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Motivated Saving: The Impact of Projections on Retirement Saving Intentions

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Abstract:

The implications of current balance information for retirement provision are considerably difficult to grasp or anticipate. We study how balance and/or income projections motivate the voluntary savings intentions of pension plan participants over a sequence of ten choices. To this effect, we collect savings intentions from 1,615 respondents aged 25-57 years via an online experimental survey that compares four different formats for retirement account information. The formats are (i) current balance; (ii) current balance and projected retirement balance; (iii) current balance and projected retirement income; and (iv) current balance, projected retirement balance and retirement income. Regardless of information format, merely inviting plan participants to top up their retirement account prompts substantial increases in savings, especially among older respondents. At the first choice round, the income projection triggers marginally more voluntary saving intentions than the lump sum projection alone. However at both the first choice and over sequential choices, the combination of balance and income projections is what matters most. Furthermore, even though older respondents save at a higher level across all treatments, younger respondents are more sensitive to income balance projections than the older survey respondents.

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1. Introduction

The format of information matters. The yoghurt that declares itself "90% fat-free" is identical in fat content to the one labelled "10% fat" and yet the former is likely to be more appealing than the latter. Indeed, the US Government was so concerned about the potential for these different formats to mislead people, that in 2011 they mandated that companies could only claim products to be 90% fat-free if they also stated they were 10% fat (Sunstein, 2017). This influence of 'information architecture' (Johnson et al., 2012) is widespread (e.g., Larrick and Soll, 2008) and underscores the simple fact that information which is mathematically equivalent is not always psychologically equivalent (e.g., Bonner and Newell, 2008; Newell, Mitchell and Hayes, 2008).

We study the impact of information architecture in the context of retirement savings. Even in countries where contributions to retirement plans are mandatory, many people retire with inadequate savings, (e.g., Mitchell and Moore, 1998; Skinner, 2007; Knoef et al., 2015, Poterba, 2014). Consequently, there is a critical and continuing need to improve the presentation and understanding of retirement information. To do so, we build on one aspect of information architecture that has shown promise in influencing saving levels: the presentation format of projected retirement wealth.

Participants in most defined contribution (DC) plans must rely on reports that only show their current account balance to figure out whether they are saving enough. The overwhelming tendency to focus more on the present than the future – the 'present-bias' (Loewenstein and Elster, 1992; Ainslie, 2001) – along with the well-known difficulties people have making forecasts that require compounding (e.g., Hilgert et al., 2003; Eisenstein and Hoch, 2005; Lusardi and Mitchell, 2009; Stango and Zinman, 2009; McKenzie and Liersch, 2011), make it likely that participants will have poorly formed expectations of their retirement wealth. Conscious of these difficulties, some plan providers have begun to show participants projected retirement wealth.[1] Thus a key consideration is whether to present wealth as a 'lump-sum' and/or as a financially, but not necessarily psychologically, equivalent income-stream.

[1] Australian pension plans have been encouraged by the regulator to provide projections to plan participants since late 2014 (ASIC 2014). Several large plans have added projections to their periodic participant statements, including Cbus (pension plan for construction and building workers) and UniSuper (pension plan for University employees).

Previous literature suggests that these two formats have a differential effect on intended and actual savings. For example, a field study by Goda et al. (2014) showed that when a plan provider gave one group of participants planning information and projections of their monthly retirement incomes, the group who received the information and projections saved more, on average, in the next period than similar participants who did not. In related work, an on-line study by Goldstein et al. (2016) showed that presenting projections as either lump sums or income streams led to what they termed an "illusion of wealth, and its reversal". Specifically, they demonstrated that participants who were asked to imagine relatively small lump sums ($100,000) indicated lower savings intentions than those shown the equivalent annuity ($500 per month). However, when the task involved relatively large lump sums ($2 million) the pattern reversed, with participants indicating higher savings intentions than for the equivalent annuity ($10,000 per month). In essence, these results highlight a greater sensitivity to changes in wealth expressed in monthly amounts than in lump sums. This manifests as an 'illusion' where relatively small annuity streams are perceived as less adequate for retirement than equivalent (small) lump sums, with the reverse perception of high amounts.[2]

One potential psychological account of why this pattern emerges builds on long-established ideas of loss-aversion and reference-dependent utility (e.g., Kahneman and Tversky, 1979). Goldstein et al. (2016) speculate that monthly amounts are more readily compared to current consumption rates and thus act as natural reference points. A monthly 'salary' of $500 is likely to be lower than a saver's current monthly spend and thus perceived as loss, in turn inducing greater savings intentions. In contrast, an income of $10,000 per month is likely to exceed current monthly budgets and be perceived as a relative gain, thus leading to lower savings intentions. Lump sums, in contrast, generally do not have such readily available reference points and thus savers are less sensitive or susceptible to changes in their overall size.

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[2] Several studies have tested the effect of projection information on retirement savings with mixed results. For example, Fajnzylber et al. (2008) show that older Chilean retirement savers add to their savings after receiving a pension projection from Fund Administrators, and Dolls et al. (2018) use German administrative data to show that people raised their private retirement savings in response to a letter from the pension administration that explained basic facts about the retirement saving system and showed their expected pension entitlements. On the other hand. Mastrobuoni (2011) did not detect any significant change in retirement or claiming dates in response to information about estimated Social Security Benefits in the US.

We build on these two recent studies in three ways. First, we introduce a comprehensive experimental design that includes a baseline treatment providing only information about current balance (i.e. no projection). This mirrors the most common current industry practice for DC plans in our context. We then compare this treatment to ones in which the current balance is combined with i) a lump sum (retirement account balance) projection, ii) an annual projected income stream (for the first 25 years of retirement), and iii) both the lump sum and the income stream. This allows us to tease apart the isolated and combined effects of the different formats thereby complementing Goda et al. (2014) and Goldstein et al. (2016) neither of whom examined all these combinations. This comprehensive design thus has the potential to shed light on practical questions providers and regulators have about the optimal way to present retirement wealth to plan-participants.

Our second innovation is to incorporate an important feature of retirement savings decisions that is not addressed in previous work: a saver's ability to revise and change her contribution rate periodically over her working life. From time to time, plan participants can change how much they contribute in response to new information about their account balance. Because past decisions affect current and expected wealth, it is possible that information framing will affect a single period saving decision differently from the way it influences the whole pattern of saving decisions over a working lifetime. It follows that we need to understand the potential interactions between information formats in *successive* saving choices as well as in a single choice.

Third, we examine the impact of projected wealth on participants of different ages. As a saver ages and approaches retirement, the difference between her current and projected balance necessarily reduces. Thus, any impact of information format might be expected to be different for younger and older age groups. Such a result would have important policy implications because it implies that different age groups should be targeted via age-relevant information formats.

We investigate these questions in an on-line context using a panel of pension plan participants. The respondents in our experiment make hypothetical choices, but the saving scenarios we present are not hypothetical. Rather, they are calibrated to the age-related median incomes and retirement account balances accumulated by savers in our target population (Australian pension plan participants), while the balances and projections evolve dynamically by following realistic trajectories. This feature of our experiment places our study between the field-study of Goda et al. (2014), and the one-shot, uncalibrated, hypothetical study of Goldstein et al. (2016). Notably, our use of calibrated scenarios means that most of our respondents face choices that are similar to the lower end of the values examined by Goldstein et al. (2016) (because most Australians do not have balances of $2 million to look forward to). This means that if we were to observe a wealth illusion, it would manifest as higher savings for participants shown income projections (which may be perceived as inadequate for retirement due to their 'low' dollar-value) compared to those shown lump-sum projections.

An open question remains for how savings levels will be affected when *both* types of information are present. One possibility is that the equivalence of the two formats will become transparent to participants, thereby cancelling out any differential influence on savings decisions. Alternatively, one of the projection formats may exert a stronger influence thereby pushing savings behavior more in line with either the income-projection, or the lump-sum projection treatments. Then again, there may be an additive effect whereby encouraging savers to think about their retirement wealth in both formats leads to a general increase in savings. We can evaluate these alternatives using the savings choices that respondents make in the first round, mimicking the one-shot choice of Goldstein et al. (2016) and Goda et al. (2014). Our tentative prediction was that respondents given both projections would exhibit similar savings behavior to the income-projection treatment, consistent with the reference-dependence account sketched above (where respondents perceive low incomes as a loss relative to current consumption). However, this remained a weak prediction given the paucity of prior data examining this exact question.

By observing respondents' savings intentions at later choices, we measure the effect of different projections on the time path of savings. Since projections update for each respondent at each choice set, respondents receive feedback about the effects of their decisions at earlier choice sets. This feedback could have a range of effects on final retirement wealth. On the one hand, people who choose to save extra might be encouraged to save even more because of the growth they observe in their current or projected balance. We hypothesize that this positive feedback could be particularly effective for respondents in the lump sum projection treatments who might find lump sums to be more satisfying than income streams, or who do not anticipate the effects of compounded growth and are pleasantly surprised by the increases their saving generates. Of course, income streams also rise when respondents decide to raise their contributions, but income stream changes could be less noticeable than lump sum changes, possibly dampening feedback effects when compared with lump sums. Alternatively, and for similar reasons, respondents who see lump sum projections could become satisfied with their retirement prospects and stop saving. The question of how respondents who get both types of feedback behave is open.

To foreshadow our basic results, we demonstrate that i) simply inviting respondents to consider their retirement wealth increases voluntary saving – irrespective of information presented (i.e. we see respondents in all treatments top up their accounts); ii) that the provision of lump-sum and income stream projections *together* has the largest impact on savings both at the first choice and after the ten rounds of choices; and iii) that the sensitivity to projections is stronger in the younger respondents than the older ones.

The paper proceeds as follows: The next section presents the experimental design and implementation. In Section 3 we show and discuss the results of our three experimental treatments, while Section 4 concludes with brief theoretical and policy implications of our findings.

2. The Experimental Framework

We use an online experimental survey involving 1615 plan participants where savers see their account balances presented in different formats. We fielded the online experimental survey in two rounds: Version 1 in August 2017 and Version 2 in December 2017, both via the web-panel provider Pureprofile. Both versions were implemented between-subjects and were identical with the exception that Version 1 involved a two-stage saving decision and Version 2 a single-stage decision, as discussed below.[3]

The experimental survey consists of three stages: screening; experimental task; and covariate collection. Screening ensured that respondents were all pension plan participants in the

[3] Links the two versions of the survey can be found for Version 1 at http://survey.us.confirmit.com/wix/p3083650853.aspx and Version 2 at https://survey.us.confirmit.com/wix/1/p3085280331.aspx.

accumulation phase at the time of the survey, that the sample was split 50:50 between genders and that four age groups: 25-30; 31-39; 40-48; and 49-57 were approximately equally represented.

The experimental task was designed to test four between-subjects account balance treatments in which respondents saw: 1) their current plan balance; 2) their current balance and a projected lump sum balance at retirement, based on a formula set by regulation; 3) their current balance and a projected 25 year income stream beginning at retirement, again computed by the regulated formula; and 4) their current balance, projected lump sum balance and projected 25 year income stream. In summary, the experimental design consists of 2 versions x 4 age groups x 4 account balance treatments.

As background information, we informed respondents that we were interested in how much people plan to save for retirement in addition to compulsory retirement plan (superannuation) contributions, which for most people are 9.5% of their earnings. We explained that we would present a sequence of ten choice sets and ask respondents if they would like to save extra into their retirement account out of their discretionary income (which we call 'left over income' in the choice sets) for that choice set (year) only. We further explained that for each choice set we show typical income, expenses, and retirement account balance information for a person around their age. Respondents were then told that they would progress towards retirement through the ten choice sets, each time being offered the option to save extra into their retirement account out of their discretionary income. We stated that all amounts were after tax and expressed in today's dollars (and explained that this means they are adjusted for inflation). We also highlighted that, in addition to their personal retirement account balance, many people are entitled to a government "Age Pension" of around A$20,000 a year from age 67.

Respondents then completed choice sets one to ten, where they hypothetically progressed from their allocated starting age (the upper bound of the age group to which they had been allocated) to retirement. This age progression, set out in Table 1, shows that, by choice set 10, all respondents had hypothetically progressed to age 66 where they made their final extra saving decision before "retirement" at age 67.

In Version 1 of the survey we elicited voluntary saving intentions in two-stages by first asking the binary question 'Would you save some of your left-over income into your superannuation fund? (Yes/No)'. For those who answered 'Yes', we then asked, 'What percentage of your leftover income would you save into your superannuation fund this year?', followed by five options: 25%, (of leftover income) 50%, 75%, 100%, and an open box for custom amounts. Version 2 involved a single decision where we asked, 'What percentage of your left-over income would you save into your superannuation fund this year?', followed by six options: 0%, 25%, 50%, 75%, 100%, custom amount. In all other respects Version 1 and Version 2 of the survey were identical. We ran Version 2 in an effort to replicate the findings in Version 1, to guard against the possibility that some respondents clicked 'No' in the initial question of Version 1 due to a lack of engagement rather than the expression of a true preference, and to test a variation in the choice architecture. In other words, an inadvertent feature of the two-step choice architecture used in Version 1 may have, by itself, impacted savings rates independent of any treatment effects. In both versions we tested the four between-subjects account balance treatments for participants in the four allocated age groups (which are associated with four hypothetical starting ages - 30, 39, 48 and 57).

Figure 1 (for Version 1) and Figure 2 (for Version 2) show screen shots of the first choice set for treatment 4 (where respondents were shown their current balance, projected lump sum and projected income stream) and age group 25-30 (hypothetical starting age 30). Respondents in the other three information treatments saw (both before and after the choice of extra contributions – if any) the current plan balance only (treatment 1), the current plan balance and projected lump sum retirement balance at age 67 (treatment 2), and the current plan balance and projected retirement balance at age 67 translated into an annual payment made for 25 years from age 67 (treatment 3).

The income, expenses and left over (discretionary) income information we showed participants in each choice set for each age group is consistent with population medians (ABS 2015, 2016a) adjusted by the personal income tax rates applying in 2017.[4] Similarly, the starting account balances by age are also consistent with population medians (APRA 2017) and are adjusted for mandatory contributions and for respondents' voluntary savings over the sequence of ten choices. We followed Australian regulations to compute the projected lump sum retirement account balance

[4] Income, expenses and disposable income information by age group is shown in Appendix 1, Table A1.

and projected 25-year annual payment (ASIC 2014). Assumptions of these regulations that are relevant to this study include: a real investment return of 3% p.a.; a retirement age of 67; that the estimated income stream be calculated and expressed as an annual payment of 25 years from retirement age 67; and that the estimates be expressed in today's dollars.[5]

Once respondents completed the ten choice sets, they progressed to the third stage of the survey in which they answered questions on risk attitude (Dohmen et al. 2011), patience; retirement adequacy; subjective financial literacy, objective financial literacy (Lusardi and Mitchell 2011) and numeracy (Likpus et al. 2001); superannuation knowledge (derived from Agnew et al. 2013) and trust in pension plans (Agnew et al. 2012); bequests; subjective longevity; personality traits; and demographics. Respondents who completed the survey received a small compensation from the panel provider amounting to around $4 US redeemable as cash or rewards.

Industry and regulatory context

Our experimental retirement account balance treatments are based on the regulatory framework in Australia, where over 90 percent of employees belong to DC pension plans. These plan participants receive a mandatory employer contribution of 9.5% of earnings and have the option to make additional voluntary contributions. Pension plans are required to provide benefit statements to plan participants at least annually that, as well as other key information on contributions, investment returns, and fees and taxes, must include the participant's current balance (Commonwealth of Australia 2001)[6]. Since 2014 Australian pension plans have been allowed to provide retirement estimates on benefit statements (ASIC 2014). Under the regulatory guidelines, plans must provide both a projected lump sum account balance and a projected annual income stream, as well as the current account balance.[7]

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[5] Retirement account balance information by age group is shown in Appendix 1, Table A2.

[6] Specifically, the Corporations Act 2001 - s1017D and 1017DA.

[7] Other requirements for the inclusion of retirement estimates in benefit statements include: an assumed investment return of 3 percent p.a.; benefits be shown in today's dollars; an assumed retirement age of 67; the annual income stream must assume and show income payments for 25 years; the Age Pension can be included and if so it must be assumed that - the member qualifies for the Age Pension, the member has a partner and both jointly own their own home, have the same amount of superannuation and no other assets or income; current tax conditions and legal factors remain unchanged (ASIC 2014).

Elsewhere in the world the presentation of account balance information on benefit statements generally differ by whether plans are defined benefit (DB) or DC. DB plans by their design show projected incomes (often presented as a retirement replacement rate) while DC plans, defined as a function of contributions and net earnings, have traditionally shown the current account balance only. However, with the increasing coverage and importance of DC plans in retirement provision, and concerns about engagement and under-saving of plan participants, plan providers, regulators and policymakers have been contemplating providing supplemental account balance information. For example, in the US the "Lifetime Income Disclosure Act" – which would require workplace retirement plan providers to provide an annual statement to plan participants showing how their (current) lump sum savings translate into a lifetime stream of monthly annuity income - has been under consideration by Congress and relevant committees since 2015.[8] [9] Similarly, while UK pension plans are required to report current balances to plan participants on an annual basis, plan participants are able to request an individual retirement projection from their pension provider.[10] Our investigation of the impact of alternative information formats for retirement account balances is therefore timely and relevant to plan providers, regulators and DC plan participants.

3. Results

This section presents our findings on whether different information formats for retirement account balances might encourage retirement plan participants to reconsider their current savings patterns. The experiment includes several mechanisms that could encourage respondents to choose to save incrementally more. First, respondents are compelled to notice the level of a typical retirement account balance for a person around their age and to decide whether or not to increase that balance by sacrificing part of their discretionary income. This step probably forces many of our respondents to engage with their retirement plan more than they ever have in the past, so we begin

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[8] Note that the proposal under review by the US Congress is for income information based on the accrued or current balance– see https://www.congress.gov/bill/115th-congress/house-bill/2055. Key concerns as this Bill has progressed through Congress and committees relate to the life expectancy and interest rate assumptions required to produce lifetime annuity projections. The current version of the legislation directs the Department of Labor to prescribe the assumptions.

[9] In the both US and Australia the development of a regulatory framework for retirement balance and/or income information and projections has identified the challenges of prescribing underlying assumptions for investment returns, interest rates and life expectancy.

[10] https://www.gov.uk/workplace-pensions/managing-your-pension.

by reviewing aggregate saving responses. We then examine the conditional effects of the information formats on saving intentions, by comparing between current balance, projected lump sum and projected income stream presentations of wealth. Finally, we review the variations in savings patterns that emerge as respondents make successive choices in response to updated account balances and wealth projections.

3.1. Data and summary statistics

We begin with descriptive statistics of the sample characteristics and aggregate results. Our study consisted of two rounds of the online experimental survey described in Section 2 where we employed a panel provider (Pureprofile) to field the survey to representative samples of the Australian population who passed age, gender and retirement plan membership filters.[11] The first round included 795 respondents and the second one included 820 respondents (for a total of 1,615 participants), with current ages between 25 and 57 years, consisting of 50% males and 50% females. The panel provider randomly allocated respondents from each age group (25-30, 31-39, 40-48, and 49-57) between the four treatment groups placing 25% of the total sample of respondents in each treatment. This random-assignment procedure was largely successful, with one exception: the 25-30 year-olds made up only 19% of the sample and are somewhat underrepresented compared with 29%, 27% and 24% for the three older age groups respectively. Even so, we have at least 70 respondents per treatment group in the youngest age range.

Simply showing respondents a typical retirement account balance and asking them if they would save more stimulates the majority of respondents to make extra contributions, in most cases of substantial size. For instance, at each choice set, an average of 62.5% of respondents chose to save some discretionary income, and 78.5% of respondents chose to make additional savings at least once during the task. By contrast, official statistics (ABS 2009) report that around 76% of Australian plan participants made *no* additional personal contributions to their retirement accounts – with "cost/can't afford to" or "have not bothered/never thought about it/not interested" as the most commonly cited reasons why not.

[11] Appendix Table A3 compares our sample with the Australian population. The sample includes slightly more tertiary educated, higher income people than the population, reflecting the filter that requires respondents to be contributing to a pension plan.

In terms of the value of savings, when we average over respondents and choice sets, supplementary voluntary savings were 29.2% of discretionary income (Table 2). This represents a 32.7% increase on the mandatory minimum contribution rate of 9.5% of earnings, which effectively raises the total contribution rate to 12.6%.[12] This behavior, however, displays an interesting age gradient, with the oldest age group saving the largest percentage of discretionary income on average (31.8%), the 35-39 year-olds saving the least (27.6%) and the middle groups saving somewhat in between.[13]

We note that the average extra savings in our experiment are somewhat higher than, but within the range of, patterns observed in aggregate administrative data. Industry studies report that voluntary contributions are about 25% of mandatory (employer) contributions (FSC 2017). This amounts to raising the contribution rate from the mandatory 9.5% to around 11.9% of earnings compared with 12.6% in the survey data. We take this as confirmation that the median income and discretionary income information we provide in the experiment is a realistic guide to respondent saving decisions.

Figure 3 graphs the average percentage of discretionary income saved at each choice by information treatment group. The projection treatments (2-4) all track steadily upwards as the respondents proceed towards retirement, while the current balance treatment rises early and flattens off at later choices. There is also an obvious gap between the savings associated with treatment 1 (current balance) and the effects of the other information treatments that begins at choice 1 and widens over the remaining choices of the task. Overall, however, respondents who received information only about their current retirement balance saved an additional 27.2% of disposable income averaged over the 10 choices. This translates into an average increase in projected retirement savings of 9.31% (compared to a base of zero additional saving).[14] In

[12] The average additional voluntary savings amount to 29.19% or $2,222.49 p.a. The average annual income shown throughout all experimental choices is $71,584.97, which means an average mandatory superannuation contribution of $6,800.57 (9.5% of 71,584.97). The $2,222.49 average additional savings thus represents a 32.7% increase w.r.t the mandatory contribution, raising total superannuation contribution from 9.5% p.a. to 12.6% p.a.

[13] The age gradient in the value of additional contributions to retirement accounts in official survey data is flatter, being relatively even across age groups and declining at older ages (ABS 2009). The decline of additional contributions by the elderly is likely due to increasing retirement and therefore decumulation. We filtered out people who had begun to decumulate from the experiment.

[14] The retirement balance projection on average at the start of the first choice (i.e., prior to any savings decisions) for treatment 1 respondents was $341,279.35. (This projection accounts for mandatory contributions and assumes a 3%

treatment 2, where respondents received information about their current balance and their projected retirement balance at age 67, the average extra savings for each respondent was 30.0% of disposable income. This figure was just above the 29.3% savings increase for treatment 3 respondents who got information on annual projected income stream instead of a projected retirement balance at age 67. Respondents in treatment 4, who saw their current balance, as well as projected wealth at age 67 *and* annual projected income stream, on average saved an additional 30.3% of discretionary income over the 10 choices.

To sum up, the results imply that presenting respondents with information about a typical retirement accumulation process and directing them to make decisions about whether to save more at each choice has an effect on voluntary savings similar to raising the official contribution rate from 9.5% to 12.6% of earnings. On a first pass, these preliminary results indicate important effects on saving from changing the information architecture and similarly important effects from giving respondents successive savings choices.

3.2. Two-stage or single stage saving decisions

We now turn to the differences we observed when we gave respondents a prior choice about whether they wanted to add any savings to their minimum retirement contributions before they chose an amount. Our findings show that offering a two-stage decision lowers both the aggregate saving probability and the aggregate percentage of discretionary funds saved but does not dramatically change the dynamic pattern of saving.

On average, respondents in Version 1, who made a preliminary decision about whether to save at all, saved less than respondents who choose from a list of savings rates that included zero per cent (Version 2). In Version 1 the average proportion of respondents in each choice set who chose zero savings was 47.8%; in Version 2 this proportion dropped to 27.6%. As a consequence, the choice architecture used in Version 2 raised the level of saving by an average of about 9% of discretionary income at each choice. This pattern confirmed our conjecture (following initial analysis of Version

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fixed annual growth rate). This increased to $373,039.55 on average as a result of the 27.19% average savings throughout the experiment, which represents a 9.31% increase in the base projection.

1) that some respondents were taking the ‘easy’ (less time and effort consuming) option of simply saying “no” in the preliminary decision.

While the frequency of zero saving is a clear difference between the two versions of the experiment, there are also remarkable similarities between the patterns of choices they triggered. Figure 4 graphs the change between choices 1 and 10 in the proportion of respondents who selected each percentage of additional savings. While the graphs show the distinctly higher frequency of zero savings in Version 1, in both versions there are two key common features to the patterns of savings as respondents move from near term to more distant choices (i.e., from choice 1 to choice 10). First, the proportion of respondents that elect to save nothing extra rises, and second, the average percentage of left-over income that respondents save also rises. In other words, more respondents choose to save either zero, or 75% to 100% of discretionary income at later choice sets (the Y-axis values on Figure 4 are positive). In contrast there was a drop in the proportion of respondents choosing to save 25% (the Y-axis values are negative). In the light of these patterns, we conclude that most respondents change their savings decision at successive choices, but that those changes differ between respondents (we return to possible reasons for these differences later).

3.2. Impact of information format on first savings choice

In this section we answer the question of how information formats affected saving decisions for respondents’ first choices. We concentrate on the first choice because it is the most comparable with the one-shot decisions studied by Goda et al. (2014) and Goldstein et al. (2016) and since our design nests both the Goldstein et al. and Goda et al. information formats, we can complete the comparisons made in these studies.

In our experiment, respondents who saw projections of their retirement lump sum, income or both, chose to save significantly more in the first choice than respondents who saw only their current balance. (Table 3 sets out definitions of all variables used in the regression models.) Table 4 reports marginal effects from an OLS regression that tests the information treatment effect. The first column reports marginal effects from a model that regresses the log of projected retirement wealth at choice set one (that includes any increase due to additional savings made at the first choice set) on indicators for survey version, information treatment, age group and a complete set of interactions between age group and information treatment.

First, we note that the marginal effects of the projection treatments are all positive and significant at the 10% level or less in the first model. Treatment 4, that shows lump sum and income stream projections, is associated with a 0.26% ($p<0.05$) increase in projected retirement wealth after the first saving choice. The next largest effect, of 0.19% ($p<0.1$), is estimated for the income stream projection (treatment 3) and then 0.17% ($p<0.1$) for the lump sum projection in treatment 2. While statistically significant, these effects are small in economic terms partly because they relate to saving from only one year's discretionary income, made in addition to the mandatory minimum contribution rate of 9.5% of earnings. Interestingly, the size order of the treatment effects is consistent with the results of Goda et al. (2014) – we also find the strongest inducement to save when wealth is projected to retirement and shown as both a lump sum and an income stream; and also consistent with Goldstein et al. (2016) – we find the effect of the income stream representation on additional savings is (slightly) stronger than the effect of the lump sum projection.

Crucially, our design identifies new insights about the effect of information formats on respondents of different ages. The full estimation results (Appendix 1 Table A4) show that coefficients on interactions between age and information treatment for older initial ages (48 and 57) are negative relative to the reference group of age 30 thus implying that the treatments are less effective at encouraging saving by older respondents than younger respondents.

Life cycle saving theory predicts that respondents with different preferences, financial literacy, life expectancy and bequest motives are likely to save differently for retirement.[15] Table 5 reports marginal effects from a regression of the log of projected wealth on a constant, information treatment indicators, age group indicators, a version indicator, covariates that measure various preferences, psychological traits, financial literacy, bequest, longevity expectations and demographics, and a complete set of interactions between the treatment indicators and the age

[15] We check whether respondents whose actual income or age are different from their assigned hypothetical age make different saving choices. We include two covariates in the regression model, namely i) "age difference" denoting the absolute difference in years between the respondent's actual age and their hypothetical age at each choice set, and ii) "income difference" capturing the percentage difference between the respondent's hypothetical gross income and their actual gross income at each choice set. However, neither i) nor ii) is relevant in the projected wealth regressions so deviations between respondent's actual age and income and her hypothetical settings are not biasing the results.

indicators and covariates. When we add covariates and their interactions with the treatment indicators into the initial regression (cf. Table 4, column 1), we see that the marginal treatment effects at the first choice set do not disappear (Table 5, column 1). In fact, they become slightly larger and stronger. We also show that higher savings are associated with higher patience, higher willingness to take financial risks, higher retirement saving system knowledge, tertiary education and a higher probability of wishing to leave a bequest. These are characteristics that are often associated with more financially sophisticated people. However, we also find that respondents who score higher in the test of objective financial literacy and numeracy, as compared with those who score higher on knowledge of the retirement saving system itself, tended to save less of their discretionary income. This result leads us to conclude that otherwise financially literate people who are relatively unfamiliar with the retirement saving system prefer to place their savings into investments other than their pension plans.[16]

Our analysis of the first saving choices of respondents confirms that projection information can encourage additional retirement saving and that respondents are (slightly) more sensitive to income stream formats than lump sum formats. This sensitivity to projections and income streams is stronger for younger respondents and remains significant when we allow for the effects of demographics, financial skills or preferences.

3.3 Impact of information format on savings choice over time

After having explored the savings effects of our information intervention at the first experimental round, we now report the equivalent outcome after respondents have made 10 successive choices. We note that respondents move hypothetically in ten steps from their initial (close to current) age to retirement age at 67. As they do so, the information presented in each successive choice adjusts to their earlier saving decisions. Respondents who choose not to save more than the mandatory retirement contributions see their current or projected wealth increase as it would if their income path followed the median income for their age cohort, their contributions continued at 9.5% of earnings and they received the prescribed investment rate of return of 3% p.a. Naturally, respondents who choose to save from their discretionary income see their current or projected

[16] Appendix Table A6 reports the full estimation results. We find the coefficients on interactions between treatment indicators and other covariates to be statistically insignificant with a few exceptions.

wealth increase even more. To evaluate the effects of feedback, we estimate the regression models again after the 10th choice and compare the results with the models estimated on the 1st choice (Table 4, column 2, and Table 5, column 2).

By the 10th choice, the increase in projected retirement wealth due to information format is 1.0% (or around $5K) in treatment 4 where respondents see both the lump sum and income stream projections. The marginal effect of the lump sum projection alone is 0.77% of retirement wealth (or around $3.4K) and of the income projection alone is 0.61% of retirement wealth (or around $2.5K); neither of these latter two marginal effects is, however, statistically significantly different from the control (treatment 1). We note an interesting fact: the lump sum projection has had no less an effect, and is estimated to have a larger effect, on saving than the income stream projection when respondents have completed 10 successive savings decisions. When we include preference measures, financial literacy and demographic covariates, the size and significance of the treatments remain the same. The marginal effects of the covariates themselves are virtually the same as estimated at the 1st choice (see Table 5 column 2), with higher final saving related to higher risk tolerance, patience, retirement system knowledge, tertiary education and bequest motives.

3.4 Dynamic patterns in savings

We also investigate the dynamic patterns in savings choices in more detail. To do so, we categorize each respondent's saving pattern and explore whether being designated as member of one particular category can be explained by our treatment or by other respondent characteristics.

Table 6 allocates the full sample of respondents (from both Versions 1 and 2 of the survey) into five categories: people who chose to save 0% at every choice set (21.5% of the sample); people who chose to save a constant, strictly positive, percentage of their discretionary income at every set, such as 25% or 50%, (10.2% of the sample); people whose saving pattern was monotonically increasing (16.9%); people whose saving pattern was monotonically decreasing (8.4%); and people whose saving went both up and down (43%).

The upper panel divides the categories by treatment. The differences between treatments are not large, however the table shows that respondents in the income stream treatment (treatment 3) are less likely to follow a constant or downwards path, and more likely to follow a mixed path than respondents in other treatments. Respondents in the lump sum projection treatment (treatment 2) are the most likely to *monotonically raise* their savings, while respondents in the income stream and lump sum treatment (treatment 4) are most likely to choose a *constant, positive rate of discretionary savings*.

The lower panel of Table 6 shows how respondents were grouped into these saving categories by age. The oldest age respondents are more than twice as likely than other ages to select a *constant positive* saving rate and the most likely to monotonically raise their savings. Compared with other ages, the 30 and 39 years groups are less likely to follow downwards or constant paths, rather tending to vary up and down. Finally, the 48 years group is the most likely to follow a monotonically downward path.

We next check the effect of other respondent characteristics on these dynamic patterns by estimating a multinomial logit model. Table 7 reports the marginal effects of the covariates on the probability of pursuing a particular dynamic pattern of savings. Some of the respondent characteristics are significant in explaining these probabilities. As suggested by Table 6, respondents in the income stream treatment (3) are less likely to choose a positive constant rate of voluntary savings. Older age respondents tend to choose constant zero or positive savings at much higher rates than the youngest group. Respondents with higher bequest motives are significantly more likely to save at a constant, strictly positive rate. Zero saving is related to lower risk tolerance, lower retirement system knowledge and being unemployed. Monotonic increases in saving are more likely among respondents who more financially literate, who have better working knowledge of the retirement saving system and who are more optimistic about their life expectancy.

Overall, the classification of respondents into dynamic patterns of savings is more systematically influenced by demographics, preferences and financial capability than by the information treatments.

4. Discussion

Understanding how choice and information architectures influence behavior is becoming increasingly important across a wide range of areas. None more so than retirement planning where the complexity of products on offer, the difficulties in getting people engaged, and the dire consequences of inadequate saving all contribute to the urgent need to help consumers (Campbell et al. 2011).

We focussed on how different ways of presenting projected retirement wealth influence patterns of voluntary saving in a calibrated, online experiment. Here we highlight five key results and briefly discuss their theoretical and policy implications.

i) Forcing people to think about retirement wealth increases saving: Almost 80% of our sample chose to save some of their discretionary income at some point during the experiment. This contrasts sharply with official data suggesting that over three-quarters of plan-participants *never* make voluntary contributions (ABS 2009). While some of this effect can no-doubt be attributed to the demand of being in the experiment or the hypothetical setting, the difference between the experimental results and the official survey data is not so surprising in other ways. The task addresses the two most commonly mentioned barriers to making additional contributions: “cost/can’t afford to” or “have not bothered/never thought about it/not interested” (ABS 2009). The task compels respondents who have “never thought about it” to review their retirement account balance and to decide whether to save more and it also shows respondents the discretionary income that they could save from, thus directly informing them about affordability. This stark difference between experiment and experience does suggest that plan providers should more often remind and invite participants to think about how their retirement wealth is tracking in order to promote more voluntary saving. Our results support the ample evidence from field studies that simple reminders can significantly increase saving and loan repayment (Karlan et al., 2016; Cadena and Schoar, 2011; Soman and Cheema, 2011).

ii) Eliminating the ability to ‘opt-out’ increases saving rates: Version 2 of our survey offered participants the single-stage choice – “How much would you like to save?” rather than the two-stage “Would you like to save?”, “How much?” used in Version 1. The comparison of these versions was to some extent inadvertent (we did not design Version 1 with the intention of comparing two- vs. one-stage decisions) – but nonetheless revealing. In a nutshell, the large reduction in respondents saving nothing in Version 2 shows – yet again – the power of choice architecture (e.g. Johnson et al., 2012). Preventing an 'easy exit' and presenting 0% among the other savings options (25%, 50% etc) appeared to make 0% less palatable, perhaps because it invited simultaneous evaluation and comparison of the impact of saving something rather than nothing, as shown in Figure 2.

iii) Projection information influences younger respondents more than older respondents: There are several reasons why projections of wealth and/or income rather than current balance information could encourage more saving by younger respondents. For instance, before entering the experiment, younger respondents might never have thought about what their current account balance is likely to grow to by the time they retire. On reading the task information they get a clear idea of their projected wealth for the first time, possibly feel concerned, and therefore add to their savings. Older respondents are more likely to have taken notice of their retirement savings prior to the task (Agnew et al. 2013). Another reason is that over successive choices, younger respondents who add to their savings see the benefit of longer compounding periods, whereas older respondents see the effects of at most 10 years of investment returns. These features of the experiment make a marked difference in the nominal quantities. For example, a respondent in the 25-30 years group who contributes an additional 25% of discretionary income at each choice will see their income stream projection increase from $28,900 p.a. to $31,800 p.a., or an extra $2,900 p.a., and their lump sum rise from $503,500 to $553,500, or an extra $50,000, whilst a respondent in the 49-57 group who saves the same 25% at each choice sees only a $900 p.a. increase in their income stream and a $15,500 increase in their lump sum. This combination of shock and encouragement could be the "carrot" and "stick" that motivates saving at younger ages.

iv) In a one-shot choice, income stream projections lead to slightly more saving than lump-sum projections, but both income and lump sum projections lead to more savings than either projection alone: Following the work of Goldstein et al. (2016) and Goda et al. (2014) we predicted that projected income stream information would have a more positive effect on savings than lump sum projections. This prediction was supported – weakly – in the analysis of the first choice with income stream projection information leading to slightly higher levels of additional voluntary saving than projected lump sum information. This effect is consistent with a reference-dependence account whereby respondents perceive the projected income as lower than their current salary and thus inadequate (cf. Goldstein et al., 2016). The respondents in treatments 3 and 4 in our experiment saw income stream projections at the first choice set that correspond to replacement rates of 46% (for ages 25-30), 29% (for ages 31-39), 21% (for ages 40-48) and 20% (for ages 49-57). These levels of income would be patently inadequate for almost all respondents, even if augmented by the public pension. However, the fact that providing both lump sum and income projections encourages the most saving indicates that some respondents may also compare lump sum projections to a reference level – possibly the "round numbers" proposed by popular financial planning advice such as $1 million dollars[17]. Respondents who compared a projected lump sum with a $1 million reference level would expect a shortfall of between $500K (25-30) and $760K (49-57). Either way, the combination of income and lump sum projection provides more information in total for respondents in treatment 4 than in treatments 2 or 3, and offers two possible channels for reference-dependence.

v) Over successive choices the combination of lump sum and income-stream projections is best: We found that combining both forms of projection led to the highest level of additional saving – and that this effect persisted across all ten choices. This additive effect may have arisen because the combination gives respondents initial realistic – and motivating – information about future consumption in the income stream projection, along with the continued satisfaction of seeing the lump sum projection grow in value across choices. Such an account presentation format again suggests a dual-reference-dependence: one in which projected income is compared with current consumption/salary (and perceived as either a loss or gain), and another in which the lump sum amount is compared with a notional impression of how much is 'enough' for retirement. Because the changes in the lump sum projection are more noticeable across choices, the positive feedback loop created by seeing 'the pot grow' sustains additional voluntary savings. For example, a respondent aged 31-39 who saves 100% of their discretionary income sees a pot that grows from $386,200 at choice 1 to $497,700 at choice 5 to $538,500 at choice 10 whereas the analogous

[17] See for example, https://www.superguide.com.au/boost-your-superannuation/comfortable-retirement-how-much-super-need#Table_2_Single_person_What_type_of_lifestyle_do_you_want_during_retirement

changes in projected income are $22,200 to $28,600 to $30,900. In support of this claim, our analysis of the dynamic savings paths revealed that although demographics, preferences and financial capability had more influence than our information treatments, the combined effect of income stream and lump sum projections (treatment 4) resulted in the highest proportion of respondents consistently saving a constant positive percentage of discretionary funds. One plausible interpretation of our findings is that respondents are more sensitive to the income stream framing at the first choice, but the lump sum projection supports savings efforts more over successive choices by raising satisfaction with the effects of saving. The combination of income stream and lump sum projections give respondents realistic information about future consumption in the income stream projection, along with the satisfaction of seeing a lump sum projection grow.

Overall, our results clearly show that practices that improve information architecture should be reviewed and supported by regulation. Our experiment strongly supports recent changes to retirement plan benefit statement guidelines initiated by Australian plans and regulators and in the US, and that are under consideration elsewhere.

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Figure 1: Screen shot of first choice set – Version 1

Set 1 of 10

Please review the information below carefully. It describes the situation of a typical person of this age. If this were your situation, would you save some of your left over income into your superannuation fund? If so, how much extra would you save this year?

Information about you:	
Age:	30
Annual income:	$61,900
Compulsory (Employer) Superannuation Contribution:	$5,900
Income after tax:	$50,200
Annual living expenses:	$37,700
Income left over:	$12,500

Information about your superannuation:	
Current superannuation balance:	$16,200
Estimated superannuation balance at age 67:	$503,500
Estimated superannuation balance as an annual payment made for 25 years from age 67:	$28,900 each year

Would you save some of your left over income into your superannuation fund?

- (•) Yes
- ( ) No

What percentage of your left over income would you save into your superannuation fund this year?

	Per cent of left over income saved	$
(•)	25%	$3,100
( )	50%	$6,200
( )	75%	$9,400
( )	100%	$12,500
( )	Custom amount	$

Updated information about your superannuation:	**Before Extra Contribution**	**After Extra Contribution**
Current superannuation balance:	$16,200	$19,300
Estimated superannuation balance at age 67:	$503,500	$512,900
Estimated superannuation balance as an annual payment made for 25 years from age 67:	$28,900 each year	$29,500 each year

Notes: Respondents saw their current account balance at age 30 (A$16,300), estimated retirement account balance at age 67 (retirement age) (A$503,500), and estimated retirement account balance as an annual payment made for 25 years from age 67 (A$28,900 each year). They then chose whether (Yes/No) and how much to voluntarily contribute for one year (Version 1). Once they had chosen their contributions, respondents saw the impact of the extra contributions (if any) on their account balance. For example, suppose a respondent chose to voluntarily save 25% of their left-over income in that year (equal to A$3,100). Respondents in treatment 4 saw updated account balance information as follows –current balance of A$19,300, estimated future balance of A$512,500 and estimated future balance as an income payment of A$29,500 each year. They could then decide whether to confirm the chosen voluntary saving of 25% of left-over income, or further investigate the impact of the alternative voluntary contribution options before settling on their choice.

Figure 2: Screen shot of first choice set - version 2

Set 1 of 10

Please review the information below carefully. It describes the situation of a typical person of this age. If this were your situation, would you save some of your left over income into your superannuation fund? If so, how much extra would you save this year?

Information about you:	
Age:	30
Annual income:	$61,900
Compulsory (Employer) Superannuation Contribution:	$5,900
Income after tax:	$50,200
Annual living expenses:	$37,700
Income left over:	$12,500

Information about your superannuation:	
Current superannuation balance:	$16,200
Estimated superannuation balance at age 67:	$503,500
Estimated superannuation balance as an annual payment made for 25 years from age 67:	$28,900 each year

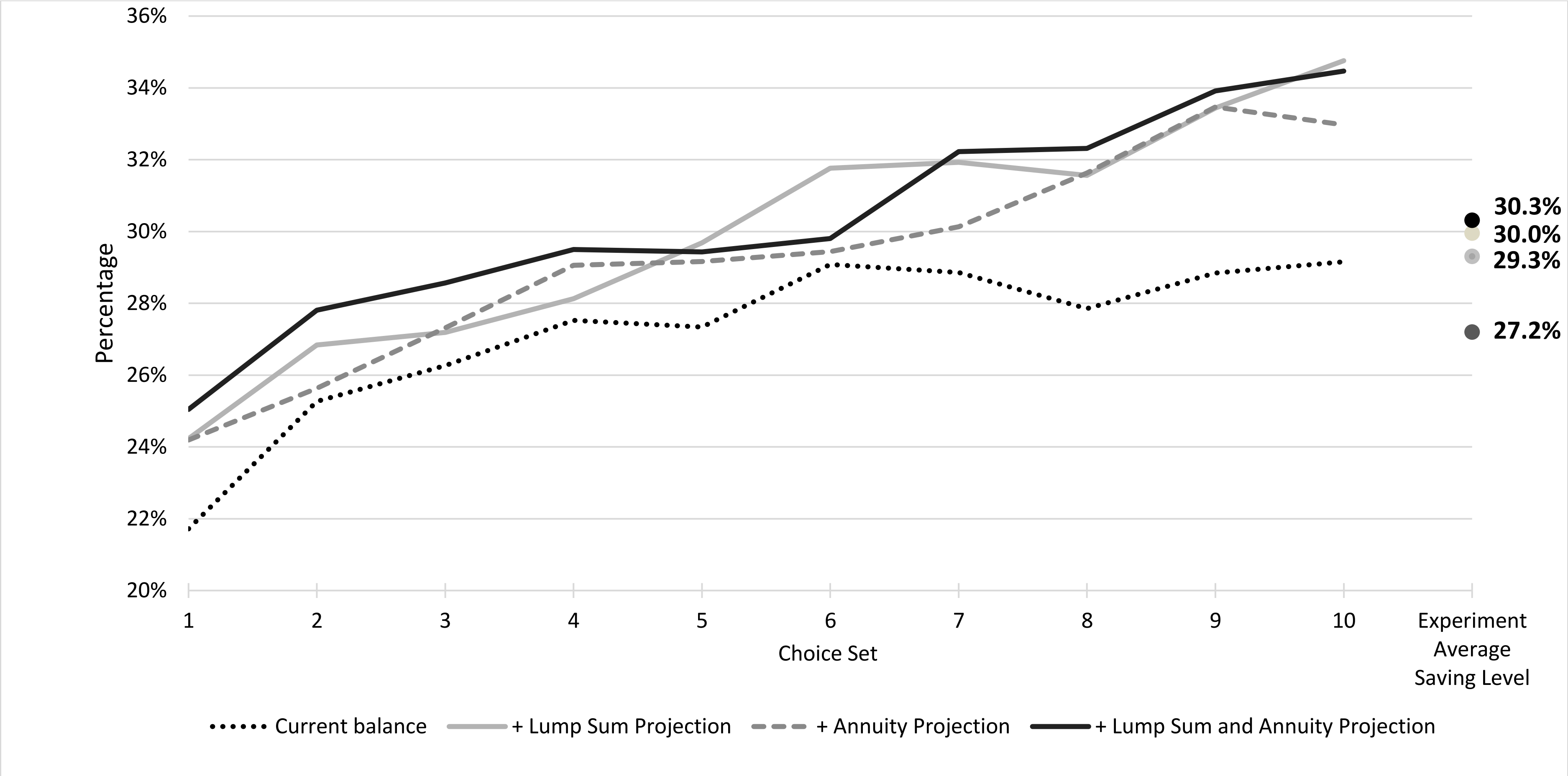
What percentage of your left over income would you save into your superannuation fund this year?

	Per cent of left over income saved	**$**
○	0%	$0
◉	25%	$3,100
○	50%	$6,200
○	75%	$9,400
○	100%	$12,500
○	Custom amount	$

Updated information about your superannuation:	**Before Extra Contribution**	**After Extra Contribution**
Current superannuation balance:	$16,200	$19,300
Estimated superannuation balance at age 67:	$503,500	$512,900
Estimated superannuation balance as an annual payment made for 25 years from age 67:	$28,900 each year	$29,500 each year

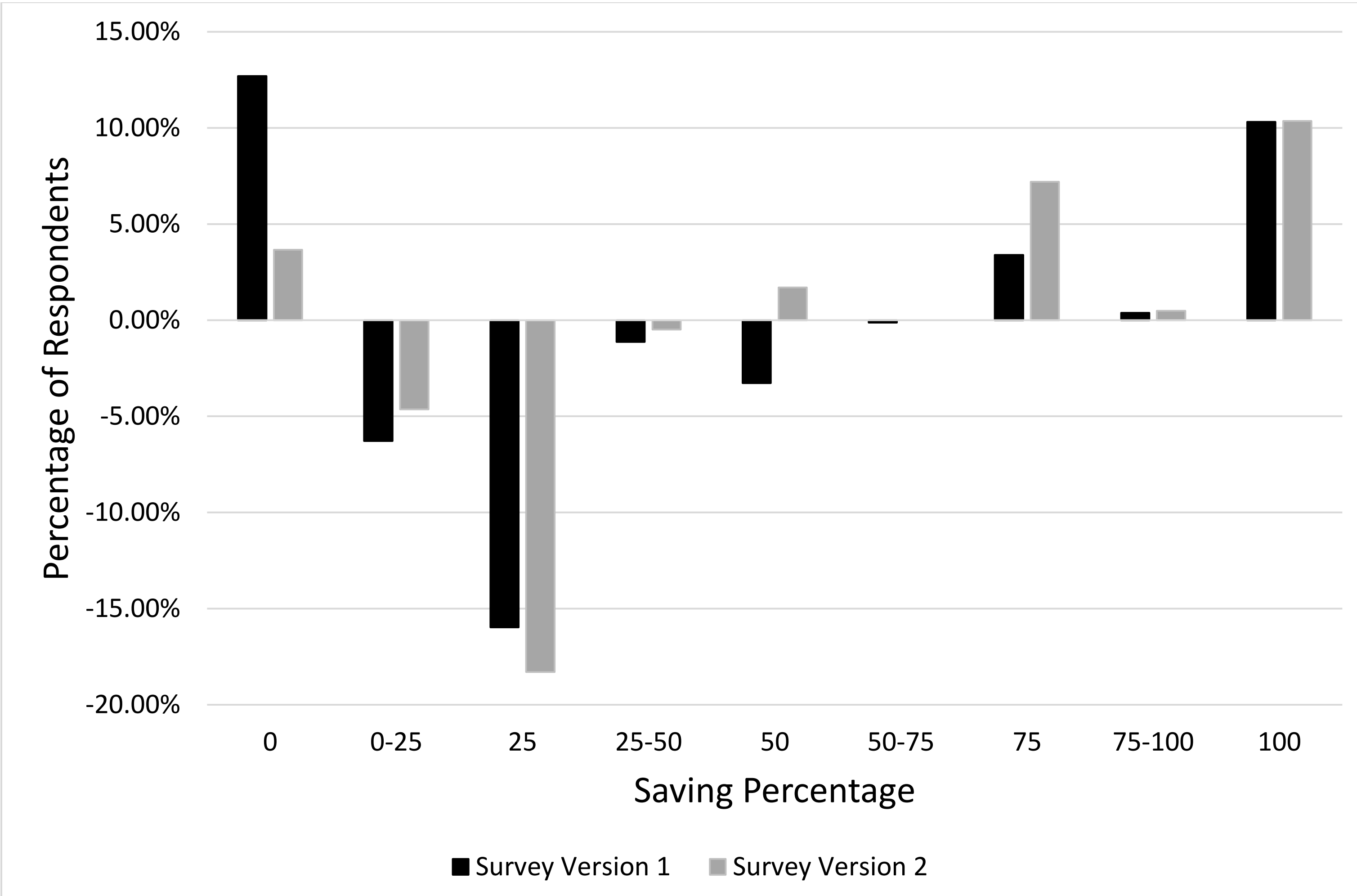
Notes: Respondents saw their current account balance at age 30 (A$16,300), estimated retirement account balance at age 67 (retirement age) (A$503,500), and estimated retirement account balance as an annual payment made for 25 years from age 67 (A$28,900 each year). They then chose how much to contribute for one year (Version 2). Once they had chosen their contributions, respondents saw the impact of the extra contributions (if any) on their account balance. For example, suppose a respondent chose to voluntarily save 25% of their left-over income in that year (equal to A$3,100). Respondents in treatment 4 saw updated account balance information as follows –current balance of A$19,300, estimated future balance of A$512,500 and estimated future balance as an income payment of A$29,500 each year. They could then decide whether to confirm the chosen voluntary saving of 25% of left-over income, or further investigate the impact of the alternative voluntary contribution options before settling on their choice.

Figure 3: Average percentage of discretionary income saved by treatment group



Notes: Figure graphs the average of all respondents' savings at each choice by treatment group. "Current balance" viewed their current retirement savings balance; "+ Lump Sum Projection" viewed their current and projected retirement savings balance; "+Income Stream Projection" viewed their current balance and a projection of their retirement income from ages 67 to 92; and "+ Lump Sum and Income Stream Projection" viewed all information formats. Dots show the average over all choice sets of percentage of discretionary income saved by treatment group.

Figure 4: Difference in rates of choice between choice 1 and choice 10: Experiment Version 1 and Version 2.



Notes: Figure graphs the change between choice 1 and choice 10 in percentage of all respondents who chose to save at each level of discretionary income shown on the horizontal axis for Versions 1 and 2 of the experiment. For example, the black bar for Version 1 at level 0 shows that approximately 13% more respondents elected to save 0% of discretionary income at Choice 10 compared to Choice 1. In Version 2 this increase was approximately 4% of respondents.

Table 1: Age progression by choice set

	Age in years assigned at choice set									
Actual age group	1	2	3	4	5	6	7	8	9	10
25-30	30	34	38	42	46	50	54	58	62	66
31-49	39	42	45	48	51	54	57	60	63	66
40-48	48	50	52	54	56	58	60	62	64	66
49-57	57	58	59	60	61	62	63	64	65	66

Notes: Table shows the hypothetical age that the experiment assigned to respondents at each of 10 savings choices. For example, the choice sets assigned respondents of actual ages from 25 to 30 years the hypothetical ages shown in the first row.

Table 2: Average percentage of discretionary income saved

Age Group	Treatment	Choice Set		
		First (1) %	Last (10) %	Average
25-30	Current balance	17.63	31.39	24.68
	Lump sum projection	21.33	33.34	26.81
	Income stream projection	21.53	32.65	27.09
	Lump sum and income	26.23	35.46	31.62
	Total	21.81	33.27	27.64
31-39	Current balance	18.82	25.50	24.64
	Lump sum projection	22.92	36.26	30.87
	Income stream projection	24.13	31.15	26.93
	Lump sum and income	22.22	33.11	27.27
	Total	22.01	31.61	27.50
40-48	Current balance	22.30	27.84	27.55
	Lump sum projection	23.58	32.19	28.93
	Income stream projection	23.23	31.55	29.43
	Lump sum and income	26.94	36.74	33.73
	Total	23.93	31.94	29.82
49-57	Current balance	27.40	33.40	31.59
	Lump sum projection	29.09	36.77	32.47
	Income stream projection	27.74	37.11	33.81
	Lump sum and income	25.55	32.96	29.39
	Total	27.43	35.03	31.79
25-57	Current balance	21.72	29.16	27.19
	Lump sum projection	24.23	34.76	29.95
	Income stream projection	24.19	32.97	29.30
	Lump sum and income	25.04	34.47	30.31
	Total	23.80	32.84	29.19

Table shows average across respondents of percentage of discretionary income saved by age group.

Table 3: Regression model variable definitions

Variable Type	Name	Description
Independent Variable	Projected balance	The projected retirement balance at age 67, which includes all previous and current iteration voluntary retirement contributions and is calculated according to ASIC 2014 retirement estimate regulations.
	Log projected balance	The natural logarithm of the projected retirement balance.
Experimental Design Variable	Version 1	A binary variable = 1 for survey version 1 respondents and = 0 for survey version 2 respondents.
	Framing Treatment	A categorical variable indicating the information architecture / framing of retirement information presented throughout the experiment. Framing Treatment = 1 represents the control group who receive only their current retirement account balance. In addition to current retirement account balance, Framing Treatment = 2 represents respondents who receive a customized projection of their lump sum balance at retirement, Framing Treatment = 3 represents participants who receive a customized projection of their retirement income, and Framing Treatment = 4 represents respondents who receive both frames of retirement projections.
	Initial Age	The hypothetical starting (choice 1) age.
	Age difference	The absolute difference between the respondent's actual age and their hypothetical age at each choice in years.
	Income difference	The percentage difference between the respondent's hypothetical gross income and their actual gross income at each choice.
Demographic Variable	Male	A binary variable = 1 for male respondents and = 0 for female respondents.
	Risk Aversion	A binary variable = 1 for respondents with a higher risk aversion than the survey median and = 0 otherwise.
	Patience	A binary variable = 1 for respondents with a higher level of patience than the survey median and = 0 otherwise.
	Financial Literacy and Numeracy	The percentage of the three (3) financial literacy questions and the three (3) financial numeracy questions correctly answered.
	Superannuation Knowledge	The percentage of nine (9) superannuation knowledge questions correctly answered.
	Financial Support	A binary variable = 1 for respondents who are either solely or jointly responsible for major financial decisions within their household and = 0 otherwise.
	Tertiary Education	A binary variable = 1 for respondents who had obtained at least a bachelor degree or equivalent and = 0 otherwise.
	Employment	A binary variable = 1 for respondents who are employed (including full-time, part-time, self-employed and civil servant / military roles) and = 0 otherwise.
	Income (Personal)	Weekly gross personal income in $AUD.
	Bequest	Self-reported probability of bequeathing an inheritance totalling $A100,000 or more to a respondent's children.
	Longevity	The absolute difference between the respondent's subjective life expectancy and their actuarial life expectancy in years.

Table 4: Marginal effects of information treatment on log projected retirement balance

Dependent Variable: Log projected retirement balance	Choice Set	
	First (1)	Last (10)
Version	0.0037^{***}	0.0286^{***}
	(0.0007)	(0.0038)
Treatment 2 - Projected Lump Sum	0.0017^{*}	0.0077
	(0.0010)	(0.0053)
Treatment 3 - Projected 25 Year Income	0.0019^{*}	0.0061
	(0.0010)	(0.0053)
Treatment 4 - Projected Lump Sum and Income	0.0026^{**}	0.0104^{*}
	(0.0010)	(0.0054)
Initial Age - 39	0.2644^{***}	0.2576^{***}
	(0.0012)	(0.0055)
Initial Age - 48	0.5637^{***}	0.5518^{***}
	(0.0012)	(0.0057)
Initial Age - 57	0.7668^{***}	0.7717^{***}
	(0.0010)	(0.0055)
Observations	1615	1615

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Marginal effects from OLS estimation of log projected balances at first choice (column 1) and last choice (column 2) on version indicator, treatment indicator, age indicators and interactions. Appendix Table A4 shows full estimation results.

Table 5: Marginal effects of information treatment and respondent characteristics on log projected retirement balance

	Choice Set	
	First (1)	Last (10)
Version	-0.0039^{***}	-0.0296^{***}
	(0.0008)	(0.0039)
Treatment 2 - Projected Lump Sum	0.0019^{*}	0.0078
	(0.0010)	(0.0051)
Treatment 3 - Projected 25 Year Income	0.0020^{**}	0.0059
	(0.0010)	(0.0052)
Treatment 4 - Projected Lump Sum and Income	0.0027^{***}	0.0094^{*}
	(0.0010)	(0.0053)
Initial Age - 39	-0.2656^{***}	-0.2625^{***}
	(0.0012)	(0.0078)
Initial Age - 48	-0.5646^{***}	-0.5552^{***}
	(0.0013)	(0.0135)
Initial Age - 57	-0.7673^{***}	-0.7705^{***}
	(0.0011)	(0.0206)
Age Difference	0.0002	0.0002
	(0.0002)	(0.0008)
Income Difference	0.0005	-0.0052
	(0.0008)	(0.0040)
Male	0.0006	0.0015
	(0.0008)	(0.0040)
Risk Aversion	-0.0030^{***}	-0.0186^{***}
	(0.0008)	(0.0042)
Patience	0.0020^{***}	0.0065^{*}
	(0.0007)	(0.0039)
Financial Literacy and Numeracy	-0.0082^{***}	-0.0323^{***}
	(0.0016)	(0.0077)
Superannuation Knowledge	0.0070^{***}	0.0477^{***}
	(0.0020)	(0.0100)
Financial Support	0.0010	0.0021
	(0.0008)	(0.0045)
Tertiary Education	0.0017^{**}	0.0088^{**}
	(0.0008)	(0.0040)
Employment	0.0008	-0.0030
	(0.0013)	(0.0069)
Bequest	0.0017	0.0150^{**}
	(0.0010)	(0.0058)
Longevity	0.0000	0.0002
	(0.0000)	(0.0002)
Observations	1615	1615

Standard errors in parentheses.
$^{*}\ p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Notes: Marginal effects from OLS estimation of log projected balances at first choice (column 1) and last choice (column 2) on version indicator, treatment indicator, age indicators, respondent characteristics and interactions. Appendix Table A5 shows full estimation results.

Table 6: Dynamic saving patterns by treatment group and age group.

	Same Responses (0%)				Same Responses (=/= 0%)				Up Monotonically				Down Monotonically				Up and Down			
	Treatment				Treatment				Treatment				Treatment				Treatment			
Savings %	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
0	21.9%	21.1%	21.5%	21.4%	0.0%	0.0%	0.0%	0.0%	6.2%	4.4%	4.0%	3.7%	0.0%	0.0%	0.0%	0.0%	10.7%	8.6%	8.2%	10.7%
0-25	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	1.7%	1.5%	1.5%	1.2%	0.5%	0.7%	0.2%	0.0%	5.2%	4.9%	6.9%	3.5%
25	0.0%	0.0%	0.0%	0.0%	6.7%	5.4%	5.4%	7.0%	6.2%	8.6%	5.4%	7.2%	5.7%	6.1%	5.4%	4.5%	15.9%	14.7%	16.6%	13.9%
25-50	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	0.2%	0.5%	0.2%	0.0%	0.0%	0.0%	0.5%	1.0%	1.0%	0.5%	0.7%
50	0.0%	0.0%	0.0%	0.0%	2.2%	2.7%	1.0%	1.5%	1.7%	2.5%	3.5%	4.0%	0.7%	1.0%	1.5%	2.5%	5.5%	8.6%	9.7%	8.5%
50-75	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.2%	0.2%
75	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	1.0%	0.0%	0.7%	1.5%	0.7%	0.0%	0.5%	0.2%	0.7%	2.0%	2.0%	3.2%	2.5%
75-100	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%
100	0.0%	0.0%	0.0%	0.0%	1.5%	1.7%	0.7%	2.2%	0.0%	0.0%	0.0%	0.0%	1.2%	1.0%	0.0%	0.2%	1.5%	1.2%	2.0%	1.0%
Total	**21.9%**	**21.1%**	**21.5%**	**21.4%**	**11.2%**	**10.6%**	**7.4%**	**11.7%**	**16.2%**	**17.9%**	**16.3%**	**17.2%**	**8.2%**	**9.3%**	**7.4%**	**8.5%**	**42.5%**	**41.0%**	**47.3%**	**41.3%**
	Age				Age				Age				Age				Age			
Savings %	30	39	48	57	30	39	48	57	30	39	48	57	30	39	48	57	30	39	48	57
0	16.9%	21.3%	21.2%	25.7%	0.0%	0.0%	0.0%	0.0%	4.8%	4.9%	3.9%	4.9%	0.0%	0.0%	0.0%	0.0%	14.6%	11.0%	7.3%	6.2%
0-25	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	2.5%	1.1%	1.4%	1.3%	0.6%	0.2%	0.2%	0.5%	6.1%	6.1%	5.5%	2.8%
25	0.0%	0.0%	0.0%	0.0%	4.5%	4.2%	6.4%	9.5%	6.7%	5.9%	6.8%	8.2%	6.7%	4.6%	7.1%	3.6%	15.9%	19.4%	16.2%	8.7%
25-50	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.2%	0.7%	0.0%	0.0%	0.2%	0.2%	0.0%	1.0%	0.8%	1.4%	0.0%
50	0.0%	0.0%	0.0%	0.0%	1.6%	0.4%	1.4%	4.4%	1.9%	2.7%	3.2%	3.6%	0.3%	1.5%	2.3%	1.3%	9.6%	9.1%	8.4%	5.1%
50-75	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.2%	0.2%	0.3%
75	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	1.0%	0.3%	0.0%	1.1%	1.5%	0.0%	0.4%	0.7%	0.3%	3.2%	2.5%	1.6%	2.6%
75-100	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%
100	0.0%	0.0%	0.0%	0.0%	0.6%	1.1%	0.2%	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	1.5%	1.6%	1.5%	1.4%	1.3%
Total	**16.9%**	**21.3%**	**21.2%**	**25.7%**	**6.7%**	**6.1%**	**8.2%**	**20.3%**	**16.6%**	**14.8%**	**17.1%**	**19.5%**	**7.6%**	**7.0%**	**11.4%**	**7.2%**	**52.2%**	**50.8%**	**42.0%**	**27.2%**

Notes: Table reports percentage of respondents whose saving over 10 choices can be categorised as constant at zero, constant above zero (Same), increasing (Up Monotonically), decreasing (Down Monotonically) or mixed (Up and Down). Top panel shows percentage of each saver type by treatment group, and lower panel shows percentage of each saver type by age group. Horizontal row shows the percentage of respondents who chose that saving rate at the first choice set. Treatment 1= current balance only, Treatment 2 = current balance + lump sum projection; Treatment 3 = current balance + income stream projection; Treatment 4 = current balance + lump sum and income stream projection.

Table 7: Marginal effects - multinomial logit model of saver types.

Variable	Saver Type				
	Same = 0%	Same =/= 0%	Increasing	Decreasing	Mixed
Version	0.1361***	−0.0289*	−0.0326*	0.0228	−0.0974***
	(0.0214)	(0.0153)	(0.0190)	(0.0149)	(0.0248)
Treatment 2	−0.0019	−0.0070	0.0111	0.0152	−0.0173
	(0.0274)	(0.0212)	(0.0262)	(0.0200)	(0.0331)
Treatment 3	0.0041	−0.0359*	−0.0061	−0.0085	0.0463
	(0.0285)	(0.0201)	(0.0256)	(0.0187)	(0.0339)
Treatment 4	0.0050	0.0083	0.0026	0.0037	−0.0196
	(0.0284)	(0.0223)	(0.0258)	(0.0193)	(0.0335)
Initial Age - 39	0.0367	−0.0072	−0.0170	−0.0074	−0.0051
	(0.0284)	(0.0185)	(0.0281)	(0.0199)	(0.0366)
Initial Age - 48	0.0466	0.0125	−0.0121	0.0356	−0.0826**
	(0.0298)	(0.0204)	(0.0289)	(0.0235)	(0.0379)
Initial Age - 57	0.0928***	0.1354***	0.0048	−0.0086	−0.2244***
	(0.0329)	(0.0280)	(0.0310)	(0.0216)	(0.0381)
Male	0.0208	−0.0125	−0.0251	−0.0231	0.0399
	(0.0207)	(0.0161)	(0.0194)	(0.0147)	(0.0250)
Risk Aversion	0.0759***	−0.0091	−0.0316	0.0106	−0.0457*
	(0.0217)	(0.0167)	(0.0197)	(0.0147)	(0.0260)
Patience	−0.0332	0.0156	−0.0215	0.0006	0.0384
	(0.0206)	(0.0154)	(0.0188)	(0.0138)	(0.0245)
Financial Lit. & Num.	0.0558	−0.0354	0.1780***	0.0342	−0.2327***
	(0.0399)	(0.0297)	(0.0365)	(0.0269)	(0.0453)
Super. Knowledge	−0.2320***	−0.0021	0.0963*	−0.0207	0.1585**
	(0.0535)	(0.0401)	(0.0491)	(0.0364)	(0.0635)
Financial Support	−0.0085	−0.0086	−0.0333	0.0051	0.0454*
	(0.0238)	(0.0179)	(0.0218)	(0.0157)	(0.0275)
Tertiary Education	−0.0145	0.0183	−0.0133	−0.0283*	0.0379
	(0.0210)	(0.0157)	(0.0193)	(0.0153)	(0.0252)
Employment	−0.0629*	0.0144	0.0195	−0.0086	0.0376
	(0.0368)	(0.0224)	(0.0294)	(0.0238)	(0.0389)
Bequest	−0.0325	0.0499**	0.0132	−0.0143	−0.0163
	(0.0315)	(0.0216)	(0.0258)	(0.0210)	(0.0347)
Longevity	−0.0012	0.0005	0.0031***	−0.0006	−0.0019*
	(0.0008)	(0.0007)	(0.0008)	(0.0006)	(0.0010)
Observations	1615	1615	1615	1615	1615

Notes: Table reports marginal effects from multinomial logit model estimation of probability of saver type. Delta method standard errors in parentheses. * p<0.1; ** p<0.05; ***p<0.01.

Appendix 1: Background data

Table A1: Starting income and expenses information by age group (A$)

Age Group	Starting Age	Annual Gross Income	Annual Net Income	Annual Consumption Expenditure	Annual Discretionary Income
25-34	30	61,854	50,204	37,722	12,482
35-44	39	76,774	60,275	47,901	12,374
45-54	48	76,956	60,397	49,544	10,853
55-67	57	68,688	54,817	49,549	5,268

Source: ABS (2015, 2016a, 2016b, 2016c).

Notes: Table shows median gross income, net (of taxes, levies etc) income, estimated median consumption expenditures and "left over" or discretionary income for each age group based on Australian Bureau of Statistics household survey data.

Table A2: Retirement account balances (A$)

Age Group	Starting Age	Current Retirement Account Balance	Estimated Retirement Account Balance	Estimated Annual Payment for 25 years
25-34	30	16,191	503,537	28,917
35-44	39	37,070	386,221	22,180
45-54	48	65,612	286,406	16,448
55-67	57	119,620	235,564	13,528

Source: APRA (2017).

Notes: Table shows retirement account balances at choice set 1 and associated lump sum projection/income stream for each age group. Current balance is the average Australian Superannuation balance for plan participants (fund members) of each age. We calculate projections using the regulated formula and (for this table) assuming zero saving in addition to the mandatory contributions until retirement at age 67. Decreasing projections for older age groups are based on official observed median account balances and are due to the immaturity of the mandatory savings system where older workers have contributed for fewer years and at lower average rates than younger workers are projected to.

Table A3: Sample demographics

		Combined Survey[1] (%)	Australian Population (%)
Age Group (years)	25-30	19.44	19.09
	31-39	29.35	27.81
	40-48	27.12	27.28
	49-57	24.09	25.82
Gender	Male	49.78	49.21
Marital Status	Married or de facto	66.44	54.58
Secondary Education	Completed Year 12	80.99	61.42
Tertiary Education	Bachelor Degree or Higher	51.33	29.79
Employment	Employed full or part time	88.17	73.35
Personal Income ($ p.w.)	Negative and Nil	4.58	6.82
	1-299 [2]	7.55	7.96
	300-399	4.71	5.25
	400-599	7.55	12.99
	600-799	9.16	8.78
	800-999	10.77	10.87
	1000-1249	12.94	11.99
	1250-1499	12.07	8.87
	1500-1999	14.92	13.25
	2000+	15.73	13.22

[1] Percentages are relative to the total number of survey respondents and Australian census respondents aged between 25 and 57.
[2] Combines survey and census responses for $1-199 and $200-299.

Table A4: Full estimation results, OLS regression of log projected balance on experiment indicators.

Variable	Choice Set	
	First (1)	Last (10)
Constant	13.1434***	13.2203***
	0.0019	0.0083
Version	−0.0037***	−0.0286***
	(0.0007)	(0.0038)
Treatment 2 - Projected Lump Sum	0.0030	0.0098
	(0.0025)	(0.0112)
Treatment 3 - Projected 25 Year Income	0.0032	0.0115
	(0.0065)	(0.0114)
Treatment 4 - Projected Lump Sum and Income	0.0065**	0.0280**
	(0.0027)	(0.0118)
Initial Age - 39	−0.2635***	−0.2523***
	(0.0023)	(0.0107)
Initial Age - 48	−0.5616***	−0.5452***
	(0.0023)	(0.0110)
Initial Age - 57	−0.7636***	−0.7596***
	(0.0020)	(0.0111)
Treatment 2 × Initial Age - 39	0.0000	0.0075
	(0.0033)	(0.0151)
Treatment 2 × Initial Age - 48	−0.0022	−0.0084
	(0.0032)	(0.0155)
Treatment 2 × Initial Age - 57	−0.0026	−0.0085
	(0.0028)	(0.0152)
Treatment 3 × Initial Age - 39	0.0005	−0.0060
	(0.0034)	(0.0151)
Treatment 3 × Initial Age - 48	−0.0024	−0.0074
	(0.0033)	(0.0155)
Treatment 3 × Initial Age - 57	−0.0032	−0.0069
	(0.0030)	(0.0157)
Treatment 4 × Initial Age - 39	−0.0041	−0.0230
	(0.0034)	(0.0154)
Treatment 4 × Initial Age - 48	−0.0037	−0.0105
	(0.0034)	(0.0164)
Treatment 4 × Initial Age - 57	−0.0070**	−0.0331**
	(0.0030)	(0.0158)
Observations	1615	1615
R^2	0.9972	0.9301

Standard errors in parentheses.
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Notes: Results of OLS regression of log projected balances at first choice (column 1) and last choice (column 2) on version indicator, treatment indicator, age indicators and interactions. Robust standard errors in parentheses.

Table A5: Full estimation results, OLS regression of log projected balance on experiment indicators and respondent characteristics.

Variable	Choice Set	
	First (1)	Last (10)
Constant	13.1401***	13.2096***
	(0.0036)	(0.0358)
Version	−0.0039***	−0.0296***
	(0.0008)	(0.0039)
Treatment 2 - Projected Lump Sum	0.0022	−0.0010
	(0.0049)	(0.0269)
Treatment 3 - Projected 25 Year Income	0.0080	0.0179
	(0.0054)	(0.0267)
Treatment 4 - Projected Lump Sum and Income	0.0113**	0.0357
	(0.0053)	(0.0273)
Initial Age - 39	−0.2656***	−0.2621***
	(0.0022)	(0.0117)
Initial Age - 48	−0.5630***	−0.5505***
	(0.0023)	(0.0163)
Initial Age - 57	−0.7652***	−0.7620***
	(0.0021)	(0.0226)
Age Difference	0.0002	0.0002
	(0.0002)	(0.0008)
Income Difference	0.0005	−0.0052
	(0.0008)	(0.0040)
Male	0.0013	0.0091
	(0.0015)	(0.0077)
Risk Aversion	−0.0009	−0.0142
	(0.0017)	(0.0087)

(Continued)

Variable	Choice Set	
	First (1)	Last (10)
Patience	0.0049***	0.0223***
	(0.0015)	(0.0075)
Financial Literacy & Numeracy	−0.0082***	−0.0375**
	(0.0029)	(0.0152)
Superannuation Knowledge	0.0071**	0.0371**
	(0.0034)	(0.0185)
Financial Support	−0.0004	0.0075
	(0.0015)	(0.0082)
Tertiary Education	0.0017	0.0091
	(0.0014)	(0.0075)
Employment	0.0012	−0.0085
	(0.0021)	(0.0120)
Bequest	0.0022	0.0123
	(0.0018)	(0.0111)
Longevity	−0.0001*	−0.0003
	(0.0001)	(0.0004)
Treatment 2 × Initial Age - 39	0.0009	0.0125
	(0.0032)	(0.0151)
Treatment 2 × Initial Age - 48	−0.0024	−0.0089
	(0.0032)	(0.0157)
Treatment 2 × Initial Age - 57	−0.0038	−0.0152
	(0.0029)	(0.0159)
Treatment 3 × Initial Age - 39	0.0019	0.0027
	(0.0033)	(0.0148)

(Continued)

Variable	Choice Set	
	First (1)	Last (10)
Treatment 3 × Initial Age - 48	−0.0012	−0.0036
	(0.0034)	(0.0159)
Treatment 3 × Initial Age - 57	−0.0006	0.0002
	(0.0030)	(0.0158)
Treatment 4 × Initial Age - 39	−0.0028	−0.0167
	(0.0032)	(0.0151)
Treatment 4 × Initial Age - 48	−0.0028	−0.0060
	(0.0034)	(0.0165)
Treatment 4 × Initial Age - 57	−0.0040	−0.0188
	(0.0031)	(0.0163)
Male × Treatment 2	−0.0003	−0.0073
	(0.0021)	(0.0109)
Male × Treatment 3	−0.0010	−0.0115
	(0.0021)	(0.0110)
Male × Treatment 4	−0.0017	−0.0117
	(0.0022)	(0.0112)
Risk Aversion × Treatment 2	−0.0021	−0.0060
	(0.0023)	(0.0118)
Risk Aversion × Treatment 3	−0.0019	0.0026
	(0.0023)	(0.0118)
Risk Aversion × Treatment 4	−0.0045*	−0.0142
	(0.0023)	(0.0119)
Patience × Treatment 2	−0.0023	−0.0171
	(0.0021)	(0.0108)

(Continued)

Variable	Choice Set	
	First (1)	Last (10)
Patience × Treatment 3	−0.0065	−0.0275**
	(0.0021)	(0.0107)
Patience × Treatment 4	−0.0025	−0.0184*
	(0.0021)	(0.0110)
Financial Literacy & Numeracy × Treatment 2	0.0001	0.0088
	(0.0045)	(0.0213)
Financial Literacy & Numeracy × Treatment 3	0.0029	0.0208
	(0.0043)	(0.0219)
Financial Literacy & Numeracy × Treatment 4	−0.0029	−0.0091
	(0.0043)	(0.0215)
Superannuation Knowledge × Treatment 2	0.0060	0.0343
	(0.0057)	(0.0265)
Superannuation Knowledge × Treatment 3	−0.0065	−0.0035
	(0.0053)	(0.0278)
Superannuation Knowledge × Treatment 4	0.0000	0.0111
	(0.0053)	(0.0282)
Financial Support × Treatment 2	−0.0004	−0.0133
	(0.0023)	(0.0120)
Financial Support × Treatment 3	0.0022	−0.0046
	(0.0023)	(0.0124)
Financial Support × Treatment 4	0.0037	−0.0034
	(0.0023)	(0.0122)
Tertiary Education × Treatment 2	−0.0014	−0.0048
	(0.0021)	(0.0108)

(*Continued*)

Variable	Choice Set	
	First (1)	Last (10)
Tertiary Education × Treatment 3	0.0009	−0.0026
	(0.0021)	(0.0109)
Tertiary Education × Treatment 4	0.0006	0.0063
	(0.0021)	(0.0112)
Employment × Treatment 2	0.0015	0.0161
	(0.0031)	(0.0174)
Employment × Treatment 3	−0.0007	0.0029
	(0.0030)	(0.0167)
Employment × Treatment 4	−0.0026	0.0030
	(0.0033)	(0.0172)
Bequest × Treatment 2	0.0003	0.0039
	(0.0028)	(0.0162)
Bequest × Treatment 3	−0.0016	−0.0026
	(0.0027)	(0.0159)
Bequest × Treatment 4	−0.0006	0.0094
	(0.0029)	(0.0165)
Longevity × Treatment 2	0.0001	0.0004
	(0.0001)	(0.0005)
Longevity × Treatment 3	0.0004***	0.0014***
	(0.0001)	(0.0005)
Longevity × Treatment 4	0.0001	−0.0001
	(0.0001)	(0.0005)
Observations	1615	1615
R^2	0.9974	0.9357

Notes: Table reports estimation results from OLS regression of log projected balance on version, age, treatment indicators and individual respondent characteristics. Robust standard errors in parentheses. * p<0.1; ** p<0.05; ***p<0.01.