirect evidence. The main contribution of this paper, therefore, is to test this hypothesised effect.

We conducted two laboratory studies that manipulated the framing of a pension and employed alternative elicitation methods for measuring preferences for annuitisation. The studies were undertaken in collaboration with the Pensions Authority, which is the regulator for the pensions industry in Ireland. Regulatory policy has the potential to influence the framing of communications to pension scheme members (and potential future members) via regulations governing disclosure and advice. Thus, any substantial effect of how pensions are framed has policy relevance, although the policy implications of framing effects are not straightforward. Where policymakers observe inconsistent choices across contexts, determining which choices are "better" can be challenging (Beshears et al., 2008). Consequently, in addition to testing for a main effect of framing, the experimental designs sought insight into the relationship between choices and underlying preferences.

The first experiment consisted of a between-subject manipulation through which a pension was framed as a lump sum or as guaranteed monthly income for life. Participants undertook a matching task, in which they were offered the opportunity to covert the lump sum (or monthly income) and had to provide the minimum monthly income (or lump sum) at which they would be willing to convert. The annuity rates implied by responses differed between the two conditions by approximately one percentage point. This laboratory effect size translates to a more than two-fold increase in the proportion of individuals who would purchase an annuity at contemporaneous market rates. We further hypothesised that choices might be altered by an improved understanding of decumulation in relation to lump sums. Participants were given a calculator designed to explain the process and to allow them to explore worked examples. This had a marginal, non-significant impact on the framing effect.

The second experiment employed an alternative choice-based elicitation procedure, in which participants chose between various lump sums and monthly incomes. The primary aim was to assess the robustness of the main framing effect found in the first experiment, by

checking that it is observed not only when individuals state minimum amounts required for conversion but also when offered specific options to convert. A secondary aim was to compare with a "neutral frame" condition in which participants were offered a simple binary choice between the two options. The second experiment also collected information on expected longevity – how long participants think they will live. Using the choice procedure, the main framing effect was even larger, approximately 1.75 percentage points. There was a strong relationship with expected longevity, against which the framing effect could be compared. The effect on choices of the different frames was equivalent to expecting to live 10-15 years longer. Decisions under the neutral frame were closer to decisions when the pension was framed as regular income. However, an unanticipated spatial effect emerged. Participants were biased towards whichever option appeared on the left, which presumably they were more likely to read it first. Interestingly, this spatial effect occurred despite the fact that there was no explicit default or status quo option.

Although we are cautious about whether our effect sizes generalise from the laboratory setting, these experimental findings suggest that how scheme members conceive of their pension may affect how they choose to receive it, perhaps substantially. Given the asset risk associated with management of investments and alternative decumulation products, this possibility needs to be taken seriously by policymakers. Furthermore, the effect we observed under a supposedly neutral active choice frame, in which no default option or status quo existed, points towards an underlying mechanism centred on the psychological process of conversion and/or comparison.

The paper proceeds as follows. Section 2 describes relevant previous work that motivates our primary hypothesis, as well as relevant research on the annuities puzzle. Section 3 describes the first experiment; Section 4 the second. The final section considers potential explanations, together with implications for policy and future research.

2. Relationship to Previous Work

2.1 Reference Dependent Choices

No previous study we can find directly proposes or addresses the framing effect we hypothesise. However, the effect builds on a substantial literature that shows the power of defaults (Johnson and Goldstein, 2003; McKenzie, Liersch and Finkelstein, 2009), not least in pension choice (Madrian and Shea, 2001; Carroll et al., 2009). In addition to inertia, behavioural convergence and implicit advice, the psychology that underlies status quo bias (Samuelson and Zeckhauser, 1988) and the endowment effect (Knetsch, 1989; Kahneman et al., 1990) may contribute to the stickiness of defaults. There remains no consensus on the psychological explanation for these manifestations of "reference dependence", whereby choices are inconsistent across different reference points, although a fundamental aversion to losses is perhaps the most commonly accepted theory (Ericson and Fuster, 2014).

For present purposes, two aspects are noteworthy: first, these effects can be substantial in magnitude and, second, they tend to be larger when individuals face uncertainty over the value of the different options that they face (Horowitz and McConnell, 2002; Sayman and Öncülar, 2005). Combining these findings with the challenges of comprehending products as complex as pensions and decumulation options, we hypothesised that framing pensions as an accumulated fund might lead people to be more reluctant to receive the

pension as guaranteed regular income, than if the same pension was framed as a stream of income in retirement.

2.2 Preferences for Annuities

Most previous work on the annuities puzzle has focused on whether low take-up can be explained within the neoclassical rational choice framework. This debate, summarised in Beshears et al. (2014), is not directly relevant to the experiments we describe aside from the difficulty of explaining framing effects within the neo-classical framework generally. A smaller literature has investigated how context affects the demand for annuities. The studies have employed a combination of hypothetical surveys and choice experiments.

Beshears et al. (2014) investigated factors that make annuities more or less appealing by embedding hypothetical choice experiments within two large surveys administered to 50-75 year-olds across the United States. Annuities were described in non-technical terms as "guaranteed lifetime income". Their properties and descriptions were manipulated across choices, with the annuity framed as either an investment or a stream of consumption – a difference known already to affect choices (Brown et al., 2008). The framing of the pension itself, as a lump sum or regular income, was not investigated. A preference for partial annuitisation was recorded. Respondents were most concerned about: (a) having enough income later in life; (b) flexibility in spending; (c) worries about whether the company could pay in future. Demand for annuities was lower when the description placed emphasis on flexibility and when the annuity was framed as an investment (versus a stream of consumption). Closely similar findings were recently obtained using Dutch data (Bockweg et

al., 2017). Thus, previous work suggests that stated preferences for annuities are sensitive to contextual factors.

Perhaps the closest previous investigation to the present study was undertaken by Brown et al. (2017). An adaptive choice experiment was embedded in a survey to elicit the size of the lump sum that individuals required in return for giving up a portion of their expected social security income. This was compared with an elicitation of how much individuals would be willing to pay in a once-off payment in return for an increase in their social security income. The results revealed a very large gap in valuations between buyers and sellers: individuals demanded prices to give up social security income that were multiple times the prices they were willing to pay to increase it. One difficulty in interpreting this very large gap between buying and selling prices for a guaranteed income stream is that the question posed was fundamentally different from the decision typically faced by pension scheme members. Buyers were asked to state the lump sum that they would be willing to pay from their own sources of wealth, not to state their preferred option for receiving a benefit to which they were entitled. Moreover, the regular income was framed as social security, which may not be conceived of the same way as private pension income. Nevertheless, the authors conclude that the inconsistency of responses indicates that many individuals find it difficult to make the comparison between regular income and lump sums.

Goldstein, Hershfield and Benartzi (2016) also recorded inconsistencies between evaluations of lump sums and regular incomes. When rating the perceived adequacy of different wealth levels on Likert scales, participants' were more sensitive to changes across a large range of monthly incomes ($160 – $10k) than to approximately equivalent changes across a range of lump sums ($25k – $1.6m). The lowest monthly incomes were rated as less adequate than the lowest lump sums, while the highest monthly incomes were rated as more adequate than the highest lump sums. The authors argue that this difference reflects the

psychophysics of how people code numbers, specifically a diminishing sensitivity for higher numbers. Other explanations are possible, however, since any additional uncertainty in evaluations will flatten a distribution of Likert responses. Thus, the pattern of results is consistent with people simply finding it harder to evaluate large lump sums than monthly incomes, with which they may be more familiar.

Overall, these previous findings indicate substantial variability and inconsistency when evaluating or deciding between guaranteed incomes and lump sums. However, no previous study has directly addressed the hypothesis that decisions over whether to purchase an annuity might be influenced by the framing of the pension itself, as a lump sum fund or as a regular income. We test this explicitly in the context of options for retirement.

3. Experiment 1

Experiment 1 set out to investigate whether the hypothesised framing effect existed and, if so, whether it would be eradicated by an intervention designed to improve participants' understanding about how lump sums convert to monthly incomes. The experiment had a simple between-subjects design, with participants split into lump sum (LS) and regular income (RI) conditions. All participants completed three questions in a matching paradigm. They had to generate an equivalent regular income or lump sum that represented the minimum amount required for them to choose that way to receive their pension benefits. An initial response was recorded prior to the intervention, after which two further responses were collected.

3.1 Method

3.1.1 Participants

Participants were 100 consumers aged 22-60 recruited by a market research company. The sample was a representative sample of the Dublin population, balanced by gender (48 females), age (mean = 41.1, sd = 12.2) and working status (80 working full time). Participants were paid €30 for participation in this study and an unrelated one.

3.1.2 Materials

The tasks were computerised. They were programmed in Python using the PsychoPy package (Peirce, 2007; 2009) and presented on 14" (1366 x 768) Dell laptops. Aurora DT210 pocket calculators, a pen and paper were left beside each laptop for use by participants during the task. An additional demonstration computer was attached to a projector to support experimenter explanations, as described below.

3.1.3 Design

The experiment consisted of a repeated hypothetical choice experiment in which the sample was randomly split into the LS (n = 50) and RI conditions (n = 50). The condition and size of the fund was assigned pseudo-randomly based on participant number. The size of the funds varied from €200,000 to €608,000, with the equivalent regular incomes set at 4% of the lump sums – an approximation based on the contemporaneous market annuity rate.

3.1.4 Procedure

There were six stages to the experiment, outlined in Table 1, which lasted on average 15-20 minutes. Participants completed the task in groups of five assigned to the same

condition. On arrival, they were asked to read and sign a consent form. The experimenter then told participants: "We want you to imagine that you are just about to retire at age 65. In a moment you will be presented with a scenario on your computer screen that we want you to imagine and respond to. There are no right or wrong answers, we are just interested in your opinion. You can use the calculators in front of you or a pen and paper if you want to. Please do not talk to your neighbours or look at their screens – you have all been given different numbers."

Table 1: Stages of Experiment 1

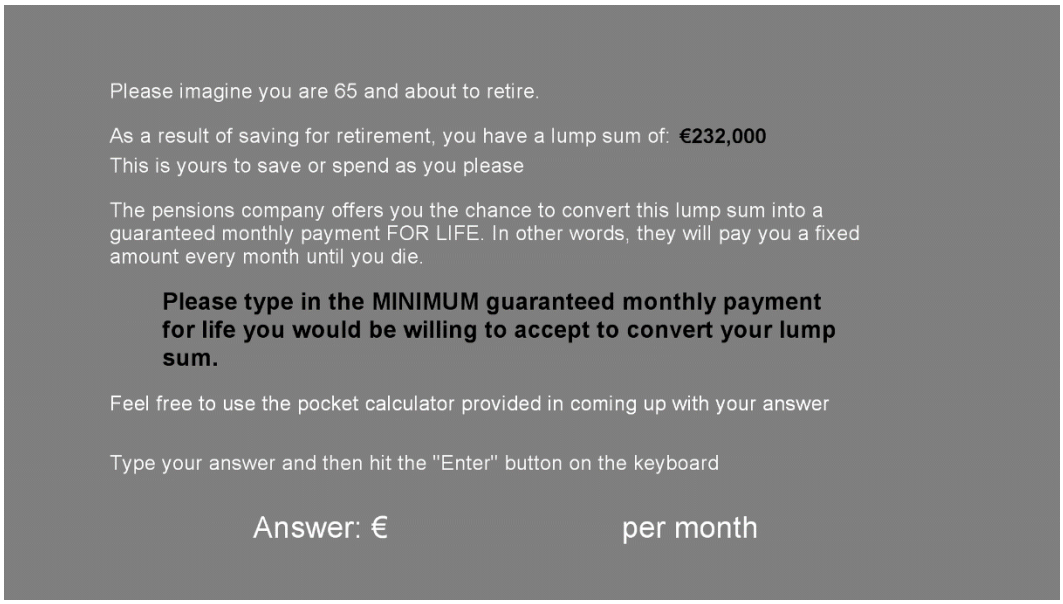
Stage	Task	Description
(1)	WTA Elicitation	Read scenario and responded by typing in minimum euro amount they would be willing to swap lump sum for regular income (or vice versa)
(2)	Rank reasons	Rank (up to) 10 reasons for decision in order of importance.
(3)	Retirement Calculator	Simple visual description of how a retirement account works followed by guided use of retirement calculator and free time to use calculator
(4)	Repeated WTA Elicitation	Presented with same scenario as in Stage 1
(5)	Matched WTA Elicitation	Presented with different scenario. Participants shown high lump sum previously given low lump sum in this stage and vice versa. Similar for regular income group.
(6)	Demographic Questions	Demographic questions answered on screen

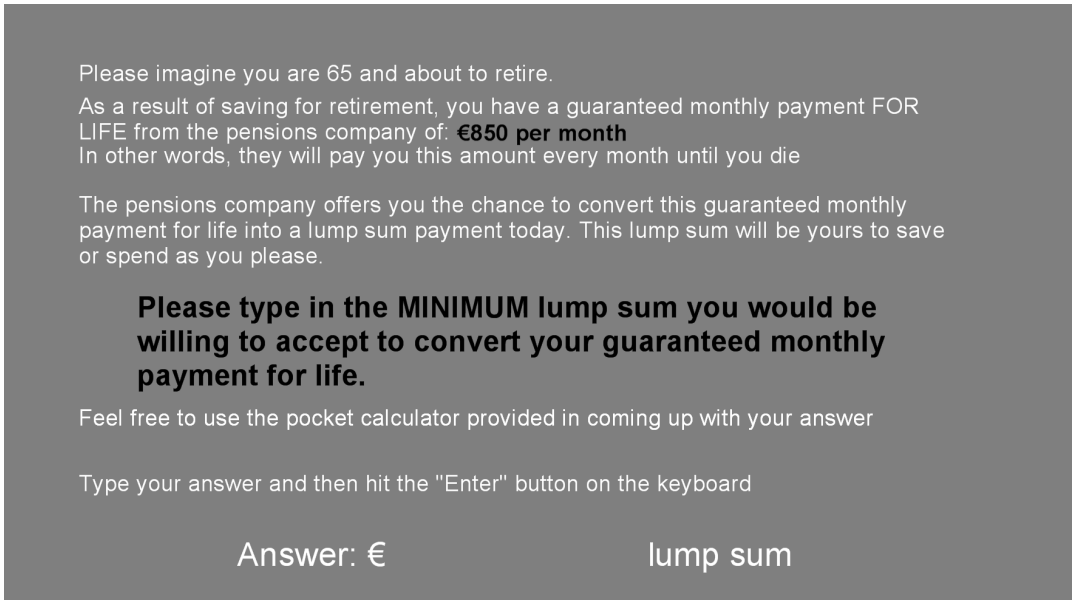
In Stage 1, a retirement scenario was presented. Examples are shown in Figure 1. It contained either the lump sum or income that the participant was set to receive. The lump sum was described as a 'once-off lump sum payment'. In keeping with previous literature, the

annuity was described as a 'guaranteed regular monthly payment for life'. Each scenario also described in words the alternative that the pension company was offering. The lump sum group were asked to type in the minimum guaranteed monthly income at which they would be willing to convert their lump sum. The regular income group were asked to type in the minimum lump sum for which they would be willing to convert their monthly payment. Both were reminded on screen that they were free to use the calculator to help them arrive at an answer. A confirmation screen allowed participants to check their submitted answer and go back and change it if necessary. There was no time limit.

In Stage 2, participants were asked to read a list of reasons potentially relevant to the retirement decision they had just made and to rank them in order of importance. The list was taken from Beshears et al. (2014), who elicited ratings for the importance of each reason on a seven point scale. The order of the reasons was randomised across participants. An example is shown in Figure 2.

Figure 1: Lump Sum (LS) (top) and Regular Income (RI) condition (bottom)



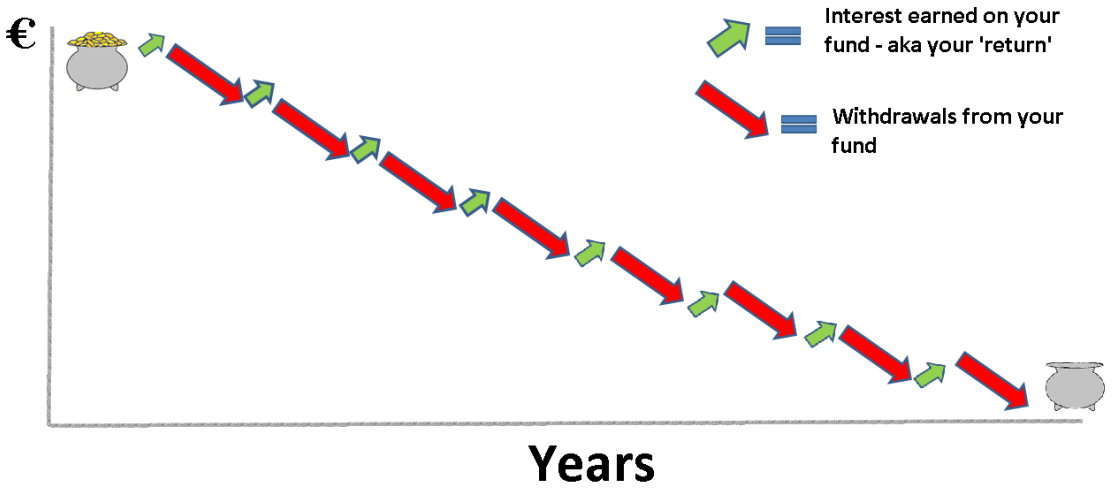


In Stage 3, a graphic illustrating how a retirement account works appeared onscreen (Figure 3, top). The experimenter used a PowerPoint projection of the same graphic to explain it in simple terms. He explained that interest (green arrows) increased the amount in the account but that regular withdrawals decreased it (red arrows). Eventually there would be no money left in the account, depending on how much was withdrawn and how often. Participants could ask questions of the experimenter to be sure that they understood.

Figure 2: Elicitation of reasons for decision in Experiment 1

On the next screen, participants encountered a retirement calculator with three input fields, labelled ‘Lump Sum at Retirement’, ‘Regular Monthly Payment’ and ‘Years Until Money Runs Out’. The purpose of the calculator was to highlight the relationships between lump sums, regular income and how long the lump sum would last. Participants could fill in any two of the three fields and then click ‘Calculate’. The calculator would then fill in the missing variable under a “bad”, “expected” and “good” interest rate scenario. Thus, it could be used to calculate: (1) what lump sum would be needed to receive a given regular income for a predetermined amount of time; (2) what regular income from a specific lump sum could be expected to last a predetermined amount of time; or (3) how many years a specific lump sum providing a given regular income would last.

Figure 3: Graphic to explain retirement fund in Experiment 1

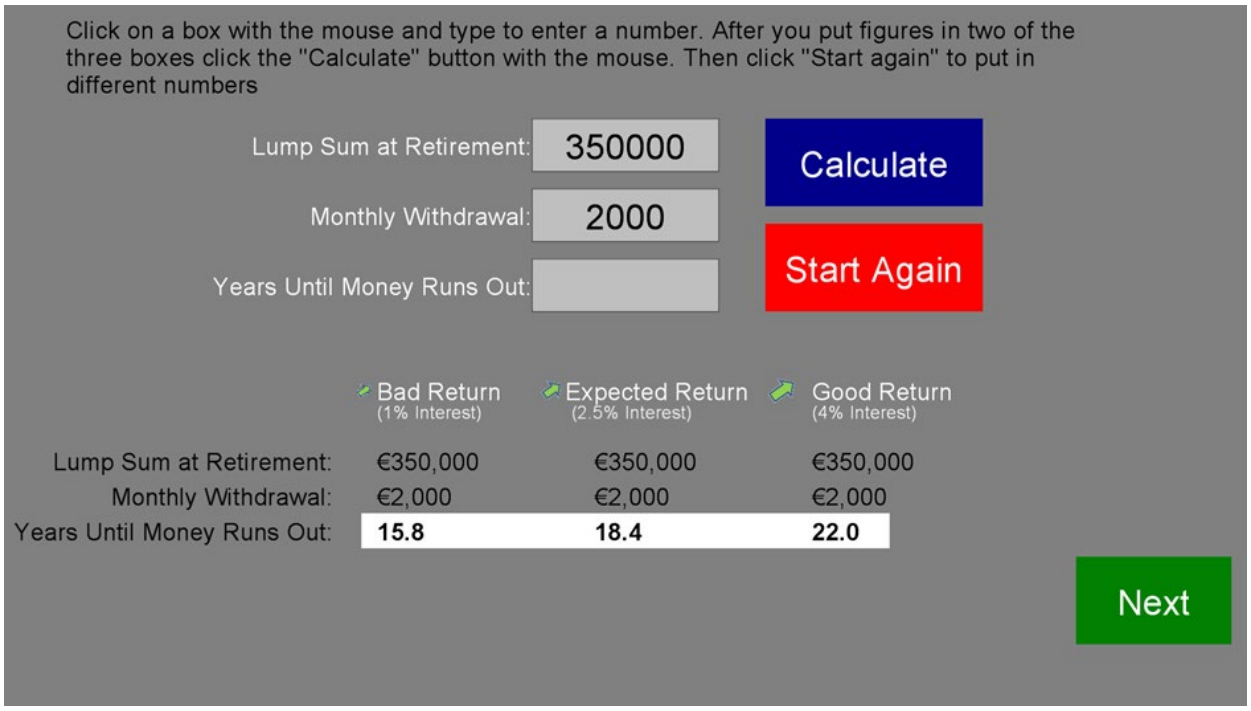


The experimenter talked the group through two guided examples. These were designed not to give any signal regarding what might constitute a normative answer. In the first example, participants typed in the amount they had been presented with in Stage 1, into either the "lump sum at retirement" field or "monthly withdrawal" field, depending on the condition. The experimenter then suggested typing 10 years into the "years until money runs out" field, on the assumption that he only expected to live till 75. He told the group to do the same, then click calculate. The experimenter did the same on the demonstration computer and explained the output via the projector. For the second example the same procedure was followed but the experimenter asked participants to type in 45 years, on the assumption that he expected to live to 110. The output was explained again and the difference to the previous example was highlighted (i.e. much smaller regular income or much larger lump sum, depending on condition).

After the examples, the group were given the opportunity to use the calculator and to input whatever figures they liked into any two of the three boxes and then hit calculate. The lump sum group were told they could leave that box blank and fill in the other two. Likewise, the regular income group were told they could leave that box blank. This part of the

experiment continued for three further minutes. The large majority of participants fully engaged in this task, with 92 continuing to input examples. The modal usage of the calculator was seven times in total. Written feedback at the end indicated that many found it interesting and a helpful tool.

Figure 4: Retirement fund calculator used in Experiment 1



Stage 4 invited to participants to amend their first answer in light of what they had learned by using the calculator. The scenario from Stage 1 was repeated with the participant's previous answer shown onscreen. They could stick with their original response or change. Since it is possible that participants might wish to appear consistent, a third elicitation was then collected. In Stage 5, participants were shown a different vignette. The LS group who had been shown a lump sum from the lower half of the range (less than €400,000) were instead given a scenario with a lump sum from the top half of the range, and vice versa. The equivalent procedure was carried out for the RI group. This stage generated a between-

subjects measure of the effect of the calculator, as every Euro amount shown in Stage 5 had been shown to a different participant in Stage 1 (and Stage 4).

Stage 6 collected some background information by asking participants to provide information in relation to gender, age, educational attainment and whether they had a pension.

3.2 Results

The primary dependent variable was the annuity rate demanded to convert between lump sums and regular income, or vice versa.

3.2.1 Stage 1

Eleven of the 100 responses corresponded to annuity rates below 1% or above 20%. In most of these cases, comparisons with answers at later stages indicated that the participant had inputted the wrong number of zeros when entering a lump sum in the RI condition, or had entered an annual instead of monthly income in the LS condition. After removing these responses, median and mean annuity rates in the LS condition were 5.00% and 6.11% (sd = 2.61) respectively, while the equivalent figures for the RI group were 4.71% and 4.95% (sd = 2.28). A non-parametric Wilcoxon rank-sum test indicated that this difference in annuity rates was statistically significant ($p < .05$).

3.2.2 Stage 2

The most important motive for the decision was "I want to make sure I have enough income later in life" (79 of the 100 participants gave this a ranking of 1, 2 or 3 out of the 10 reasons). The next most important was "I want to prevent money running out too soon" (58

participants), followed by "I want flexibility in the timing of my spending" (37 participants). Interestingly, the fourth most important reason was "I am worried about the company not being able to pay me". These rankings are generally in line with the results of Beshears et al. (2014) for a larger survey sample and clearly indicate engagement with the task.

3.2.3 Stage 3

The retirement calculator was used extensively. Mean usage was 5.85 calculations (sd = 2.47), including the two guided examples. All inputs were recorded and we generated a proxy for expected longevity by computing the mean of each participant's entries to the "Years Till Money Runs Out" box. We omitted the initial entries that the experimenter had instructed participants to enter, as well as 10 out of 457 that were below 5 or above 55 years, since these were most likely mistakes. This expected longevity variable was approximately normally distributed across participants, with a mean of 23 years (sd = 6.2), i.e. living until age 88.

3.2.4 Stage 4

In Stage 4, only four participants gave responses that corresponded to annuity rates below 1% or above 20%. These were dropped. Seventy-two participants changed their original answer given in Stage 1 when the question was repeated. The median and mean annuity rates demanded by the LS group were 5.43% and 6.01% (sd = 1.78) respectively, compared to 4.77% and 5.06% (sd = 2.26) for the RI group. This difference was again statistically significant (Wilcoxon rank-sum, $p < .01$). The lower standard deviation in the LS condition compared to Stage 1 suggests that using the calculator may have reduced variability in the responses of the LS group, in keeping with the idea that people find large lump sums difficult to evaluate (see Section 2).

3.2.5 Stage 5

Four participants produced responses that corresponded to annuity rates below 1% or above 20% and were dropped. In Stage 5, the median and mean annuity rates in the LS group were 5.39% and 6.18% (sd = 2.32), compared to 4.61 and 5.31% (sd = 2.97) for the RI group. This difference was once again statistically significant (Wilcoxon rank-sum, $p < .01$).

3.2.6 Mixed Effects Model

The bivariate analysis above indicates a consistent difference in annuity rate demanded associated with the frame. To explore further the relationship between annuity rates demanded, expected longevity and background characteristics, the responses to the three conversion questions were pooled and analysed via a linear mixed effects model. The dependent variable was the logged annuity rate, specified in basis points to assist interpretation of coefficients. A random effect was estimated for the intercept, with variation in preferred annuity rate between individuals assumed to be normally distributed.[1] Dummy variables were specified to identify the question. Results are shown in Table 2.

Model (1) confirms the result of the bivariate analysis: there was a significant effect of condition on the annuity rate demanded, with the LS condition producing higher rates ($p < .01$). At the median annuity rate, the estimated coefficient indicates that the LS condition increased the rate demanded by 1.19 percentage points, or 0.45 of one standard deviation.

[1] The log transformation of the annuity rate demanded was undertaken to remove the right skew in the raw responses. Logged annuity rates across participants passed standard tests for skew and kurtosis for all three questions ($p > .1$) and Shapiro-Wilk tests for normality ($p > .1$ for the questions in Stages 4 and 5, $p = .09$ for Stage 1). In the latter case, a Q-Q plot revealed a hint of non-normality due to slightly fatter tails in the distribution, so further checks were undertaken to ensure the robustness of the reported results: (i) reducing the sample to those who produced rates between 2% and 15% did not alter the effects; (ii) closely similar effects were obtained by running separate models for each of the three questions; (iii) the point estimates were also similar for a fixed effects model. Given these findings, for reasons of parsimony, the mixed effects model is reported in full.

Model (2) introduces a variable for the size of the pension, standardised within condition.[2] The finding that larger pensions significantly decrease the demanded annuity rate is consistent with the finding of Goldstein et al. (2016) that the relative attractiveness of monthly incomes relative to lump sums increases with magnitude. Since the independent variable is standardised, the coefficient estimates the effect of increasing the pension by one standard deviation (c. €120,000 increase in fund size). Controlling for this variable leaves the main effect unchanged. Interacting the variable by condition reveals no significant interaction (not shown). Model (3) includes the background characteristics collected in Stage 6: educational attainment (specified as below or above degree level), gender, age and whether the individual contributed to a pension. The main effect barely alters, which is to be expected given random allocation into conditions. Educational attainment, a prominent factor identified by previous literature, provides the only other significant effect. Those without a degree demanded a higher annuity rate ($p < .05$). However, tests for an interaction revealed no tendency for the main framing effect to be larger among those with lower educational attainment. Indeed, interactions between frame and the various background characteristics were all non-significant (not shown).

One possible explanation for the influence of educational attainment is that those with lower levels of education expect to live less long, given that lower education is associated with lower life expectancy (Meara et al., 2008). Model (4) provides support for this explanation. When the average number of years that participants inputted to the calculator in Stage 3 is included in the model as a proxy for expected longevity, the effect of educational attainment is diminished and becomes non-significant, while implied expected longevity is itself highly significant ($p < .01$). The influence of the pension size also diminishes and becomes non-significant in Model (4). The longevity variable also provides a benchmark for

[2] Standardising within condition allows a single variable to be specified for both the LR and RI conditions.

the main framing effect: the LS condition increased annuity rates demanded by the equivalent of expecting to live ten years longer.

Table 2: Mixed effects model for the (logged) annuity rate demanded in Experiment 1

	(1)	(2)	(3)	(4)
LS Condition	.228***	.233***	.259***	.227***
	(.069)	(.066)	(.066)	(.062)
Stage 4	.023	.023	.023	.013
	(.037)	(.037)	(.037)	(.037)
Stage 5	.037	.037	.037	.024
	(.037)	(.037)	(.037)	(.037)
Pension size		-.091***	-.081**	-.047
		(.034)	(.033)	(.031)
Education < degree			.145**	.039
			(069)	(066)
Male			-.007	-.000
			(.064)	(.058)
Age			0.003	0.002
			(.003)	(.003)
Pension Holder			.056	.038
			(.073)	(.067)
Implied E(Longevity)				.020***
				(.005)
Constant	1.500***	1.493***	1.261***	1.889***
	(.055)	(.053)	(.137)	(.184)
Var (Constant)	.081	.073	.065	.052
	(.015)	(.014)	(.013)	(.011)
Individuals	85	85	85	82
Obs.	255	255	255	246

* p<0.1; ** p<0.05; *** p<0.01

3.3 Discussion

The results of Experiment 1 support the main hypothesis. When contemplating options at retirement, individuals who made decisions with respect to a pension framed as a lump sum demanded higher annuity rates than individuals who made decisions with respect

to a pension framed as an income stream for life. The effect was statistically significant and the effect size substantial: a gap in annuity rates greater than one percentage point at the median rate, or 0.45 standard deviations. Applied to real markets, this difference would be economically significant. Based on responses across the three questions in this laboratory setting, 39% of responses in the RI condition implied willingness to purchase an annuity at 4% – the approximate contemporaneous market rate in Ireland. For the LS condition, the equivalent figure was just 17%.

Our finding that the annuity rate demanded was lower at higher magnitudes is consistent with Goldstein et al.'s results when measuring perceived "adequacy" on Likert scales, although this effect did not prove robust to controlling for expected longevity (as proxied by individual inputs to the retirement calculator. Brown et al. (2017) found greater gaps in buying and selling prices for additional social security payments among the less well educated. They hypothesised that less educated participants might be more uncertain about how to value a financial asset and, consequently, demand a higher price to exchange it as a defence mechanism against being ripped off. In the current study, by contrast, the framing effect was no larger for people with lower educational attainment. The higher annuity rate they demanded was simply linked to lower expected longevity.

Access to a retirement calculator and associated worked examples did not shift the responses in one condition more than in the other. The dispersion of responses reduced, suggesting learning, but there was no systematic directional effect. Had there been one, such that responses in either the LS or RI conditions more closely matched decisions following an improvement in understanding of the decumulation process, we might have been able to infer that responses under one condition more closely reflected preferences as people became better informed. This was not the case, however.

4. Experiment 2

Experiment 2 aimed to check the robustness of the findings of Experiment 1 and to establish which of the LS or RI condition produces responses that are closer to those obtained under a neutral frame. Some responses in Experiment 1 had to be discarded because they equated to extreme annuity rates that appeared to reflect mistakes when entering numeric values in the matching task. To check that this did not affect the primary result, Experiment 2 employed a more straightforward binary choice task in which participants simply chose between two options. Testing our main hypothesis using a choice task is important also because it is not uncommon to encounter preference reversals between matching and choice tasks (Slovic and Lichtenstein, 1968), so there is no guarantee that a given phenomenon will arise for both kinds of elicitation. Using a choice task also allowed us to compare choices under the LS and RI frames with those under a neutral frame that simply requested participants to pick one of the two options, rather than framing the choice as willingness to convert one to the other. Because this neutral frame has no default setting or endowment, it rules out inertia, behavioural convergence or loss aversion as drivers of choice. To the extent that these influences can be regarded as biases, choices under the neutral frame might be regarded as better indications of true underlying preferences, although this argument is not unchallengeable (Beshears et al., 2008).

All participants made six binary choices between taking retirement income as a lump sum or as a guaranteed regular income for life, with random assignment to one of three conditions: LS, RI, neutral. The first two were as in Experiment 1, except that the participant chose whether or not to convert their pension from a lump sum into a specific guaranteed monthly income (LS condition) or vice-versa (RI condition). In the neutral condition, participants were not told they were currently set to receive either a lump sum or a guaranteed

monthly payment in retirement. Both options were presented simultaneously and participants simply had to make an active choice as to which of the two they preferred.

4.1 Method

4.1.1 Participants

Participants were 180 consumers aged 22-68 recruited by a market research company. The sample was a representative sample of the Dublin population, balanced by gender (91 females), age (mean = 42.46, sd = 13.11) and working status (109 working full time). Eighty eight had a degree or higher. Participants were paid €30 for participation in this task and two unrelated experiments.

4.1.2 Materials

Materials were the same as in Experiment 1.

4.1.3 Design

Participants were randomly assigned to the LS, RI or neutral condition based on participation number. As in Experiment 1, for the LS and RI conditions, participants were set to receive their pension in a given form and could choose to convert their pension to the other form by opting for the alternative offered by the pension company. In the neutral condition, participants were not told that they were set to receive either a lump sum or a guaranteed monthly payment; they had to make an active choice. For those in the neutral frame, for half the participants the lump sum always appeared on the left; for the other half always on the right. We did not vary the position of options within-subject as we thought it might be

confusing and possibly cause participants to make mistakes. Screenshots of the primary decision of interest for the three conditions are shown in Figures 5-7.

Figure 5: Lump Sum (LS) Condition in Experiment 2

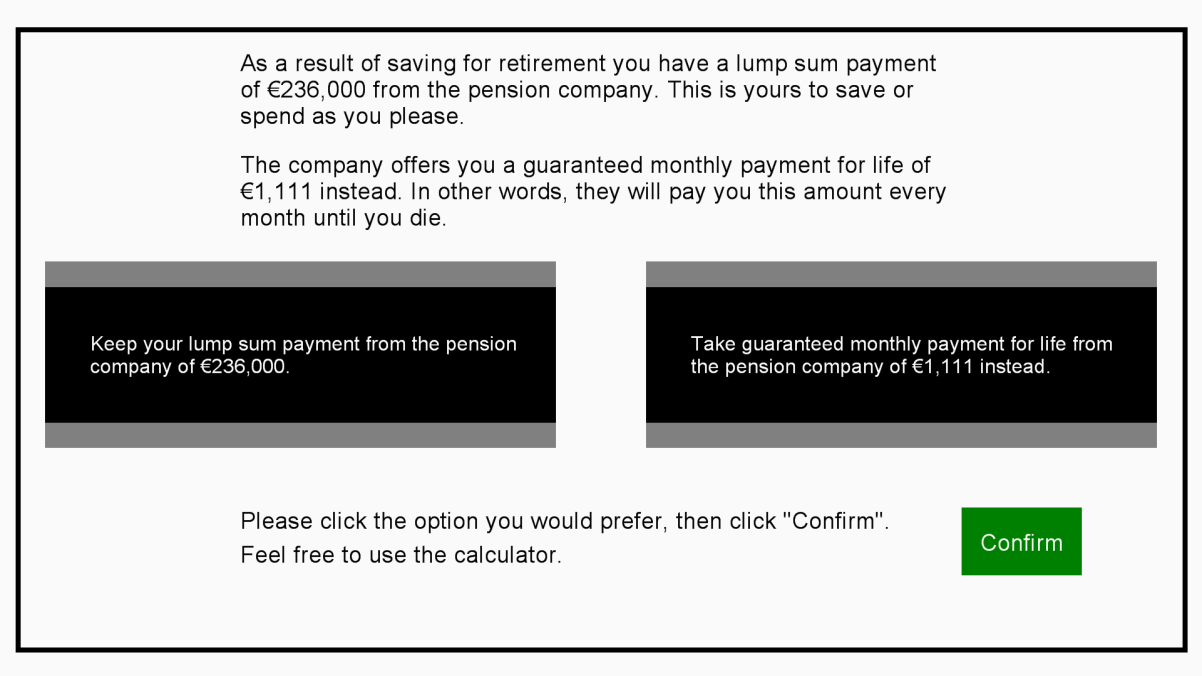


Figure 6: Regular Income (RI) Condition in Experiment 2

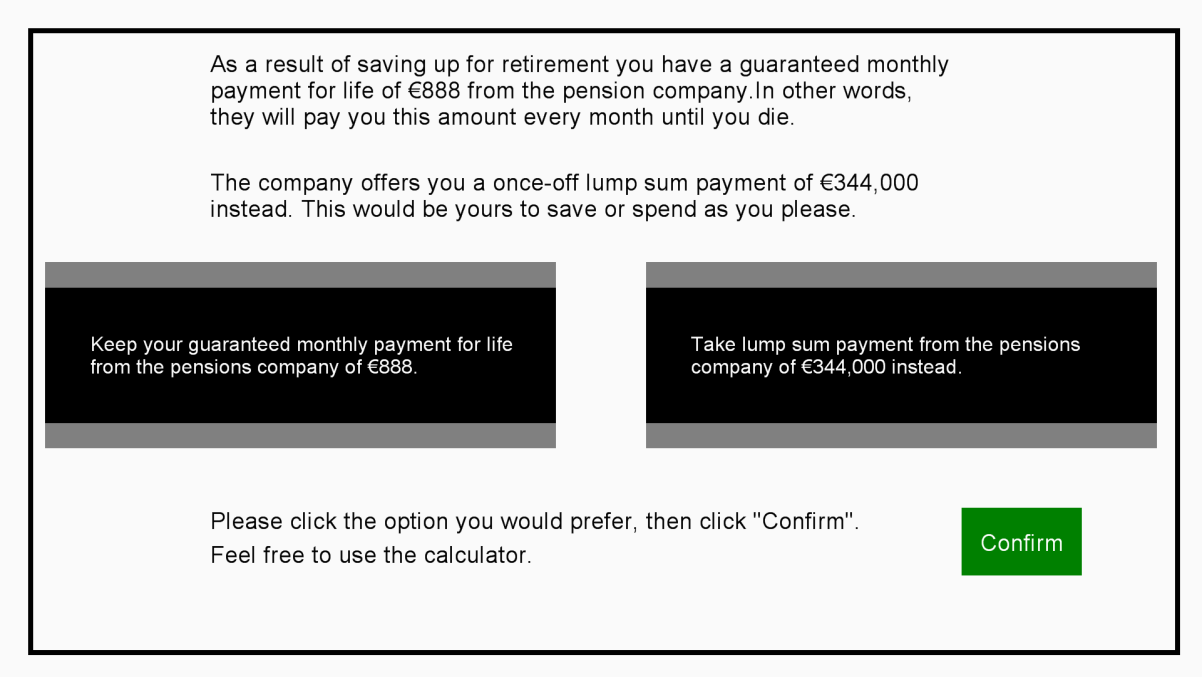
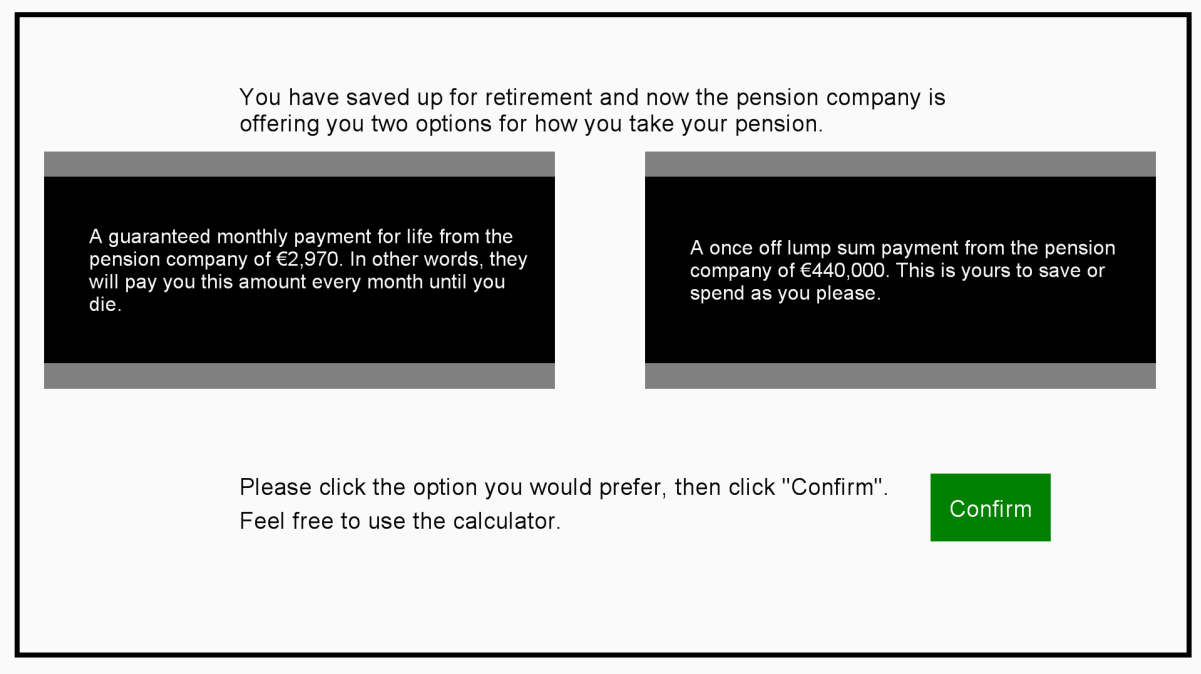


Figure 7: Neutral condition in Experiment 2



The monetary amounts for each choice were drawn pseudo-randomly from uniform distributions of lump sums and regular incomes. The range of lump sums was €200,000 – €560,000 and the range of monthly incomes was €916 – €2,566, matched according to an annuity rate based on the results of Experiment 1 of 5.5%. These ranges were divided into six to form a six-by-six matrix of LS-RI pairs. Selection was random subject to the criterion such that each row and column was picked only once for each participant. Across their six choices, each participant was therefore presented with a wide range of lump sums, incomes and annuity rates, with different participants experiencing different numbers. The logic of this design was to avoid the possibility that certain salient numbers or combinations of numbers might systematically affect choices. The median annuity rate was 5.5%, which was chosen based on responses in Experiment 1 in order to ensure variation in responses across

conditions. Trials were matched across conditions such that one participant in each condition was given the identical choices in the same order to one participant in each of the other two conditions.

4.1.4 Procedure

The procedure closely followed that in Experiment 1. The experiment was undertaken in groups of five. After signing the consent form, the experimenter asked the participants to imagine they were 65 and about to retire. They were told that one the next screen they would be presented with a retirement scenario. As in experiment one, they were told there were no right or wrong answers and that they were free to use the calculators provided when answering the questions. They were also informed there were six questions to answer in total.

Participants completed the six binary choices at their own pace. On completion, they were asked whether they had used the calculator and if so, whether they found it helpful. This concluded the experiment. Questions on background characteristics were asked at the end of the experimental session after two unrelated tasks were completed, approximately 30 minutes later. These questions included one that asked them how long they expected to live.

4.2 Results

Out of the 1,080 choices (180 x 6), the annuity was chosen 443 times (41%). There were differences by condition, with the annuity being opted for on 36% of trials in the LS condition, 44% in the RI condition and 43% in the neutral condition. Preliminary analysis revealed that despite randomisation into conditions, there were significant differences

between conditions in reported expected longevity.[3] Consequently, we present analyses that control for expected longevity. The number of times each participant opted for the annuity (a score ranging from 0-6) was employed as a dependent variable in a series of regressions reported in Table 3. Models 1 and 2 are Ordinary Least Squares (OLS) models, but given that the dependent variable had only seven possible values for robustness we also present ordered logistic models (Models 3 and 4). There is strong consistency across the two types of model. The primary framing effect is statistically significant ($p < .05$) and of consistent magnitude across the four specifications. As in Experiment 1, those in the RI condition were more likely to opt for the annuity. The point estimate for the neutral condition lies closer to the RI condition, but the difference between the neutral and LS conditions is just short of statistical significance (except in Model 2, $p < .1$). There was again a positive relationship between expected longevity and the propensity to choose the annuity. Comparison of coefficients indicates that framing the pension as regular income rather than a lump sum had a greater effect on the probability of choosing the annuity than a ten-year increase in expected longevity. In this choice experiment, by contrast with the matching procedure in Experiment 1, males and older participants were less inclined to opt for the annuity.

[3] Logically it is possible that the condition into which people were randomised somehow affected reported life-expectancy, which was collected subsequently. We judge this possibility to be highly unlikely. The expected longevity question was asked approximately half-an-hour after the experiment was completed and following participation in two other unrelated studies. Furthermore, there is no theoretical or reasoned argument of which we are aware that would link the different frames to an individual's expected longevity. Far more likely is that this was a product of random allocation. Moreover, since higher expected longevity was recorded for individuals in the LS condition, any bias induced would have acted against our main hypothesised effect.

Table 3: OLS and ordered logistic models for the number of times participants chose the annuity over the lump sum in Experiment 2.

	OLS		Ordered Logistic	
	(1)	(2)	(3)	(4)
Condition (Ref: LS)				
No Frame	.508	.551*	.437	.544
	(.330)	(.326)	(.327)	(.336)
RI Frame	.694**	.685**	.683**	.670**
	(.336)	(.332)	(.327)	(.326)
Life Expectancy: (Ref <= 70)				
70-79	.432	.363	.350	.240
	(.488)	(.486)	(.483)	(.499)
80-89	.909**	.735	.878*	.663
	(.459)	(.464)	(.453)	(.473)
90+	1.379**	1.129*	1.299**	0.922
	(.580)	(.591)	(.574)	(.616)
Average Annuity Rate	.465	.353	.464	.407
	(.423)	(.424)	(.420)	(.431)
Education < degree		.140		.056
		(.313)		(.314)
Male		-.589**		-.602**
		(.273)		(.289)
Age		-.023*		-.025**
		(.012)		(.012)
Pension Holder		-.032		-.091
		(.281)		(.288)
Constant	-1.473	-0.21		
	(2.619)	(2.74)		
Obs.	180	180	180	180
R^2	.06	.11		

* p<0.1; ** p<0.05; *** p<0.01

Since the above models aggregated the data across decisions with varying annuity rates, it was possible to control only for the mean rate across each individual's six decisions. This may have dampened estimated effects. Consequently, the individual choice data were also fitted with a generalised liner mixed (GLM) model using a logistic link function, where the dependent variable was whether the participant chose the annuity. This allowed both the annuity rate and the size of the pension for each choice to be controlled for. Participants were

assumed to vary normally in their overall propensity to opt for the lump sum or annuity, modelled via a random effect on the intercept. The resulting models are shown in Table 4.

Table 4: GLM models for choosing the annuity in Experiment 2.

	(1)	(2)
Condition (Ref: LS)		
No Frame	.715	.789*
	(.445)	(.434)
RI Frame	1.048**	1.019**
	(.450)	(.440)
Life Expectancy: (Ref <= 70)		
70-79	.640	.509
	(.663)	(.649)
80-89	1.302**	1.012
	(.624)	(.619)
90+	1.964**	1.530*
	(.784)	(.785)
Annuity Rate	.593***	.591***
	(.049)	(.049)
Pension size	.028	.026
	(.124)	(.124)
Education < degree		.075
		(.411)
Male		-.764**
		(.364)
Age		-.029*
		(.016)
Pension Holder		.060
		(.367)
Constant	-5.898***	-4.114***
	(.806)	(.996)
Var (constant)	4.178	3.852
	(.868)	(.811)
Individuals	180	180
Obs.	1,080	1,080

* p<0.1; ** p<0.05; *** p<0.01

These models confirm the findings of the aggregated analysis in Table 3. The RI frame increased the probability of choosing the annuity, while the neutral frame produced choices that were closer to the RI frame than the LS frame, with the latter difference being marginally significant ($p < .1$ in Model 2). The framing effect is again estimated to be stronger than the effect of expecting to live for ten years longer. In this decision-level model, a comparison of coefficients suggests that the main framing effect was the equivalent of an increase of approximately 1.75 percentage points in the annuity rate. Thus, by this measure, the estimated effect was stronger in this choice experiment than in the matching procedure of Experiment 1.

The models also reveal no significant effect of the size of the pension (measured as the standardised lump sum on offer) on whether to choose the annuity; the coefficient in both models is positive but small. Lastly, males and older people were less inclined to choose the annuity.

We conducted an additional check for any differences to the spatial positioning of the options in the neutral frame. This generated a surprising result. Participants in the neutral condition were more likely to choose the annuity when it was positioned on the left. Furthermore, this effect was as strong as the main framing effect recorded between the LS and RI conditions. Since we did not hypothesise this effect prior to the analysis, it is not reported in full above. However, when the neutral condition is split into two separate left-right conditions in the equivalent of Model 1 in Table 3, the difference is be highly statistically significant ($\beta_{left} = 1.100$, se = .396, $p = .006$; $\beta_{right} = -0113$, se = .400, $p > .5$), confirmed also by the corresponding test using the specification of Model 1 in Table 4 ($\beta_{left} = 1.484$, se = .530, $p = .005$; $\beta_{right} = -.134$, se = .539, $p > .5$). As indicated by these coefficients, the point estimates for left versus right framing in the neutral condition are similar to the main LS versus RI effect. Indeed, there is no statistically significant difference

in choices between the RI condition and the neutral condition with the annuity placed on the left, or between the LS condition and the neutral condition with the annuity placed on the right. No other findings reported above are altered by separating the neutral frame in this way.

4.3 Discussion

Experiment 2 provides further evidence that framing a pension as a large accumulated fund results in a higher demanded annuity rate than when a pension is framed as a guaranteed income stream for life. The main effect size recorded in Experiment 2 was larger than in Experiment 1 – equivalent to 1.75 percentage points on the annuity rate. This may be related to the choice rather than matching procedure employed. The matching procedure in Experiment 1 required participants to generate a number to match a lump sum to a regular income or vice versa. One possibility is that this process induced a greater degree of noise into participant's responses that somewhat dampened the effect relative to the binary choice elicitation.

The difference in task removed any effect of the size of the pension on the preference for an annuity. The implication is that the findings of Goldstein et al. (2016) that annuities are more attractive relative to lump sums at higher magnitudes, do not translate to binary choices between the two options. In that study, regular incomes and lump sums were not directly compared but instead rated for adequacy on Likert scales. This may account for the different result, although we note that the range of magnitudes covered in the present study was narrower. Future research needs to examine further the genralisability of this effect.

The second aim of Experiment 2, which was to compare responses to a neutral frame, was somewhat undermined by the surprisingly strong left-right bias in the neutral condition.

Although we did not hypothesise this, it was highly statistically significant and mirrored the main effect. Substantial left-right biases in decision tasks are not unprecedented and may be caused by strong order effects in comparisons. If the option on the left is read first, it can affect the psychological mechanisms used to make comparison (Englund and Helström, 2018). In the present case, the mental mapping involved in comparing a monthly income to a lump sum requires the negotiation of a trade-off between numeric amounts differing by more than two orders of magnitude. It is possible that this mapping process is somehow calibrated or biased by which of the two is considered first, perhaps leading participants to build some kind of margin for error into their conversion. An alternative is that the strong tendency to opt for the choice presented on the left is an indication that participants were not fully engaged in the task, which was after all hypothetical. We judge this latter possibility to be highly unlikely, however. The data revealed strong, systematic relationships between choice, expected longevity and the annuity rate presented, which indicate proper engagement in the decision and consideration by participants.

5. General Discussion

Taken in aggregate, the findings presented in this paper suggest that framing a pension as a lump sum – a "nest egg" or "pension pot" – may influence retirement decisions. In two experiments using representative samples of adults, different elicitation methods, and an experimental set-up that did not impose any cognitive constraints (calculators were provided and there were no time limits), a substantially higher annuity rate was demanded in hypothetical choices when the pension was initially framed as a lump sum rather than as a regular income. If these laboratory findings generalise to real-world settings, the measured

effect sizes of 1 – 1.75 percentage points imply a large effect on people's willingness to purchase an annuity – more than doubling it at present market rates.

Of course, whether one can generalise the effect from the laboratory is difficult to ascertain. On the one hand, the decision over retirement options is a once-off decision that individuals must make based on abstract concepts with which they have little familiarity, just as in our experiments. Arguably, the worked examples and use of a decumulation calculator in Experiment 1 may exceed the assistance that is typically taken up for these decisions in many real life settings. On the other hand, in such real life settings the decision is highly incentivised, can be taken over a much longer period of time and may be subject to multiple conversations and inputs, including perhaps professional advice. In both experiments, expected longevity strongly and systematically influenced the annuity rate demanded, suggesting that participants engaged with the task fully. For now, we contend that our results at least show that there is a susceptibility to a framing effect of substantial magnitude. Further research will be needed to establish the conditions under which the effect may be present, mitigated, or indeed absent.

The present results also add to the growing literature on choice of annuities versus lump sums. They confirm that the valuation of annuities is subject to strong context effects (Brown et al., 2008; 2017). However, the effect we report here cannot be accounted for by individuals building in margin as a defence against being ripped off by annuity providers (Brown et al., 2017), because it occurred in direct binary choices in which no exchange was implied or required. Our findings also question the generalisability of previous results that suggest a stronger preference for annuitisation of larger funds (Goldstein et al., 2016), since we did not observe this in a binary choice task.

From a policy perspective, the present findings raise some issues. We emphasise three. First, the potential welfare effects involved in the decision under study are large. How

to receive a pension is a major financial decision, which carries the risk of leaving an individual short of income in extreme old age. If the decision can be manipulated as easily as the present study implies, this is a cause for some concern. Second, it can reasonably be argued that the alternative financial arrangements for receiving pension benefits, including retirement funds that offer a mix of non-secured investments and regular drawdowns, are perhaps more complicated than annuities. There is a need to undertake empirical work on how individuals comprehend such products, how they make choices between them and whether the context in which such choices are made might be improved. Third, as we have emphasised throughout the present paper, given such a large inconsistency in decision making there is a need to understand what might be regarded as a "good" decision. Regulatory policy has the capacity to influence how decisions are framed via regulations that cover marketing, disclosure and advice, but it is not obvious which frame is most desirable. This is a considerable challenge, but one that can be informed by empirical research (Beshears et al., 2008). In the present study, our attempts to uncover what might be regarded as a better indication of underlying true preferences failed to overcome the framing effect that constituted our main hypothesis. However, other techniques designed to contrast choices with more informed preferences or more neutral frames can be a feature of future work.

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