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Easy As Pie: How retirement savers use prescribed investment disclosures

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As easy as pie:

How retirement savers use prescribed investment disclosures

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Abstract: We report the results of two laboratory experiments that study how university student and staff participants chose retirement savings investment options using 'user-friendly' information prescribed by regulators. We demonstrate that choices of more than 20% of participants cannot be predicted using any of the prescribed information items but that 30% of participants used all, or almost all, items, frequently in unexpected ways. A pie-chart showing asset allocation had the largest marginal impact on investment choices. Participants preferred options with more segmented pies (lower concentration) and with equally sized segments (lower deviation from a 1/n allocation). This choice behavior is consistent with the application of a simple diversification heuristic. Participants cannot choose more than one investment but are guided by the extent to which a pre-mixed investment option appears evenly balanced across asset classes. This novel application of a 1/n strategy is distinct from existing findings of naïve diversification in 'mix-it-yourself' conditions where participants spread resources evenly across funds or categories. The results highlight that information contained in prescribed investment disclosures may not be used in the manner intended by the regulator. The results also pose interesting methodological questions about the way 'user-friendly' information prescribed by regulators is validated before being legislated.

Highlights:

- We evaluate whether newly mandated short form disclosure has enabled plan members to use and assess the information relevant to the retirement investment decision.
- We demonstrate that the marginal effects of return information frequently have an unexpected (negative) sign and that even simplified risk information is irrelevant to investment decisions of around half of subjects.
- An asset allocation pie-chart, the visual representation of diversification information, has the largest marginal impact of all the pieces of information provided for most of the subjects.
- Participants preferred options with more segmented pies (lower concentration) and with equally sized segments (lower deviation from a 1/n allocation). This novel application of a 1/n strategy contrasts with the standard finding of naïve diversification when allocation is participant driven.

Keywords: consumer finance; diversification heuristics; pensions; choice experiment

JEL classifications: G02; G11; D14; C91

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1. Introduction

Many retirement plans offer members menus of investment options for their savings. Standard models of investment choice assume that individuals will allocate their wealth efficiently by using relevant information on expected return, risk and co-variation, while ignoring non-salient information and different 'frames'. By contrast, observation of these decisions shows that allocations are not neutral to 'choice architecture' (Benartzi and Thaler 2007). In particular, when confronted with large, complex, non-comparable information sets, investment choices can degenerate to ad-hoc diversification strategies (Benartzi and Thaler 2001; Huberman and Jiang 2006; Brown et al. 2007; Morrin et al. 2012; Agnew et al. 2011) or reliance on defaults (Madrian and Shea 2001; Carroll et al. 2009; Choi et al. 2009; Beshears et al. 2008; Beshears et al. 2013).

Concerned about the impact of financial 'mistakes' (Calvet et al. 2007) in a setting of increasingly complex financial products, regulators have begun to specify the content and presentation of many types of financial disclosures, including retirement saving investment menus (Kozup et al. 2008; Beshears et al. 2011; Navarro-Martinez et al, 2011). The context of the current study is the introduction of new 'simplified' retirement investment disclosures of specified length and content, replacing long and complex prospectuses. The prescribed disclosure format includes an option label and textual description of the strategy, a real returns target, strategic asset allocation and a risk description. By stipulating this content, regulators aimed to help plan members more easily locate and understand all necessary information for selecting a retirement savings investment (Treasury 2010).

Recent studies, however, suggest that simplified or 'better' information does not necessarily lead to improved choices (Beshears et al. 2011; Hung et al. 2010). Just as expanding a choice set does not necessarily make consumers better off (Benartzi and Thaler 2001; Brown et al. 2007; Scheibehenne et al. 2010), simplified or 'improved' disclosures may have unintended consequences. For example, Navarro-

Martinez et al. (2011), in their experimental investigation of the impact of credit card disclosures, find that minimum required payment information has a negative impact on repayment decisions, while an increased minimum required repayment level has a positive effect on repayment for most consumers. Importantly, "disclosing supplemental information, such as future interest cost and time needed to repay the loan, does not reduce the negative effects of including minimum payment information and has no substantial positive effect on repayments." (Navarro-Martinez et al. 2011, S60). This raises critical questions as to how retirement plan members use the shorter and simpler prescribed disclosure format, whether the specific information items assist the decision process, and whether outcomes align with the intentions of the regulators. Since many of the formats tested in the current experiments are common to prospectuses in financial services, our results have implications for financial product disclosure regulations internationally, and for the framing and marketing of many investment products.

Using two incentivized laboratory experiments, we study how university retirement plan members and students chose investment options from the simplified investment menu recently implemented (as a component of a new short eight-page product disclosure statement) by the Australian regulator (the Australian Securities and Investment Commission - ASIC) (Commonwealth of Australia 2011).

Our study makes several contributions. First, we measure the marginal impact of each component of the simplified disclosure format on investment preferences, comparing it with the sign and size predicted by standard finance theory. This allows us to identify the items in the shorter disclosure format which play a greater/lesser role in investment decisions, and whether these effects are as expected. Second, we estimate these impacts between and within experimental subjects, giving a detailed view of the cross-section of responses. Third, we test the attraction of defaults after subjects have been compelled to systematically study the disclosures and compare options. Overall we evaluate whether the short form disclosure has enabled plan members to use and assess the information relevant to the retirement

investment decision well or if the changes have unintended consequences. Fourth, the result that information contained in prescribed investment disclosures may not be used in the manner intended by the regulator, poses, in our view, interesting methodological questions about the way 'user-friendly' information prescribed by regulators is validated before publication.

Existing studies show that even well-informed investors may be influenced by non-salient information: in Choi et al. (2010), experimental subjects from a pool of Harvard and Wharton MBA students put high weight on irrelevant historical returns and failed to minimize fees when making an allocation across index mutual funds. We go further by demonstrating that many individuals use *salient* information in unexpected ways. In particular, we demonstrate that the marginal effects of expected return information frequently have an unexpected (negative) sign and that even apparently simplified risk information is irrelevant to investment decisions of around half of subjects – despite substantial attention paid to the development of an appropriate summary risk measure by industry and the relevant regulators (APRA 2010, FSC and ASFA 2011, ASIC 2012a,b).

In their survey of heuristics and biases in retirement savings, Benartzi and Thaler (2007, p. 90) comment that "[t]he diversification heuristic does not seem to apply when people pick among premixed funds, as the naïve investor perceives all the funds to be equally diversified." By contrast, we find that the disclosure feature which most powerfully predicts decisions is the asset allocation pie-chart for each investment option. Specifically, participants' choices appear to be predominantly driven by a preference for *pre-mixed* options which are low in concentration and close-to-evenly spread between asset classes, having a number of approximately equally sized segments of 'pie'. This result suggests that the tendency to adopt naïve 1/n strategies is highly prevalent and extends beyond situations of 'mix-it-yourself' portfolios (e.g., Benartzi and Thaler 2001) to our novel setting in which all choices are made from pre-mixed investment options.

The remainder of the paper is organized as follows. In the next section we sketch out the policy and institutional background that motivated our study. In Section 3 we detail experimental design and implementation. In Section 4 we report the results of our experiments and in Section 5 we discuss the theoretical and policy implications of our results.

2. Policy and institutional background

The increased complexity of consumer financial products coupled with the trend by governments to outsource major financial decisions such as retirement saving and health plans, means that ordinary people are increasingly required to make complex financial decisions. This has led to concerns about consumer protection and initiatives to stipulate financial product disclosures and to improve levels of financial literacy. For example, at its October 2011 meeting, the G20 endorsed a set of common principles on consumer protection in the field of financial services, developed by a number of international organizations including the OECD and the Financial Stability Board (FSB) (OECD 2011). Motivated by the concern that different financial products and options are not easily compared, Principle 4 (Disclosure and Transparency) recommends that financial services providers supply consumers with information on fundamental benefits, risks and terms of the product.

In many countries, however, the development and implementation of financial product disclosure has been underway for some time and a second wave of financial product disclosure initiatives are in progress. The second wave involves simplification of existing financial product disclosure requirements. In the US, for example, the Securities and Exchange Commission (SEC) recently adopted a new simplified (or enhanced) disclosure document for mutual funds. Mutual funds now have the option of sending investors a two to four page document, called the 'Summary Prospectus', instead of the long and detailed statutory prospectus. The Summary Prospectus contains the mutual fund's investment objectives, strategies, risks, costs, and performance (SEC 2007).

Australia's original financial product disclosure initiatives were framed in the 1990s on the underlying principle that "consumers are assumed for the most part, to be the best judges of their own interests" (Commonwealth of Australia 1997, p.191) and that "disclosure rules would aid and improve the quality of decision making" (Gruen and Wong 2010, p.3).[1] Possibly as a response to the 'high-level' regulatory approach and because of a lack of guidance coupled with a concentration by product providers on compliance and disclosure obligations (Treasury 2010), the 'first generation' financial product disclosure statements were long, detailed and complex. It has been argued that these features exacerbated consumer disengagement with superannuation (Cooper 2010).

Australia's second attempt at financial product disclosure – known as the shorter PDS regime - commenced in June 2012 and takes a different approach (Commonwealth of Australia 2011).[2] The new regulations are very prescriptive and specify length (maximum of eight A4 pages or equivalent), and for retirement saving products nine section headings, and content for each section.[3]

The stipulated information for investment options is:

(a) The name of the option, a short description and the type of investor for whom it is suitable;

(b) a list of the asset classes in which the option invests and an indication of the strategic asset allocation of portfolio;

[1] These disclosures were based on the recommendations of the Financial System Inquiry conducted in the 1990s which endorsed a regulatory approach for financial markets based on market conduct and information disclosure (Commonwealth of Australia 1997).

[2] The (new) Regulations - Corporations Amendment Regulations 2010 (No.5), Schedule 10D - were developed by the Financial Services Working Group (comprising officials from the Department of Treasury, the Department of Finance and Deregulation, and ASIC), in consultation with industry and consumer representatives.

[3] The eight headings are: About <*name of superannuation product*>, (2) How super works, (3) Benefit of investing with <*name of superannuation product*>, (4) Risks of super, (5) How we invest your money, (6) Fees and costs, (7) How super is taxed, (8) Insurance in your super, (9) How to open an account), with detailed and specific content prescribed for each of these nine sections. See Corporations Amendment Regulations 2010 (No. 5), Schedule 10D, 7 (3) (a)-(e).

(c) the investment return objective of the option;

(d) the minimum suggested time frame for holding the investment (i.e., a length of time over which the return objective is likely to be realized); and

(e) a summary risk level for the option.

The main aspect of this content not detailed in the legislation is 'summary risk level'. In this case the regulator (ASIC) has provided specific guidance on the expression of risk following consultation with industry representatives (ASIC 2012a,b).[4]

The short form product disclosure statement issued by the university retirement plan studied here (UniSuper) follows these requirements closely (UniSuper 2012a). Examples of the information disclosed for three illustrative investment options are shown in Figure 1.

[INSERT FIGURE 1 HERE]

The example in Figure 1 labelled 'Balanced', is described as being 'invested in a diversified portfolio, comprising mainly growth assets, such as Australian and international shares, property and alternative investments, and with some bonds', and is considered suitable for 'investors with a high risk tolerance, seeking a high level of expected returns' (subsection (a) above).

[4] For the 'summary risk measure' ASIC have endorsed the 'Standard Risk Measure (SRM)' developed as 'industry guidance' by the Association of Superannuation Funds of Australia (ASFA) and the Financial Services Council (FSC) on behalf of the industry (ASIC 2012a and b; FSC and ASFA 2011).The SRM was developed after APRA issued a letter to superannuation trustees providing guidance on the disclosure of superannuation investment risk to members (APRA 2010). The letter states that 'risk should be measured as the likely number of negative annual returns over a 20 year period.' APRA then asked the FSC and ASFA to develop industry guidance for the SRM. The SRM developed by 'industry' maps risks measured as the likely number of negative annual returns over a 20 year period to 7 levels of risk from 'very low' to 'very high'.

Subsection (b) prescribes 'a list of the asset classes in which the option invests and an indication of the strategic asset allocation of the asset classes'. The approach taken by UniSuper has been to present these as a pie chart with textual reference to the strategic asset allocation and the ranges. For example, the strategic allocation for Australian Shares in the Balanced option (Figure 1) is illustrated as a segment of the pie chart and written as 36% with a range of 23.5%-48.5%. While this approach is not mandatory, many other Australian retirement savings plans have taken the same approach.

Subsection (c) prescribes a description of the 'investment return objective of the option', presented for the Balanced option as being 'to achieve returns (after Fund taxes and investment fees) that are at least 3.0% p.a. more than inflation (CPI), while subsection (d) prescribes a statement of the 'minimum suggested time frame for holding the investment', reported for the balanced option as 'six years'.

Finally, subsection (e) prescribes a description, in the form of a summary risk measure, of the risk level of the option. While the summary risk description is not defined in the legislation, UniSuper has followed specific guidance of the industry regulator (ASIC) to explain risk as the 'expected frequency of negative annual return' (in this case four in twenty years)'combined with a 'summary risk level' which is reported as 'high' for the illustrated Balanced option.[5]

3. Experimental Design and Implementation

3.1 Design

We designed two experiments, called Experiment 1 and Experiment 2 below, to study how our participants (university retirement plan members and students) would use the investment information prescribed by the regulator. Each experiment had three phases: an option review phase, choice phases, and a survey phase in which we administered the Holt-Laury instrument (Holt and Laury 2002; Harrison

[5] The actual short form product disclosure statement provides the summary investment information for a representative investment option only. Plan members are then referred to a separate document which includes single page summary information for all investment options on the menu (UniSuper 2012b).

et al. 2005) and an additional, widely used domain specific risk tolerance instrument (DOSPERT; see Weber and Johnson 2008 but see also Szrek et al. 2012 and Deck et al. 2013), and collected demographic information.

3.2 Financial features of investment options

At the time we conducted the experiments, UniSuper offered six 'pre-mixed' and nine 'sector' investment options to members of their defined contribution (accumulation) plans.[6] We selected ten investment options from this menu for subjects to compare and rank in both experiments: the six 'pre-mixed' options with varying exposures to cash, fixed interest, domestic and international equities, property and alternative investments (e.g., private equity, hedge funds and infrastructure); and four representative 'sector' options including portfolios consisting entirely of cash, domestic sovereign bonds, domestic equities, and international equities (described as 'Global Environmental Opportunities'). We reduced the number of sector options to address possible subject fatigue, retaining a set of sector options with as diverse features as possible. The features of the ten selected investment options are summarized in Table 1.

[INSERT TABLE 1 HERE]

The return and risk objectives presented in the short form product disclosure statement are not based directly on the historical performance of the option but are inferred from the portfolio structure and intended to be a guide to expected returns for members and a goal for managers. The implicit growth asset risk-premium underlying these objectives is a modest 3.5% p.a. and the maximum annualized volatility of any of the ten options (implied from the risk and return information supplied in the PDS, and

[6] Members may choose any blend of options from the entire menu. Introductory documentation provided by the plan states that pre-mixed options are 'designed for investors who are seeking diversified investment options… managed on their behalf' whereas the sector options 'are designed for investors who wish to create their own blend of assets' UniSuper (2012a, pp.7 and 13). This advice on diversification and blending was not given to subjects in the experiment where subjects were asked to allocate to a single option.

assuming log-normally distributed returns) is around 15% p.a. A common approach to comparing investment portfolios is to rank them by Sharpe ratio, which measures risk-adjusted returns and indicates optimal portfolio choice in some simple models.[7] Here, the more diversified pre-mixed options have higher (expected) Sharpe ratios than the single asset class sector options. Participants who maximized Sharpe ratios would most prefer the High Growth option.

In many situations, maximizing the Sharpe ratio is not an optimal allocation rule and more information about the construction of the portfolio can be salient.[8] Table 1 shows three indicators capturing different aspects of the asset allocation pie chart. The first is the percentage allocated to growth assets; this measures the proportion of maroon (growth assets) to blue (defensive assets) in each chart.[9] The second is the Herfindahl Index of portfolio concentration,

$$HI = \sum_{i=1}^{n} w_i^2, \;\; \sum_{i=1}^{n} w_i = 1 ,$$

where w_i is the proportional allocation to asset class *i*, and *n* is the number of asset classes included in the option. For sector options where *n=1*, $HI = 1$, and $\lim_{n\to\infty} HI = 0$. For any given *n*, HI is minimized where $w_i = \frac{1}{n}, \forall i$. In other words, the Herfindahl Index decreases as more, and more equally sized, sectors appear in the pie chart. The 'Balanced' option (also the default option) has the lowest HI.

Finally, we compute how close each option is to a *1/n* allocation, conditioning on *n>1*. This measure is the sum of squared deviations from *1/n* for any pre-mixed option,

$$Dev = \sum_{i=1}^{n} (w_i - 1/n)^2 .$$

[7] The portfolio with the highest Sharpe ratio would be the optimal choice for a single-period mean-variance investor, or any conventionally risk-averse investor when portfolio returns are elliptically distributed and i.i.d.

[8] The essential information for combining sector options efficiently, the covariance or correlation matrix between asset classes, is not in the product disclosure statement or supporting documents.

[9] Colors as presented in the UniSuper short form product disclosure statement (UniSuper 2012a).

Dev decreases as the sectors in the pie chart approach equal sizes rather than as more are added. We assign Dev=1 to all portfolios with one asset class. The 'Socially Responsible Balanced' option has three asset classes: Cash and fixed interest (30%), International shares (24.5%) and Australian shares (45.5%), and the lowest deviation from *1/n* even though it is only the fourth least concentrated option according to HI.

3.3 Structure

In Experiment 1, participants first reviewed information on the ten investment options we gave them. Specifically, they reviewed (via an on-screen menu) the one-page summary information (as prescribed by the regulator) which includes an investment return objective (% above CPI), strategic asset allocation pie chart (% of portfolio by asset class), minimum suggested investment time frame (years), the expected frequency of negative returns (how many out of 20 years); and a summary risk level (very low, medium, medium-high, high, very high) for each of these options (as described in section 2 above).(Screenshots and instructions showing all stages of both experiments are contained in the supplemental materials). In the 'No-name' treatment, this information was presented in the absence of the option name; in the (within-subject) 'Name' treatment the name and an additional 20 word description was provided. This manipulation was included to examine the extent to which preferences were affected by the mere presence of an option name over and above the investment features of each option. Participants had to read about each of the options before they could advance to the choice phase of Experiment 1.

Participants next made 2 x 45 pairwise rankings, with each set of 45 pairwise rankings exhausting all possible pairings of the ten options. (While participants were making their choices, they could revisit the option descriptions.) The sequence of the pair order and left-right screen position of options was randomized. On each trial, participants were asked to indicate their preferred option by clicking an on-

screen button. To control for order effects, Name and No-name treatments were counterbalanced. Before making the choices in the second treatment, participants had to review each of the 10 options again.

Following these 2x45 choice phases participants completed a standard risk attitude elicitation measure (Holt-Laury) and a measures of risk-attitude/tolerance (DOSPERT). Finally they completed a comprehensive set of demographic questions.

Staff subjects (student subjects) received a base payment of 18 (9) Australian dollars for their time and an additional payoff based on a random draw from the returns distribution of their most preferred option and the Holt-Laury risk attitude elicitation measure). The expected value of that additional payoff was larger than the base payment and this was common knowledge

Experiment 2 differed from Experiment 1 in two principal ways. First, because presence/absence of option names had little impact on preferences in Experiment 1, a no No-name treatment was not included; all choices were made between investment options that were labeled with their name (e.g., Growth, Cash, etc). Second, two additional choice phases were included – one in which a 'best-worst' elicitation procedure was used, and one in which participants provided explicit rankings of the 10 investment options. Participants were drawn from the staff pool only.

In Experiment 2, participants once again first reviewed information on (the same) ten investment options. Participants then made 45 pairwise rankings, indicating again their preferences for investment options. They then proceeded to the 'best-worst' procedure (Balanced Ranking): 14 trials on which four options were presented in a grid arrangement. Participants first indicated their 'best' option from this set (by clicking on its name), then the 'worst', then the 'best' of the remaining two. The investment options in each 4-option set were selected to match a balanced incomplete block design that allowed

calculation of an aggregate relative ranking. During this phase additional information about each option was available from the on-screen menu if participants wished to review the details of the options.

In the final choice task (Unbalanced Ranking) participants completed a task that, using drop-down menus, asked for the most and least-favored of all 10 options, then of the remaining 8 options, then of the remaining 6, 4, and 2. This provided an explicit ranking of the options for each participant. Consistent with the previous tasks, information about any of the 10 options could be reviewed at any time via the on-screen menu.

On completion of these tasks Experiment 2 proceeded in the same manner as Experiment 1, with the Holt-Laury risk-attitude measure, the DOSPERT scales, and the demographic questions. An additional 6 financial literacy and numeracy questions were included in the survey.

At the end of the experiment participants were told which of the investment options had been their preferred option (based on their choices in the 45 choice pairings phase). In a departure from the procedure of Experiment 1, participants were then given the choice of either accepting a bonus amount paid on the basis of the performance of that option, or receiving a payment from the plan's (superannuation fund's) default investment option. Participants were not told which of the 10 investment options the default was.

3.4 Implementation

Both Experiment 1 and Experiment 2 were conducted in the Research Lab of the Australian School of Business at the University of New South Wales (UNSW). Student subjects were recruited from the student pool through ORSEE (Greiner 2004), a standard procedure for incentivized experiments at the Australian School of Business. A pool of university retirement plan members (staff subjects) was created through invitations posted on the homepage portal for all staff at the University of New South Wales

(UNSW) (myUNSW) and the fortnightly online newsletter for staff at UNSW) (news@UNSW), and an email invitation from the CEO of UniSuper to UniSuper members at UNSW. From this pool, participants were recruited via ORSEE. We note that while this pool was created specifically for the purpose of the Australian Research Council Linkage grant that supports this project, we cannot be sure to what extent the employees that signed up are a representative sample. Given the demographic information that we have, it is likely that we over-sampled younger and better educated university retirement plan members.

For Experiment 1 (2), we recruited a total of 34 student subjects and a total of 26 (36) staff subjects. Average total earnings were about $21 for students and $41 ($42) for staff in Experiment 1 (2), with the minimum earnings being $21 for students $36 ($37) for staff and the maximum earnings being $23 for students and $45 ($50) for staff. Students were paid half of the amount paid to staff to account for approximate opportunity costs. For participants from the standard student pool, we were constrained by the payoff guidelines of the Australian School of Business Lab, which is common pool resource used by experimenters from several schools. For most participants the experimental sessions took less than an hour although in some cases it took up to 90 minutes. Subjects were free to leave once they had finished all tasks and were paid on their way out behind a screen.

4. Results

4.1 Counts and rankings

The most preferred option from the pairwise comparison tasks in both experiments is the Conservative Balanced option, and in the two named treatments, the least preferred is Cash (Table 2). The option most sensitive to the removal of labels (in the No-name treatment) was ‘Global Environmental Opportunities’ which is invested entirely in international shares. In the No-name treatment this was the

least preferred option but when labels and descriptions were included it was ranked at seventh place, indicating that the extra information influenced decisions.[10] This option may be more popular when labelled because people favor companies or products that broadcast their 'green' credentials and/or because participants want the experimenters to view them as environmentally conscious. The proportion of transitive choices in pairwise comparisons were remarkably consistent across experiments and treatments at 16.7%, although more detailed analysis showed that deviations from transitivity were higher in the No-name treatment.

[INSERT TABLE 2 HERE]

Experiment 2 included two phases of additional rankings tasks, one using a balanced incomplete block design (BIBD) and the other using an explicit ranking over the ten options. By contrast with pairwise choices, the most preferred option in both of these tasks was 'Socially Responsible Balanced' (again possibly an experimenter effect) and the least preferred was again 'Cash'. Figure 2 shows the relative rankings from both of these phases of the experiment by graphing the count of best rankings minus worst rankings for the 36 subjects. The 'balanced' rankings are the results of the 14x4 best-worst comparisons from the BIBD and the 'unbalanced' rankings are from the explicit comparison.

[INSERT FIGURE 2 HERE]

In summary, simple counts show that all pre-mixed (multi-asset class) options are preferred to all sector (single asset class) options in all experimental phases, demonstrating that subjects focused on options diversified across asset classes. However rankings among pre-mixed options do not align with rankings by Sharpe ratio, and varied between subjects. Introducing the labels and descriptions of options in the

[10] The description states: 'Invests in a diversified portfolio of International companies whose business activities seek to address current and emerging environmental issues and opportunities and make a profit from these activities.'

Named phases did little to trigger variation in choices, apart from the greater popularity of 'Global Environmental Opportunities' (possibly a 'greenwash' or experimenter effect). We now turn to the impact of the different information items prescribed in the short form product disclosure statement on subjects' choices.

4.3 Pooled models

We are interested in how subjects use the elements of the simplified product disclosure statement to evaluate investment options. That is, information on expected return, risk, time frame, risk label, and that inferred by the pie chart. In Experiment 1, $\{k^1\}_1^{60}$ subjects made two sets of $\{j\}_1^{45}$choices by comparing option x_j with option y_j, in Named and No-name treatments. In Experiment 2, $\{k^2\}_1^{36}$ subjects make $\{j\}_1^{45}$ choices in a Named treatment. We define a binary variable $choice_{k,j} = 1$ when x_j is preferred to y_j by individual k.

Pooling observations across subjects and experiments, we estimate a linear probability model of these choices where explanatory variables are the differences between the values of the information variables for option x_j and option y_j, and a complete set of interactions of these differences, as well as indicator variables for the textual risk labels, Name and No-name treatments, staff and student status and for choices from Experiment 2:

$$choice_{k,j} = \beta_0 + \beta_1 return_j + \beta_2 risk_j + \beta_3 growth_j + \beta_4 HI_j + \beta_5 Dev_j + \beta_6 TF_j + \sum_{i=1}^{8} \beta_{6+i} D_{ij} + interaction\ terms + \varepsilon_{k,j} \quad (1)$$

where $return_j$ is the return objective for option x_j less the return objective for option y_j, $risk_j$ is the inferred annualized standard deviation of returns for option x_j less the standard deviation for option y_j, $growth_j$ is the proportion of growth assets in the allocation for option x_j less the proportion of growth assets for option y_j, HI_j is the Herfindahl index for option x_j less the Herfindahl index for option y_j,

Dev_j is the deviation from 1/n index for option x_j less the deviation from 1/n index for option y_j, and TF_j is the minimum recommended time frame for investment in option x_j less the recommended timeframe for option y_j in years. D_{ij} are five indicator variables taking the value 1 when either x_j or y_j have a textual risk label of 'very low', 'medium', 'medium-high', 'high' or 'very high' plus additional indicators for choices from Experiment 2, whether the participant was a staff member or a student and for the Name/No-Name treatment. We include all two-way interactions between the five information variables to allow for a more general functional form.

All the mandatory information items in the disclosure document are relevant to explaining the pooled choices of the experimental subjects. Results reported in Table 3 show that coefficients on all information variables and the majority of interactions are significantly different from zero at the 5% level. Of the textual risk labels, only coefficients on indicators for 'medium-high' and 'very high' are significant. The coefficients on the indicators for the Name/No Name treatment, whether the participant was staff or student and whether choices were collected in Experiment 1 or 2, were all insignificant. More surprising are the signs of estimated marginal effects.

[INSERT TABLE 3 HERE]

Figure 3 below graphs the marginal effects of the information variables where interactions are evaluated at mean values. A 1 percentage point p.a. increase in the relative return of x_j over y_j actually *decreases* the likelihood of x_j being preferred to y_j by around 17 percentage points, whereas a 1 percentage point p.a. increase in the relative volatility of x_j over y_j *increases* the attractiveness of x_j by around 12

percentage points. The signs of these aggregate responses are clearly at odds with those predicted by standard models.[11]

[INSERT FIGURE 3 HERE]

Further, the marginal effects of asset allocation measures demonstrate the dramatic influence of the pie chart on choices. The proportion of growth assets, degree of portfolio concentration and deviation from 1/n, all have separate and significant effects. For example, as the proportion of growth assets in x_j over y_j declines from 100% to 50%, the probability of choosing x_j increases by around 25 percentage points. Similarly, as the *HI* differential declines from 1 to 0.5 the probability of choosing x_j increases by 28 percentage points, and as the Dev_j differential declines from 1 to 0.1 the probability of choosing x_j increases by 31 percentage points. In visual terms, the share of blue and maroon in the pie, the number of segments and the relative size of the segments all separately and significantly predict investment preferences. Respondents prefer more blue, more segments and more equally-sized segments corresponding to smaller allocations to growth assets, less concentration and close to equal shares across asset classes.

4.4 Individual models

The aggregate model reveals unexpected responses to returns and risk, and a multi-faceted influence of the asset allocation pie-chart. Estimating separate linear probability models for each individual can show whether these aggregate tendencies are uniform and significant within and between subjects, so we estimate equation (1) for each subject, omitting indicators that are perfectly correlated with the constant, and using the 90 choices made in Experiment 1 or the 45 choices made in Experiment 2.

[11] Estimating logit models of choices with the same explanatory variables produces consistent results. These are not reported here but are available from the authors on request. We report linear probability models for ease of interpretation

Preliminary estimation showed that diversification indicators *HI* and *Dev* are highly collinear and not well identified in individual equations when both are included. On testing each separately, we found that coefficients on *Dev* (that is, deviation from 1/n) are more often significant.

Experimental subjects use elements of the information set differently. To illustrate these differences, we use each subject's estimates to compute the marginal effect of return, risk, growth asset percentage, deviation from 1/n, timeframe, and the textual risk labels. We then use standard linear restriction tests (over main effects and interactions) to identify which marginal effects are significantly different from zero. Results on significance are reported in Table 4.

[INSERT TABLE 4 HERE]

The predictive power of the information set varies widely by subject. Of the 96 subjects, 23% made choices for which none of the five information elements were significant, and another 23% made choices predicted by only one of the five elements. On the other hand, around 30% of subjects made choices predicted by four or five information elements. The most commonly significant variable is *Dev* (that is, deviation from 1/n), having predictive power in 55 of 96 (57%) individual equations, followed by return and risk at 48% of individual equations. Results for estimation including the Herfindahl Index are similar, but show lower rates of significant marginal effects. Choices of subjects who use only one or two information items are predicted most often by the relative segmentation of the pie chart in the options being compared, and are particularly influenced by the number and size of the segments. Choices of subjects who use more information items are likely to be predicted by relative return and risk as well as *Dev* or *HI*. Overall, almost a quarter of subjects appear to respond unpredictably to any of the information items provided but around a third use most items in predictable (if surprising) ways.

Unexpected signs on marginal effects for risk and return are not universal across individual subjects, but exceed the number with expected signs. Panels in Figure 4 plot significant individual marginal effects for each information item; insignificant marginal effects are set to zero. Only 12 of 96 subjects have positive marginal effects for relative return (panel a) and only 9 subjects have negative response to higher relative risk (panel b). By contrast, 49 of the 55 subjects with significant responses to *Dev* prefer options that deviate less from 1/n allocations and only 6 significantly prefer those that deviate more (panel c). Reponses to growth asset percentage differentials are fairly evenly spread between positive and negative, but around three times as many subjects prefer short time frames to longer time frames (panels d and e).

[INSERT FIGURE 4 HERE]

Estimation of individual level models confirms that, with few exceptions, subjects preferred low-concentration investment options that deviate little from equal allocations between asset classes: those having allocation pie charts with more segments (coverage of more asset classes) and of roughly equal sizes. More salient information, including return targets and numerical risk measures, when they do significantly predict the choices of subjects, frequently have unexpected signs.

Regulators may be interested in identifying groups of plan members who tend to under-use information, or who are influenced too much by manipulable elements of the disclosure at the expense of other important information. Indeed, regulators expected that plan members with low financial literacy would be less willing to read disclosures and less able to response well to information (Treasury 2010). Our

attempts to identify demographic characteristics, or risk attitudes, that explain information use by individuals resulted in uninformative and/or unstable results. [12]

4.6 Default option

Since Australia's retirement savings system is mandatory, almost all plans offer a default investment option so that contributions can be made even when members do not make an active investment choice. As noted earlier, the Balanced option is the default for UniSuper members. Although no exhaustive information on rates of default are available, membership of default investment options frequently run as high as two-thirds of members (APRA 2013). Studies of the retirement savings system have concluded from these indicators of high default rates that members are disengaged, and uninterested in making decisions about their own investments (Cooper 2010).

As a preliminary exploration of the interaction between information, engagement and defaults, we offered participants in Experiment 2 the opportunity to receive their payout via a draw from their most preferred investment option or from the 'default' option, without identifying it. Only 2 of 36 participants in Experiment 2 elected a default option payout. The low rate of default suggests that participants, having spent time and effort in understanding and comparing the range of options, had a firm view on their preferred investment and did not follow any implied recommendation from the provider.

[12] We estimated logit regressions of indicator variables for significant marginal effects for individuals on demographics and risk measures. A larger sample may be needed to find more robust relationships between subject characteristics and information use. That said, our sample size per experiment is not out of line with those for standard experiments (List et al., 2011) and even if we were to find more robust relationships between subject characteristics and information use, it is not likely that the effect sizes would be large. As mentioned, it is likely that we over-sampled younger and better educated, and/or at least motivated, university retirement plan members which most likely explains these results.

5. Discussion and Conclusion

We conducted two experiments to study how university students and staff participants choose retirement savings investment options using new short form product disclosure information prescribed by regulators. The prescribed information includes expected return, risk, time frame, risk label and strategic asset allocation (which for the retirement plan studied here is presented as a pie chart indicating percentage of portfolio by asset class). Our results can be summarized as follows:

- Simple counts of aggregate choices indicated that subjects focussed on options diversified across asset classes, with all six pre-mixed options preferred to all four single sector options in both experiments. For example, the most preferred option from pairwise comparison tasks in both experiments is the Conservative Balanced option. In the two named treatments, the least preferred is Cash and when ranked using two best/worst designs, the most preferred was the 'Socially Responsible Balanced' and the least, Cash.
- Pooled models indicated that all information items prescribed in the short form product disclosure are relevant to explaining choices, but with some surprises: the marginal effect of return information has an unexpected (negative) sign and marginal effect of risk is positive. The largest marginal impact of all the prescribed information is for an asset allocation pie-chart, the visual representation of asset allocation information.
- Individual models identified that subjects use elements of the prescribed information differently. We demonstrate that choices of 23% of subjects cannot be predicted using any of the prescribed information items and 23% made choices predicted by only one of the five items but that around 30% used all, or almost all, prescribed items.
- Overall, participants preferred options with more segmented pies (lower concentration) and with equally sized segments (lower deviation from a 1/n allocation). This novel application of a 1/n strategy

to pre-mixed portfolios expands significantly the standard findings of naïve diversification in studies where portfolio asset class allocations are 'mixed' by participants.

Why were participants' choices influenced to such a great extent by the pie chart information? Two answers present themselves. First, the pie chart was the only graphical piece of information in the display making it an obvious focus of attention. Put simply, perhaps the quickest way for our participants to discriminate between paired options was to look at each pie chart and not bother to read the accompanying text. While such cursory processing might have occurred (for some participants), it is clear that the nature of the pie chart display itself – specifically the number and relative sizes of the 'slices' – influenced subsequent choices.

This adoption of a 1/n strategy in paired choices from pre-mixed options represents a novel extension of the more general diversification strategies often observed in the retirement savings literature (Benartzi and Thaler 2001; 2007). In those studies participants are faced with the choice of how to allocate a given amount across a set of options. In our studies participants were faced with menus containing predetermined allocations. The fact that 1/n-consistent behavior dominates in both settings is testament to the seductiveness of this simple rule and evidence against the observation that the diversification heuristic does not apply to pre-mixed funds (Benartzi and Thaler 2007, p.90).

Early studies of such 'variety-seeking' behavior documented participants' tendencies to prefer more variety in consumer products when choosing simultaneously than when choosing sequentially (Read and Lowenstein 1995; Simonson 1990). This behavior can lead to consumers ending up with more variety in their purchases than they may have wanted (e.g., Read and Lowenstein 1995). The mechanism driving the preference for more diversified options in the current experiments is likely to be different. Here our (mostly) naïve participants may have been driven by the simple rule of thumb that 'putting all your eggs

in one basket' is sub-optimal when it comes to retirement savings, and thus options which appear to spread assets among many 'baskets' are likely to be better.[13]

In short, the behavior of our participants can be summarized as the combined operation of a cognitive shortcut – "look at the graphical/salient discriminating piece of information" and a cognitive heuristic – "choose diversified/balanced allocations". The design of our experiments, with multiple repeated pairings and several methods for eliciting preferences, probably reinforced the adoption of both of these shortcuts. Open questions therefore remain regarding the extent to which the 1/n preference would hold if the asset allocation information was presented in a non-graphical format (as some, though not many, providers do) and/or under situations where fewer choices are made. This provides a partial agenda for further work, which should also include testing with a more representative sample to enable investigation of differences by demographics, risk preference and financial competence.

In introducing the disclosure format evaluated here, the intention of the regulator was to reduce complexity, increase comparability and encourage engagement with financial decisions (Treasury 2010). While there was extensive consultation (see Treasury 2010, pp. 18, 21-22) and even some independent consumer testing, the pre-testing of formats focussed on simplicity and comparability (Treasury 2010, p. 18), but apparently not on *how* people would use the information provided.[14] Our results indicate, in line with existing studies (Navarro-Martinez et al., 2011), that first order improvements from

[13] Equally-weighted portfolios are not necessarily inferior to, and in many cases perform better than, portfolios constructed using more sophisticated or finely-tuned procedures. (See DeMiguel et. al 2007, among others.)

[14] The Regulatory Impact Statement accompanying the short form product disclosure legislation reports that "78. In examining this option and developing draft regulations for shorter PDSs, the Working Group created example PDS documents for superannuation products … as 'proof of concept' and consultation documents for the proposed disclosure regimes. To ensure that these example PDSs, and hence the regulatory framework sitting behind them, were going to be effective in achieving the objective of improving financial service disclosure for consumers, each document was independently consumer tested. 79. Participants consistently said that they liked the clear structure of the example PDSs, and regarded them as logical and easy to follow. … For the superannuation … PDS, the question about how hard it was to locate information between 0 (very hard) and 10 (very easy) yielded ratings of 8.3 and 7.8 respectively. These results indicate that the proposed regulatory framework of structured headings and content sections will translate into PDSs that consumers will be able to use in a more effective manner."

simplification cannot be assumed, and need to be directly checked. Indeed, instructions such as the following from the plan provider: *'You must consider the likely investment return, the risk and your investment timeframe when choosing an investment option in which to invest.' UniSuper (2012, p.2)* while probably necessary, is not sufficient, to guarantee that information serves the purpose for which it is intended.

In addition, the highly influential pie chart shown to participants here is an example of a format that can be easily manipulated. Unsupervised or unscrupulous financial service providers could re-label or reweight asset allocation information towards low concentration, even allocations, and tilt investors towards particular products. Pool et al. (2013) report that 401(k) plan participants do not undo the favoritism towards mutual funds from their own family created by plan trustees. This favoritism is costly to members. Careful incentive-compatible pre-testing, in natural settings and with representative samples of consumers, of their responses to information items and formats prescribed by regulators seems necessary if members are to continue to have responsibility for investment choice.

References:

Agnew, J.R., Szykman, L.R., Utkus, S.P., Young, J.A., 2011. What people know about target-date funds: Survey and focus group evidence. Financial Security Project at Boston College Working Paper, 2011-2.

Australian Securities and Investment Commission (ASIC), 2012a. Information Sheet 133 – Shorter PDS regime: Superannuation, managed investment schemes and margin lending. Available at http://www.asic.gov.au/.../info133.../info133-published-18-June-2012.pdf

Australian Securities and Investment Commission (ASIC), 2012b. Information Sheet 155 – Shorter PDSs: Complying with requirements for superannuation products and simple managed investment schemes. Available at http://www.asic.gov.au/asic/pdflib.nsf/LookupByFileName/info155-published-18-June-2012.pdf/$file/info155-published-18-June-2012.pdf

Australian Prudential Regulatory Authority (APRA), 2010. Good practice guidance – investment risk description, June 2010. Available at http://www.apra.gov.au/Super/Documents/Ltr-IRD-29-June-FINAL-trustee.pdf

Australian Prudential Regulatory Authority (APRA), 2013. Annual Superannuation Bulletin 2012 (released 9 January 2013). Available at http://www.apra.gov.au/Super/Publications/Documents/June%202012%20Annual%20Superannuation%20Bulletin.pdf

Benartzi, S., Thaler, R.H., 2001. Naive diversification strategies in defined contribution plans. American Economic Review 91(1), 79-98.

Benartzi, S., Thaler, R.H., 2007. Heuristics and biases in retirement savings behavior. Journal of Economic Perspectives 21(3), 81-104.

Beshears, J., Choi, J.J. Laibson, D., Madrian, B.C., 2008. The importance of default options for retirement saving outcomes: Evidence from the United States', In Stephen J. Kay and Tapen Sinha (eds), Lessons from Pension Reform in the Americas. Oxford: University of Oxford Press, 59-87.

Beshears, J., Choi, J.J. Laibson, D., Madrian, B.C., 2011. How does simplified disclosure affect individuals' mutual fund choices? In David A. Wise (ed), Explorations in the Economics of Aging. Chicago: University of Chicago Press, 75-96.

Beshears, J., Choi, J.J. Laibson, D., Madrian, B.C., 2013, Simplification and saving. Journal of Economic Behavior and Organization, In press.

Brown, J.R., Liang, N., Weisbenner, S. 2007, Individual account investment options and portforlio choice: Behavioral lessons from 401(k) plans. Journal of Public Economics 91, 1992 - 2013.

Calvet, L.E., Campbell, J.Y., Sodini, P., 2007. Down or out: assessing the welfare costs of household investment mistakes. Journal of Political Economy 115(5), 707-747.

Carroll, G.D., Choi, J.J. Laibson, D., Madrian, B.C., Metrick, A., 2009. Optimal defaults and active decisions. Quarterly Journal of Economics 124(4), 1639-1674.

Choi, J.J., Laibson, D., Madrian, B.C., 2009. Reducing the complexity costs of 401(k) participation: the case of quick enrollment. In: Wise, D.A., (eds.). Developments in the economics of aging. Chicago: University of Chicago Press, 57-82.

Choi, J.J. Laibson, D., Madrian, B.C., 2010. Why does the law of one price fail? An experiement on index mutual funds. Review of Financial Studies 23 (4), 1405-1432.

Commonwealth of Australia, 1997. Financial System Inquiry Final Report. Available at http://fsi.treasury.gov.au/content/FinalReport.asp

Commonwealth of Australia 2011. Corporations Amendment Regulations 2010 (No.5) Select Legislative Instrument 2010 No. 135. Available at http://www.comlaw.gov.au/Details/F2010L01585

Cooper J., 2010. Super System Review, Final Report Part 1, Overview and Recommendations, Commonwealth of Australia. Available at http://www.supersystemreview.gov.au/content/downloads/final_report/part_one/Final_Report_Part_1_Consolidated.pdf

Deck, L., Lee, L., Reyes, J.J., Rosen, C.C., 2013. A failed attempt to explain within subject variation in risk taking behavior using domain specific risk attitudes. Journal of Economic Behavior and Organization, In press.

DeMiguel, V., Garlappi, L.,Uppal, R., 2007. Optimal versus naïve diversification: How inefficient is the 1/N Portfolio Strategy? Review of Financial Studies 22, 1915-1953.

Financial Services Council (FSC) and Association of Superannuation Funds of Australia (ASFA), 2011. Standard Risk Measure: Guidance Paper for Trustees.

Greiner, B., 2004. An Online Recruitment System for Economic Experiments. In Kremer, K., Macho, V. (Eds.) Forschung und wissenschaftliches Rechnen2003. GWDG Bericht 63. Goettingen: Gesellschaft fuer Wissenschaftliche Datenverarbeitung, 79 – 93.

Gruen, D., Wong, T., 2010. MySuper – Thinking seriously about the default option, presented at the Special Session on Superannuation, Australian Conference of Economists, September 2010, Sydney. Available at http://archive.treasury.gov.au/documents/1922/PDF/03_MySuper.pdf

Harrison, G.W., Johnson, E., McInnes, M.M., Rutström, E.E., 2005. Risk aversion and incentive effects: Comment. The American Economic Review 95(3), 897-901.

Holt, C.A., Laury, S.K., 2002. Risk aversion and incentive effects. The American Economic Review 92(5), 1644-1655.

Huberman, G., Jiang, W., 2006. Offering versus choice in 401 (k) Plans: Equity exposure and number of Funds, The Journal of Finance 61(2), 763 -801.

Hung, A.A., Heinberg, A., Yoong, J.K., 2010. Do risk disclosures affect investment choices? RAND Labor and Population Working Paper W-788.

Kozup, J., Howlett, E., Pagano, M., 2008. The effects of summary information on consumer perceptions of mutual fund characteristics. The Journal of Consumer Affairs 42(1), 37-59.

List, J.A., Sadoff, S., Wagner, M., 2011. So you want to run an experiment, now what? Some simple rules of thumb for optimal experimental design. Experimental Economics 14(4), 439-457.

Madrian, B., Shea, D.F., 2001. The power of suggestion: Inertia in 401(k) participation and savings behavior. The Quarterly Journal of Economics 116(4), 1149-1187.

Morrin. M., Inman, J.J., Broniarczyk, S.M., Nenkov, G.Y., Reuter, J., 2012. Investing for retirement: The moderating effect of fund assortment on the 1/n heuristic. Journal of Marketing Research 49, 537-50.

Navarro-Martinez, D., Salisbury, L.C., Lemon, K.N., Stewart, N., Matthews, W.J., Harris, A.J.L., 2011. Minimum required payment and supplemental information disclosure effects on consumer debt repayment decisions. Journal of Marketing Research 48 (Special Issue 2011), S60–S77.

OECD (2011), G20 High-Level Principles on Financial Consumer Protection, October 2011. Available at http://www.oecd.org/regreform/sectors/48892010.pdf.

Pool, V. K., Sialm, C., Stefanescu, I., 2013, It pays to set the menu: Mutual fund investment options in 401(k) plans. NBER working paper w18764, National Bureau of Economic Research, Cambridge, MA.

Read, D., and Lowenstein, G., (1995). Diversification bias: Explaining the discrepancy between combined and separate choices. Journal of Experimental Psychology: Applied 1, 34-59.

Scheibehenne, B., Greifender, R., Todd, P.M., 2010. Can there ever be too many options? A meta-analytic review of choice overload. Journal of Consumer Research 37, 409-425.

Securities Exchange Commission (SEC), 2007, RIN 3235-AJ44 Enhanced Disclosure and New Prospectus Delivery Option for Registered Open-End Management Investment Companies. Release Nos. 33-8998; IC-28584; File No. S7-28-07. Available at http://www.sec.gov/rules/final/2009/33-8998.pdf.

Simonson, I., 1990. The effect of purchase quantity and timing on variety seeking behavior. Journal of Marketing Research, 32, 150-162.

Szrek, H., Chao, L.W., Ramlagan, S., Peltzer, K., 2012. Predicting (un)healthy behavior: A comparison of risk-taking propensity measures. Judgment and Decision Making 7 (6) 716–727.

The Treasury, 2010. Regulation Impact Statement (RIS) – Financial Services Disclosure Reform, May 2010. Available at http://ris.finance.gov.au/files/2010/07/FSWG_PDS-RIS_20100713.pdf.

UniSuper, 2012a. Accumulation 1, Product Disclosure Statement. Melbourne: UniSuper Limited. Available at http://www.unisuper.com.au/~/media/F08E15DE887248C58E2DA70DF6A0849A.pdf

UniSuper, 2012b. How we invest your money. Melbourne: UniSuper Limited. Available at http://www.unisuper.com.au/~/media/96B2A529DD7447FD95411AC8198085CF.pdf.

Weber, E.U., Johnson, E.J., 2008. Decisions under uncertainty: psychological, economic, and neuroeconomic explanations of risk preference. In Glimcher,P.W., Fehr, R., Camerer,C., Poldrack, R.A., (eds.). Neuroeconomics: Decision making and the brain, London: Academic Press.

Table 1: Investment option summary risk, return and concentration.

Option name	Return objective	Risk measures		Concentration measures			Horizon	Performance
	Return. over CPI (% p.a.)	Negative returns (years in 20)	Summary risk level	Herfindahl Index	Deviation from 1/n	Growth Assets (%)	Min Time (years)	Inferred Sharpe ratio
Capital stable	2.0	2	medium	0.52	0.27	30	2	0.28
Socially responsible balanced	3.0	4	high	0.36	0.02	70	6	0.30
Growth	4.0	5	high	0.30	0.10	85	7	0.30
Cash	1.0	negligible	very low	1.00	1.00	0	short-term	-
Australian bonds	1.5	3	medium to high	1.00	1.00	0	4	0.13
Australian shares	5.0	6	very high	1.00	1.00	100	7	0.27
Global environmental opportunities	5.0	6	very high	1.00	1.00	100	7	0.27
Conservative balanced	2.5	3	medium to high	0.34	0.09	50	4	0.30
Balanced	3.0	4	high	0.27	0.07	70	6	0.30
High growth	5.0	5	high	0.42	0.17	100	7	0.34

Table shows investment option characteristics. The return objective is 'to achieve returns (after Fund taxes and investment fees) that are at least X% p.a. more than inflation (CPI).' Risk is described as the expected frequency of negative annual return expressed as 'X in twenty'. The summary risk level is a textual descriptor prescribed by the regulator matched to a scale of negative returns frequencies. The timeframe is the minimum suggested timeframe for the investment. Growth assets measures the percentage of the portfolio allocated to equities, property and alternative investments. The Herfindahl Index summarizes the concentration of the portfolio by summing and squaring the weight of each asset class. Deviation from 1/n measures the sum of squared deviations of asset class weights from 1/n, where n is the number of asset classes depicted in the pie chart for the investment option. Sector options are set to one. The Sharpe ratio assumes that the log gross return to each investment option (apart from cash) is i.i.d. normally distributed, with the implied standard deviation, σ_p, is based on the return objective, $r_{p,}$ as the median return, and the quantile information in the estimated number of negative returns. The Sharpe ratio is then $(r_p - r_f)/\sigma_p$ where the return to cash is the risk-free rate, r_f. We assume *CPI = 2.5% p.a.*

Table 2: Preferences over investment options: Summary of choices.

	Experiment 1 (n=60)		Experiment 2 (n=36)		
Option	Name	No-name	Name	Balanced	Unbalanced
	Best (% of pairs)	Best (% of pairs)	Best (% of pairs)	Best-Worst	Best-Worst
Capital stable	71	72	64	31	5
Socially responsible balanced	62	58	69	**90**	**7**
Growth	65	63	62	45	4
Cash	*24*	28	*19*	*-123*	*-19*
Australian bonds	26	29	33	-69	-2
Australian shares	24	27	32	-44	0
Global environmental opportunities	27	*22*	34	-23	-5
Conservative balanced	**75**	**76**	**73**	47	5
Balanced	69	68	63	55	3
High growth	57	57	50	-9	2
Transitivity rates	16.7%	16.7%	16.7%		

Columns 1-3 show percentages of pairwise choices where the investment option in column 1 was preferred over an alternative. Column 4 shows the number of times the option was ranked first less the number of times it was ranked fourth in the ranking exercise where four options are offered over 14 choices. Column 5 shows number of times the investment option was chosen as best (ranked first of 10 options) less the number of times it was chosen as worst (ranked tenth) in the explicit ranking exercise. Highest ranked options are in bold font and lowest in italics.

Table 3: Pooled Experiment 1 and 2 choice model estimates.

	Pooled Regression Experiment 1 and 2 (7020 observations)	
	Estimated Coefficient	**p-value**
Return	-0.131	0.001
risk	0.101	0.000
growth	-0.436	0.000
HI	-0.666	0.000
Dev	-0.233	0.069
TF	-0.081	0.000
very low	0.067	0.286
medium	-0.040	0.424
medium high	0.065	0.005
high	0.016	0.738
very high	0.126	0.046
*return *risk*	0.038	0.000
*return * growth*	0.224	0.024
*return * HI*	-1.614	0.008
*return * Dev*	1.378	0.001
*return *TF*	-0.058	0.011
risk growth*	-0.219	0.000
risk HI v*	0.159	0.243
risk Dev*	-0.207	0.021
*risk*TF*	-0.005	0.422
*growth * HI*	6.430	0.000
*growth * Dev*	-4.543	0.000
*growth * TF*	0.291	0.000
*HI * Dev*	0.150	0.191
*HI *TF*	-0.360	0.004
*Dev *TF*	0.320	0.001
Experiment 2 indicator	0.005	0.722
Staff/Student indicator	-0.004	0.730
Name No name treatment indicator	-0.010	0.386
Constant	0.408	0.000
R Square		**0.282**

Table shows the results of a pooled OLS regression of $choice_{k,j} = 1$ when x_j is preferred to y_j by individual k,$return_j$ is the return objective for option x_j less the return objective for option y_j, $risk_j$ is the inferred standard deviation of returns for option x_j less the standard deviation for option y_j, $growth_j$ is the proportion of growth assets in the allocation for option x_j less the proportion of growth assets for option y_j, $HI_j$is the Herfindahl index for option x_j less the Herfindahl index for option y_j, $Dev_j$is the deviation from 1/n index for option x_j less the deviation from 1/n index for option y_j,and TF_j is the minimum recommended time frame for investment in option x_j less the recommended timeframe for option y_j in years.

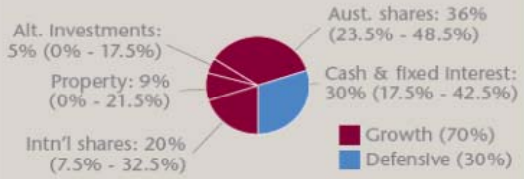
Table 4: Significant marginal effects in individual equations.

Number of Significant Marginal Effects	Returns	Risk	Growth Asset %	Deviation from 1/n	Timeframe	Number of Subjects
0	0	0	0	0	0	**22**
1	7	0	3	9	3	**22**
2	1	2	2	5	4	**7**
3	12	14	1	13	5	**15**
4	10	13	8	11	10	**13**
5	17	17	17	17	17	**17**
Total Significant	**47**	**46**	**31**	**55**	**39**	**96**
	Returns	**Risk**	**Growth Asset %**	**Herfindahl Index**	**Timeframe**	**Number of Subjects**
0	0	0	0	0	0	**20**
1	4	1	4	12	2	**23**
2	8	7	2	5	6	**14**
3	9	9	2	9	4	**11**
4	11	13	9	11	8	**13**
5	15	15	15	15	15	**15**
Total Significant	**47**	**45**	**32**	**52**	**35**	**96**

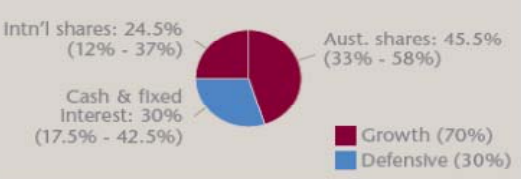
Table shows counts of significant marginal effects from OLS estimation of individual linear probability equations of choices, equation (1). Panel 1 reports results for estimates including deviations from 1/n and Panel 2 reports results for estimates including the Herfindahl index of concentration. Columns 2-6 show the conditional frequency for each information variable. For example, looking along row four, 15 subjects out of a total of 96 had 3 significant marginal effects in their individual equations. Of these, return was significant in 12 equations, risk in 14 equations and deviation from 1/n in 13 equations. The final column shows the total number of subjects at each significance count. The final row in each panel shows the total number of times the marginal effect was significant across all subjects' estimated equations.

Figure 1: Prescribed summary information for three illustrative investment options offered by UniSuper

INVESTMENT DETAILS FOR OUR BALANCED INVESTMENT OPTION

Description of option/ Type of investor	Invests in a diversified portfolio, comprising mainly growth assets, such as Australian and international shares, property and alternative investments, and with some bonds investments. Designed for investors with a high risk tolerance who are seeking a high level of expected returns.
Investment return objective*	To achieve returns (after Fund taxes and investment fees) that are at least 3.0% p.a. more than inflation (CPI).
Strategic asset allocation and ranges	
Minimum suggested timeframe for investment	Six years
Expected frequency of negative annual return	Four in twenty years
Summary risk level	High

INVESTMENT DETAILS FOR OUR SOCIALLY RESPONSIBLE BALANCED INVESTMENT OPTION

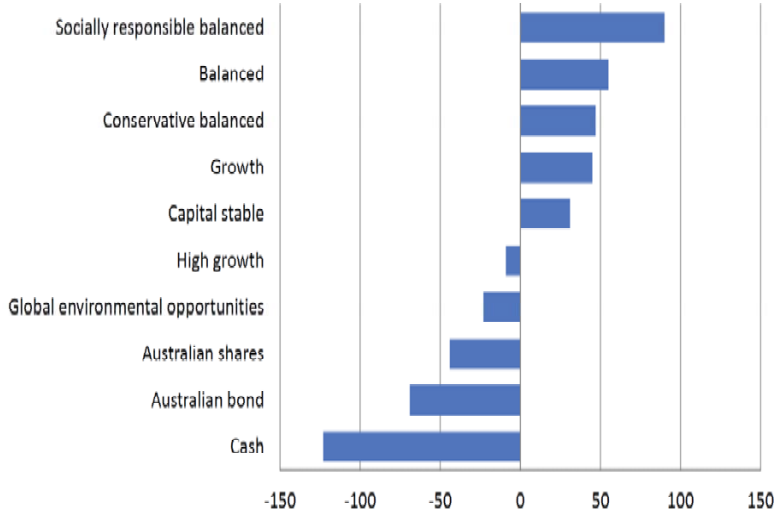
Description of option/ Type of investor	Invests in a diversified portfolio comprising Australian and international shares that are selected on the basis of sustainable investment criteria (refer to pages 22 to 25 for further details) and in fixed interest and cash assets. Designed for investors with a high risk tolerance who are seeking a high level of expected returns.
Investment return objective*	To achieve returns (after Fund taxes and investment fees) that are at least 3.0% p.a. more than inflation (CPI).
Strategic asset allocation and ranges	
Minimum suggested timeframe for investment	Six years
Expected frequency of negative annual return	Four in twenty years
Summary risk level	High

INVESTMENT DETAILS FOR OUR AUSTRALIAN SHARES INVESTMENT OPTION

Description of option/ Type of investor	Invests in a diversified portfolio of Australian shares. Designed for investors with a very high risk tolerance who are seeking a very high level of expected returns.
Investment return objective*	To achieve returns (after Fund taxes and investment fees) that are at least 5.0% p.a. more than inflation (CPI).
Strategic asset allocation	
Minimum suggested timeframe for investment	Seven years
Expected frequency of negative annual return	Six in twenty years
Summary risk level	Very high

Figure 2: Best minus worst counts

a. Best minus worst counts: balanced ranking



. Best minus worst counts: unbalanced ranking

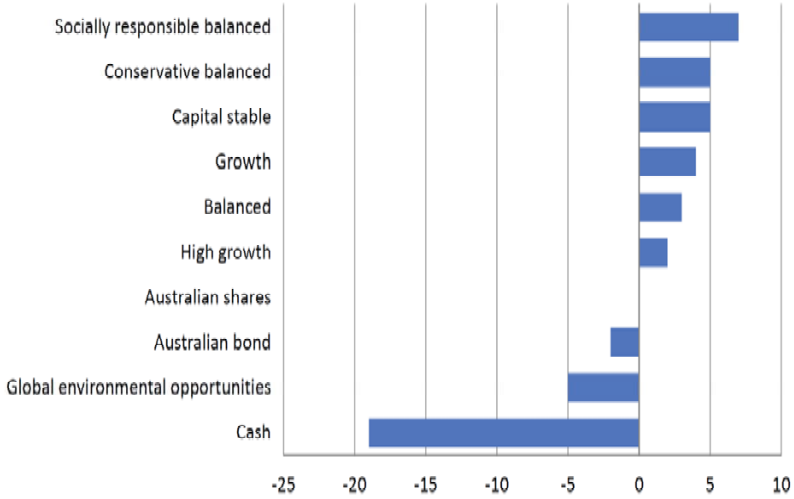


Figure shows the relative rankings from ranking phases of Experiment 2, graphing the count of best rankings minus worst rankings for the 36 subjects. The 'balanced' rankings are the results of the 14x4 best-worst comparisons from the BIBD and the 'unbalanced' rankings are from the explicit comparison.

Figure 3: Marginal effects of information variables, pooled model.

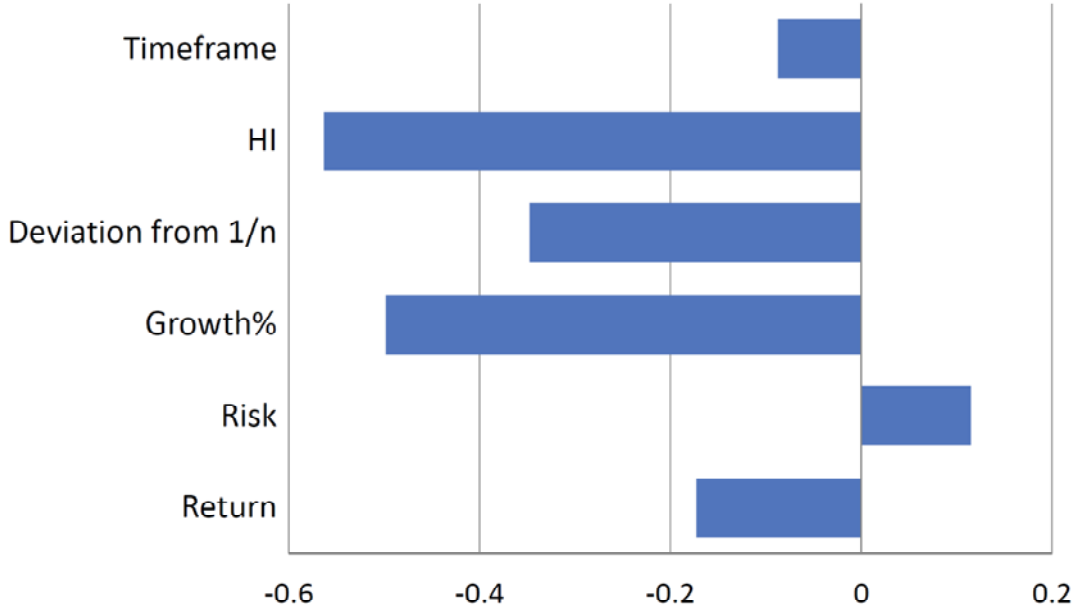
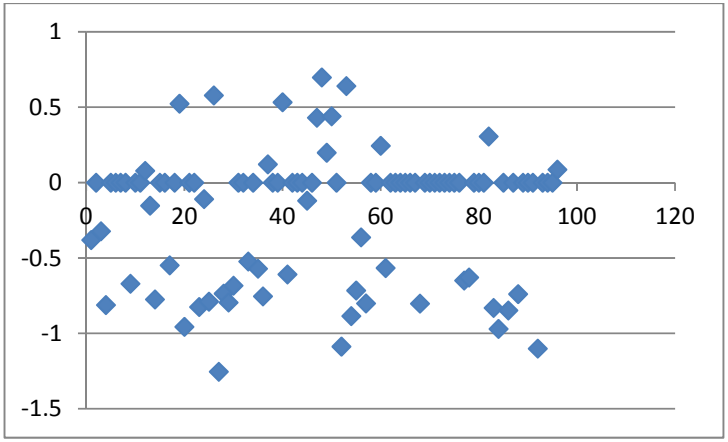


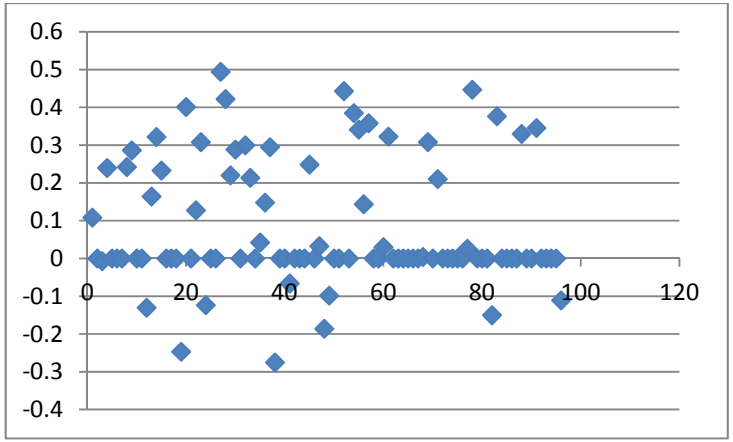
Figure graphs the marginal effects of the information variables where interactions are evaluated at mean values. Estimates of coefficients on main effects and interactions are reported in Table 3. Variable definitions are in the notes to Table 3.

Figure 4: Significant marginal effects of information variables, individual models (n=96).

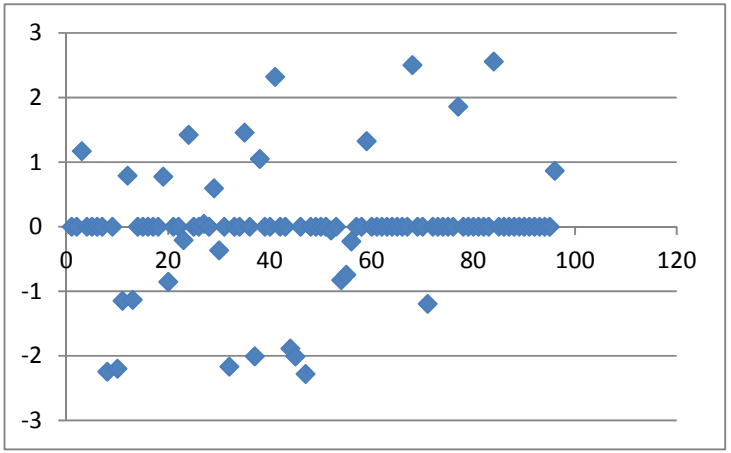
a. Returns



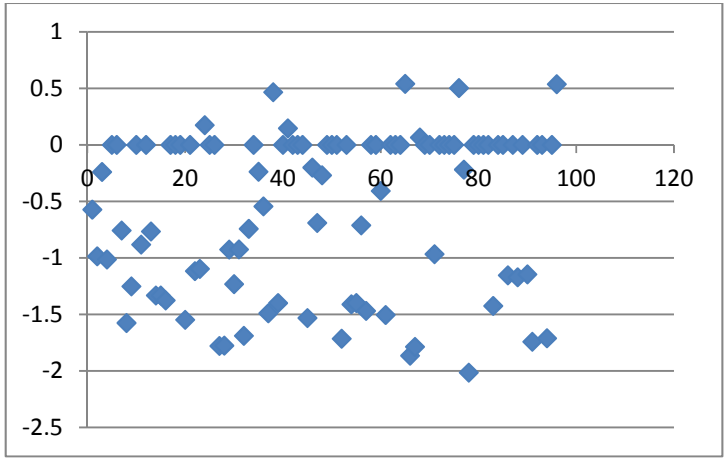
b. Risk



c. Growth asset proportion



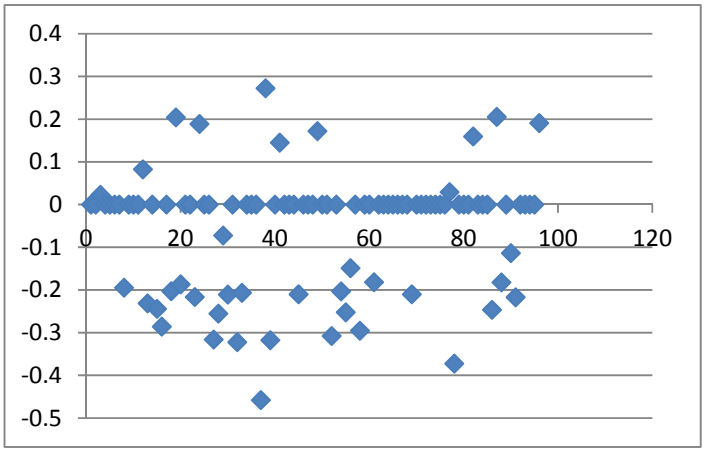
d. Deviation from 1/n



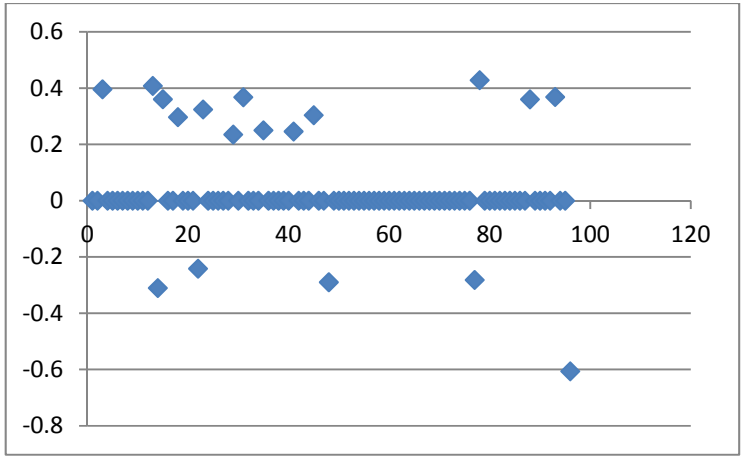
Panels plot significant individual marginal effects for each information item with insignificant marginal effects set to zero. Estimates are from individual OLS regressions of equation (1). Variable definitions are set out in the notes to Table 3.

Figure 4: continued

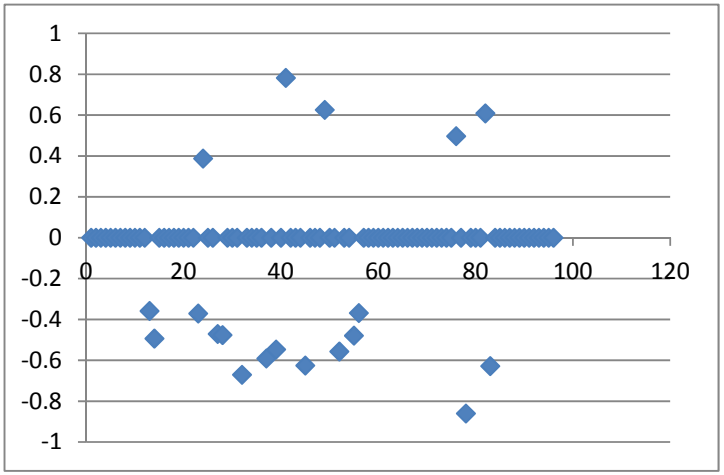
d. Timeframe



e. Medium-High



f. High



g. Very high