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# Deciding to invest responsibly: Choice architecture and demographics in an incentivised retirement savings experiment

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ABSTRACT

We report results from a framed field experiment with a realistic retirement savings simulation to examine two factors in socially responsible investment (SRI) decisions: characteristics of investors and the investment choice architecture. We find that default options, age and values are significant explanators while infographics, gender, education and income are not. Further, repeated decisions affect SRI negatively through donor fatigue and positively through windfall gains. Our results suggest SRI is significantly limited by the non-ethical default options pension providers commonly set. Conversely there is scope for *nudging* pension savers towards socially responsible investments using defaults.

## 1. Introduction

Socially responsible investment (SRI) is growing in size and importance world-wide (Sparkes, 2008; Renneboog et al., 2008; Ballestero and Pérez-Gladish, 2015). According to the Global Sustainable Investment Alliance (2016) between 2014 and 2016 alone the total value of SRI assets increased from a fifth to a quarter of all assets globally. This trend has sparked a literature on different facets of SRI including its financial performance, underlying regulatory frameworks and impact on firms' corporate social responsibility (Renneboog et al., 2008).

An important part of the SRI literature relates to the determinants of investors' SRI decisions (for overviews, see Sparkes, 2008; Méndez-Rodríguez et al., 2014). What are the characteristics and underlying motivations of individuals who tend to engage in SRI (Nilsson, 2008)? Are these individuals different (Webley et al., 2001, p. 28)? What are the factors in the choice environment that make such decisions more likely? These questions are important both for policy and practice. Studies in this area typically use questionnaires to survey representative investors regarding their demographics and motives for investing responsibly and compare these to conventional investors.

Our paper aims to make a contribution to this agenda by applying, for the first time, experimental economics methods to examine individuals' SRI choices in a retirement savings context. We believe this approach is particularly well suited for the examination of ethical investment decisions. First, questionnaires commonly used in the SRI literature with self report or hypothetical questions are associated with response biases (Bertrand and Mullainathan, 2001; Chandon et al., 2005) particularly when they relate to socially desirable behaviour (Lee and Sargeant, 2011). Instead we implement incentive compatibility in our experiment where participants' rewards are tied to their particular decisions. Second, empirical studies with abstract questions or experimental tasks removed from the natural context of real decisions can produce poor external validity (List and Reiley, 2008; Carpenter et al., 2005). We employ a field experimental technique in that our experimental SRI task was conducted using a realistic simulation of repeated pension fund investment decisions with participants most of whom have experience of this kind of decision making. We outline the background to and motivation of our study in greater detail in Section 2. The study design is contained in Section 3. Results and conclusions are reported in Sections 4 and 5 respectively.

## 2. Background and motivation

In this section we outline the background to our topic, the motivation behind our contribution and the method we chose. We will argue that (a) because of the importance of SRI its determinants are important to study, (b) the Australian retirement savings system provides a suitable research context in the field and (c) field experiments are a promising and appropriate method in this context to re-examine existing findings and generate new ones.

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### 2.1. SRI as socially responsible consumption

Many economic agents make costly commitments to ethical and green products, services and financial investments (Benabou and Tirole, 2010). Such socially responsible consumption is commonly defined as expressing a concern with the long-term public effects of private consumption (Webster, 1975; Antil, 1984; Roberts, 1995; Webb et al., 2008). SRI is the socially responsible consumption of investment products specifically.[1] In particular, SRI has been defined as the selection of investment portfolios based not only on financial but also on non-financial (social, ethical, environmental) criteria (Sparkes and Cowton, 2004; Sparkes, 2008, p. 22–27). Globally SRI is dominated by investors in Japan and Western nations in Europe, North America and Australasia with the greatest growth rates in Australia (over 250% between 2014 and 2016, Global Sustainable Investment Alliance 2016).

What drives the worldwide growth in SRI? Pension funds and other institutional investors now make up almost three quarters of all SRI assets (Global Sustainable Investment Alliance, 2016). In 2000 pioneering UK legislation came into force that obliged all private pensions funds to consider SRI as part of their overall investment policy and to disclose whether full account of the environmental, social and ethical impact of investments is taken. A large part of worldwide SRI is now driven by individual pension fund members (mostly in Western countries) who have the opportunity to decide the type of funds their investments go to.

A well-established example of pension SRI is the Australian pension ('superannuation') system (Foster and Warren, 2016). Australian employers are legally required to send part of every employee's salary into a investment fund without the possibility of withdrawal until retirement. Employees have the opportunity to decide how their funds are invested and are presented with information about investment alternatives. Where no active choice is made investments are made in a default option. In 2010 about 80% of Australians were invested in the default investment option (Cooper et al., 2010).

An Australian government review in 2010 concluded that this system was "characterised by a lack of transparency, comparability and, consequently, accountability" that impaired fund members' ability to make appropriate financial decisions (Sy et al., 2008; Tan and Cam, 2011; 2013). Lack of information from poor disclosure practices was found to lead to default rather than active decisions by members (Butt et al., 2015). A reform program was subsequently introduced with more stringent disclosure requirements. Pension fund providers are currently examining ways to implement these in the way investment choices are presented to fund members (Bateman et al., 2016; Dobrescu et al., 2017).

### 2.2. SRI and investor characteristics

An important part of the growing SRI literature has therefore examined the determinants of SRI in the decision making of individual investors (such as pension fund members). Different strands within this literature respectively focus on the asset characteristics that drive SRI, the individual motives to which these characteristics appeal as well as the underlying demographics typically associated with these motives.

A number of studies examined how different asset characteristics match the motivations of socially-responsible investors. Among the earliest factors was the financial return of SRI compared to conventional options (Nilsson, 2008; Sparkes, 2008, pp. 81). Another aspect concerns the particular ethical issues that drive SRI behaviour. SRI portfolios are commonly constructed on negative screening where investments deemed unacceptable are excluded (Sparkes, 2008, p. 27). Successful SRI funds employ exclusion criteria that match the issues that ethical investors are concerned with. A number of studies identify and compare such concerns including human rights, the environment and particular industries such as military and tobacco products. These kinds of asset feature affect SRI because they match the motivations of socially responsible investors to a greater or lesser degree.

A second strand examines these individual motivations in the ethical values and moral perceptions of investors that underlie their SRI behaviour. Benabou and Tirole (2010) differentiate three underlying motivations: financial incentives, altruism and concern for image and self esteem. Anand and Cowton (1993) identify issues that investors consider exclusion criteria including investments in monopolistic organisations, those supporting undesirable consumption and compromising human rights. McLachlan and Gardner (2004) find that socially-responsible investors rate such ethical issues more important than other investors. These authors as well as Hofmann et al. (2007) further find that ethical investors tend to perceive greater moral intensity, i.e. recognise and act on a moral imperative in a given situation (such as investing). Lewis and Webley (1994) as well as Anand and Cowton (1993, p. 381) found that 'green' attitudes are positively associated with SRI.

While people's own values influence SRI behaviour, their perception of *collective* values (what others are thought to believe) can have a similar effect. For example, Dumas and Louche (2016) argue that investors' shared interpretation of developments in financial markets coordinates their behaviour. In the context of SRI these authors suggest that evolving collective beliefs in future SRI demand and improving financial performance of ethical investments is necessary for SRI to become mainstream.

A literature on the individual characteristics of socially-responsible investors has examined an array of demographic factors. Demographics may act as overtly observable predictors of SRI-conducive motivations that can be targeted by policy. These studies typically use questionnaires where investors are asked about the proportion of SRI of their total investments and then respond to various demographic questions. A recent overview of the findings of a dozen extant studies is provided by Méndez-Rodríguez et al. (2014). Overall the evidence is somewhat equivocal. For age, different studies find that younger, older or middle aged investors are more likely to engage in SRI while about a quarter find no effect. Studies examining income are similarity split between no effects or significant ones for low, middle and high incomes. Similarly, effects for gender go in either direction with half of the studies finding none. The only clear pattern emerges from education where all bar one study find a positive significant association with SRI. A major motivation behind our work is to provide further evidence on the unsettled demographic antecedents of SRI.

### 2.3. SRI and investment choice architecture

In addition to individuals' SRI motives and their demographic characteristics, the attributes of the investment choice environment have the potential to affect individual decisions. The reason is that investment choices are generally complex and make relatively high cognitive demands on the decision maker. They are frequently abstract, taken irregularly, require complex information processing, involve future, risky or uncertain events and entail emotions such as fear, greed and hope (e.g. Shefrin, 2002; Baker and Ricciardi, 2014).

As a result decision makers in financial (and other) domains rely on heuristics or routines where choice rules are applied to systematically simplified information in order to identify one decision alternative (Gigerenzer and Todd, 1999). While heuristics enable a decision maker to cope relatively well with otherwise overwhelming decision environments, their downside is a catalogue of resulting systematic decision errors and biases (Tversky and Kahneman, 1974; Ariely, 2008).

In their book *Nudge*, Thaler and Sunstein (2008) argue that decision biases mean that changes in the choice context cause people's decisions

[1] The SRI literature developed within finance and as such somewhat separately from socially responsible consumption research that is mainly based in marketing.

to change. As a result, people's decisions can be 'nudged' through *choice architecture*, the presentation of the decision alternatives including their number, amount and type of information given for each (Camilleri and Larrick, 2015). A nudge is an element of the choice architecture that influences people's decisions predictably without changing the constraints or incentives they face (Thaler and Sunstein, 2008, p. 6).

One highly effective and easy-to-change element of choice architecture generally is the presence of defaults, pre-selected decisions that apply when no active choice is made (Jachimowicz et al., 2017). For example, Johnson and Goldstein (2003) show that changing the default (by adding the single word *don't*) raises organ donation rates in Europe from 15% (average for opt-out nations) to 98% (opt-in). In the context of retirement savings, defaults have been shown to be a powerful influence on decisions including nudges towards enrolment or higher contributions (Madrian and Shea, 2001; Thaler and Benartzi, 2004; Beshears et al., 2009; Dobrescu et al., 2017). Defaults can be 'dumb' where the same is selected for every decision maker or 'smart', i.e. fitted to the individual decision maker based on what is known about their preferences or circumstances (Smith et al., 2013).

A second key aspect of choice architecture is how information is presented. Different formats of presenting the same information can influence decisions (Ungemach et al., 2017). In the context of investment decisions, the presentation of risk information (e.g. as percentages, frequencies or probabilities) affects how investors choose (Gigerenzer, 2014). Concrete information such as frequencies rather than more abstract probabilities have been found to improve decision making (Hoffrage et al., 2000).

Both aspects of choice architecture can be used to change the behaviour of individuals in a desirable direction (e.g. consumers or members of the public). However, used as policy instruments they have very different ethical ramifications (Glaeser, 2006; Sunstein, 2014): Information presentation influences people at the conscious level (Soll et al., 2014; Grüne-Yanoff and Hertwig, 2016; Ungemach et al., 2017). In contrast, defaults are nudges that influence people without their awareness through by exploiting cognitive biases (Thaler and Sunstein, 2008). As a result, nudges have been criticised as paternalistic (Glaeser, 2006).

While choice architecture is a well-documented influence on decisions in other contexts including other types of financial decision making, it has not yet been examined for SRI.

However this is an important issue not least because pension fund providers actively design the choices their member face in response both to statutory requirements and commercial considerations (as discussed above). A main aim of our study is to empirically examine this issue for the first time.

### 2.4. SRI and experimental economics

A range of different methods exists to study the important topic of individuals' SRI decisions (see Webley et al., 2001, p. 29). The SRI literature has so far mainly relied on interviews (e.g. Lewis and Webley, 1994; Webley et al., 2001; Foster and Warren, 2016) and, more commonly, questionnaire surveys where participants are asked to respond to hypothetical investment questions, state intentions or self report past behaviour. An alternative approach is to subject experimental participants to actual investment decisions with financial rewards based on the performance of the investments they choose. This *incentive compatibility* is a way to reduce potential response biases (social desirability and self image) associated with self-reports or hypothetical responses (Hertwig and Ortmann, 2001; Croson, 2005; Ariely and Norton, 2007).

Based on this approach, an embryonic literature of economic experiments on SRI has emerged. In Lewis and Webley's (1994) early SRI experiment, student participants made decisions either to keep or to invest a hypothetical sum in five investment funds. One was labelled 'ethical'. Two factors explained the proportion invested in the ethical fund: Participants' 'green' attitudes (in terms of stated opinions regarding environmental, animal welfare and political issues) and the performance of the ethical fund as described in three different treatments. The former result echoes similar survey findings for green attitudes by Anand and Cowton (1993). Webley et al. (2001) performed a follow-up experiment were professional investors rather than students performed a similar task. Compared to professionals specialised in SRI, standard professional investors invested more overall and into high-risk shares but less into ethical ones. However both these early studies have a series of methodological drawbacks (for a frank self assessment see Webley et al., 2001, p. 38). Chiefly there are no financial incentives due to the purely hypothetical investment decisions participants made.

Consolandi et al. (2009) report an SRI experiment with financial incentives. Students were asked, over multiple periods, to allocate 100 points to four hypothetical stocks with different expected returns but equivalent risk. Some stocks were labelled socially responsible according to a (hypothetical) SRI stock index. Participants were paid in line with the simulated performance of their chosen stocks. The finding was that a stock's socially responsible label raised investment. However, this experiment fails to achieve incentive compatibility because there were no financial consequences associated with participants' SRI. While the decisions of real socially-responsible investors advance ethical causes, the hypothetical stocks and ethical stock index have no such impact. Participants' SRI is therefore inconsequential cheap talk similar to the responses in questionnaire or interview studies.[2]

Martin and Moser (2016) report a lab experiment with student participants who play a 5-person task with compatible incentives. Each such group was framed as a company with manager, shareholder and three potential investors. Managers decide whether to make and disclose costly green investments (paid to a real carbon fund) that also negatively affected shareholder income and investor buy-out decisions. Results showed that managers chose to make and disclose green investments even at a net cost in terms of reduced buy-out return and net earnings. Further, disclosure statements focusing on societal benefits rather than on company cost were more effective in soliciting buy-outs. However, this study was not designed to reveal the demographics or characteristics of real social responsible investors that we are interested in.

### 2.5. Research questions

We conducted an experiment designed to address the following research questions:

1. What is the effect of participant demographic characteristics (gender, age, income, education, employment, employment status) on SRI decisions?
2. What is the effect of participant ethical values on SRI decisions?
3. What is the effect of investment choice architecture (defaults and information display) on SRI decisions?
4. What is the effect of choice dynamics (repetition and previous performance) on SRI decisions?

## 3. Method

To address these questions we conducted a *framed field experiment*, defined by Harrison and List (2004, p. 1014)[3] in terms of non-standard

[2] Note that certain financial incentives for participants (such as a flat show up fee) do not amount to incentive compatibility, where incentives are tied to (and differ by) the particular decisions participants made.

[3] These authors classify field experiments along a scale of increasing naturalism compared with conventional student laboratory studies. Framed field experiments are in the middle of this scale and feature (non-student) participants who represent the target population, are familiar with the decision making elicited in the experiment or receive information or experimental incentives typical of the real context.

participants plus naturalistic context in either task, information or incentives. Our experiment is a framed field experiment because of several naturalistic features: Participants were quota sampled to be representative of the Australian general public, most[4] with experience of regular retirement investment decision making. The task consists of a series of pension fund investment decisions simulating the provisions and investment options of a real, existing pension fund. These decisions are elicited in an online environment similar to the websites actual superannuation funds use to allow members to manage their investment accounts (see Bateman et al., 2014). The choice was designed with fully compatible incentives where participants accumulate annual contributions and interest that are paid out based on the simulated financial performance of their chosen funds. Investments into SRI options result in real financial transfers to ethical causes explained to participants at the outset. We now describe the design and implementation in greater detail. Screenshots of the actual experimental interface with instructions, stimuli and tasks can be found in the supplementary materials.

### 3.1. Investment task

The main experimental task consisted of 24 simulated retirement investment decisions taken biennially from simulated age 18 until retirement at 65. Each such choice was to select one among five investment options offered by the hypothetical provider 'ABC Superannuation': The options were: High Growth, Balanced, Conservative, Ultra Conservative and Socially Aware. The decision was elicited on a screen listing the options with summary financial indicators (see Fig. 1). For each of the options (listed in the top row), participants could click to view and/or download an option dashboard (displayed for the High Growth option in Fig. 2). Each dashboard displayed detailed information such as the option's historical and target return, risk level, fees and an explanation of terms. The content and format of the dashboards was designed pursuant to Australian disclosure requirements.

This investment choice task was designed (in terms of available option types, names, performance and displayed information) to mimic real features of the Australian superannuation choice context as closely as possible rather than to achieve experimental control at the expense of realism. In particular our simulation was modelled on one particular major Australian retirement fund. The financial characteristics of the options in the simulations were based on actual options offered (see Table 1). The Socially Aware and the High Growth options are at the top end of the risk spectrum. However, compared to High Growth, Socially Aware provides poorer performance across all characteristics but management fees (which are slightly lower at 280 rather than 290 Australian Dollars).[5] As a result, the dominated Socially Aware option affords us an un-confounded way to observe altruistic investment decisions.

Once participants had chosen their investment option in a given period, we performed simulations (for more detail see the present paper's companion paper: Camilleri et al., 2019) of the future balance of the retirement account after two years (based on the dashboard parameters). In particular, we used data for comparable real assets sourced from MorningStar to simulate the performance of each experimental investment option. This Monte Carlo simulation was parameterised with the real assets' historical returns and volatility based on the Black-Scholes Terminal Price formula. We used annual returns for each real asset using all available years until 2015. The start year for available data varied between 1969 and 2001 for the different assets. The final figures were adjusted using Australian annual inflation data (1975 to 2015). The resulting fund balances were announced to participants who then moved on to the next period.

### 3.2. Experimental treatments

This basic task was administered under two independent treatment dimensions to examine the two hypothesised influences on SRI: decision defaults and information display. Each of these two dimensions was varied three ways resulting in a 3 × 3 between-participant design with nine conditions (see individual bars in Fig. 3), i.e. where every participant was randomly allocated to only one condition.

The three default treatments were: *No Default* where none of the five options was pre-selected, *Static Default* where the balanced option was pre-selected, and *Smart Default* where a particular default was pre-selected based on the participant's simulated age.

We designed the default options following current practice in the Australian superannuation context in line with our naturalistic field experiment approach. First, we followed the practice that SRI options are never chosen as defaults in either the smart or the static default. Further, we followed the standard practice of selecting less risky options the greater the simulated age of a given participant.[6] In conditions with defaults, the investment decision screen (Fig. 1) was displayed only if 'Select option yourself' was chosen on a preceding screen showing the current default (see Fig. 4).

For the information condition we varied whether and how frequency distributions of possible financial outcomes of investing in an option were presented. In both the *Static Graphics* and the *Dynamic Graphics* treatments participants were shown one pictograph consisting of a frequency distribution curve where each 1% probability of achieving a particular return rate after 10 years of investing was represented by a human symbol (see Fig. 5). These symbols were green for positive, black for zero and red for negative return rates. The pictograph design was based on the distribution builder tool introduced to elicit risk preferences (Sharpe et al., 2000; Goldstein et al., 2008). In the *Dynamic Graphics* treatment the pictograph distributions were calculated assuming individual remained invested until retirement. In the *No Graphics* treatment no pictographs were shown.

The difference between the static and dynamic information treatments was the particular distribution that was shown in the pictograph. A particular participant saw in a particular simulation period. Under static information, this was always the pictograph based on 10 years of the simulation remaining. In the dynamic version, the pictograph was the one corresponding to the actual number of years left after the current simulation period.

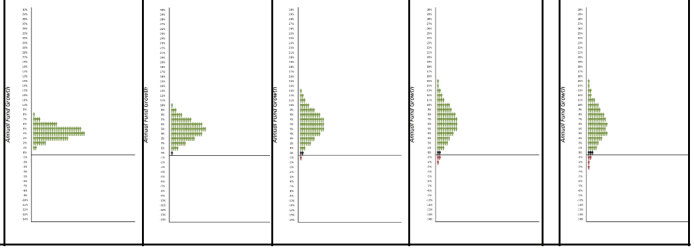
We use pictographs with two different aggregation periods (between the dynamic and static information conditions) because they can affect risk taking. In particular, shorter periods with greater outcome variance generate myopic risk aversion (Benartzi and Thaler, 1999). Fig. 5 contains sample pictographs for the socially responsible option showing the distribution of potential returns at retirement assuming the participant remains invested. In the *Dynamic Graphics* treatment the participant sees the pictograph calculating this return given the number of years until retirement. The figure shows pictographs for four examples (1, 10, 30 and 47 years remaining). In the *Static Graphics* treatment, the participant sees the pictograph for the distribution corresponding to 10 years investment (panel b).

[4] In response to an item in our questionnaire, 89% of participants stated they are members of a superannuation scheme.

[5] In the Australian context, empirical studies suggest that historically and compared to conventional funds, SRI has underperformed in terms of lower return (Tippet, 2001; Renneboog et al., 2008; Revelli and Viviani, 2015) and greater risk (Humphrey and Lee, 2011).

[6] The smart defaults were: High Growth (age 18–35), Balanced (age 36–50), Conservative (age 51–60), Ultra Conservative (age 61–65).

In the table below you will find some information regarding your available investment options.

| Option | Ultra Conservative | Conservative | Balanced | High Growth | Socially Aware |
|---|---|---|---|---|---|
| Current annual performance | 0.97% | 1.08% | 0.87% | 0.43% | -0.47% |
| Past performance in the last 10 years* | 3.19% | 4.45% | 4.03% | 3.54% | 2.76% |
| Expected annual performance for the next 10 years after inflation** | 3.09% | 4.37% | 5.35% | 5.78% | 5.20% |
| Level of investment risk | Low | Low to medium | Medium | Medium to high | Medium to high |
| Expected negative Returns over 20 years*** | 0.88 | 1.44 | 2.44 | 3.10 | 3.68 |
| Statement of management fees | $30.00 | $235.00 | $265.00 | $290.00 | $280.00 |
| Visualization of possible investment outcomes**** |  | | | | |

All information is valid as of 31st December 2015

*Moving average annual returns calculated over the last 10 years after fees.

**Expected annual return above inflation and after fees (inflation assumed to be 5% per year).

***Expected number of negative returns over the next 20 years after fees.

****If you select this option for the next 10 years, then you have an equal chance of ending up as any of the persons in this figure.

Which option would you like to be invested in for the next two years?

Ultra Conservative | Conservative | Balanced | High Growth | Socially Aware

**Fig. 1.** Presentation of investment options and summary indicators for each. Note that clicking on the underlined blue hyperlinks revealed the respective dashboards (one shown in Fig. 2). The visualisation graphs in the final row were presented only in the Static and Dynamic Graphics treatments and magnified on mouse rollover. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

### 3.3. Procedure

Participants were recruited as a representative sample of the population of Australian superannuation fund members. Ethical investment through pension fund choices has become sufficiently widespread and commonplace (Sparkes and Cowton, 2004; Méndez-Rodríguez et al., 2014, p. 27) to provide a suitable context for conducting an SRI field experiment. In countries such as Australia it is possible to recruit a representative sample of participants from the general population who have familiarity with SRI pension investment choice simulated in the experimental task.

We obtained responses from 459 participants (228 females = 49.7%) in Australia. Their average age was 40.4 years (min = 18, max = 77). Australia's eight states and territories were represented proportionally to their shares of the national population. Around two thirds were in full or part-time employment, and the same proportion had some university education. Participants were recruited via Qualtrics and performed the experiment remotely through a web-based questionnaire in July 2017. They took an average of half an hour to complete it.

A flowchart of the experimental procedure is shown in Fig. 6. The data collection proper (phase 2) was preceded by a tutorial phase 1 where each participant received written instructions on the screen in general and for each task as well as information specific to their experimental condition. This included an overview of the study followed by instructions regarding the investment tasks and information stimuli (options table, the five options dashboards and pictographs).

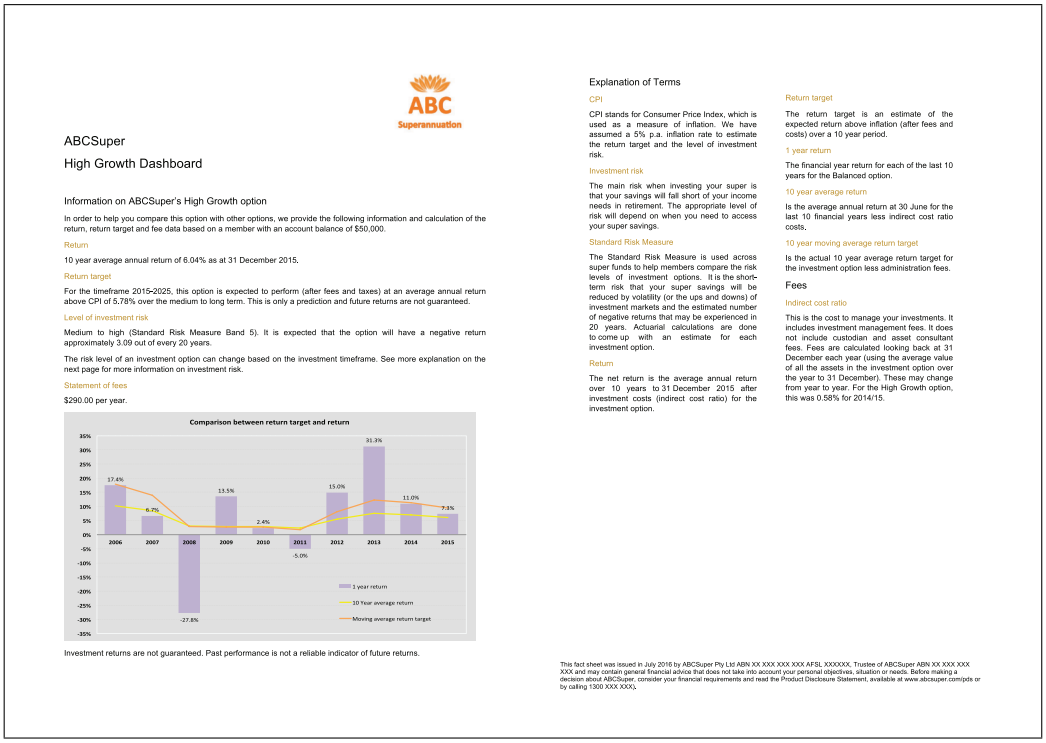



**Fig. 2.** Example of an option dashboard.

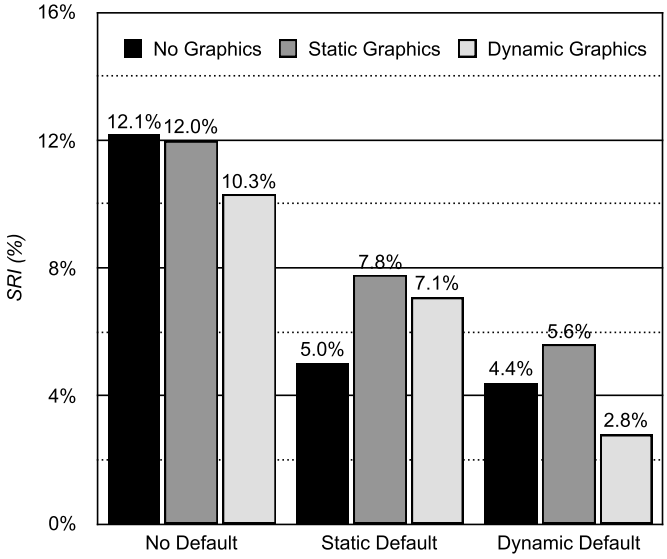



**Fig. 3.** Socially responsible investment decisions *SRI* (as a % of all investments) by experimental condition.

Participants where then required to correctly answer a series of relevant comprehension questions in order to proceed.[7]

The instructions also explained participation rewards as a flat fee for completion plus an bonus payment (in Australian Dollars) of the final accumulated retirement fund balance divided by 500,000. To provide incentive compatibility for the Socially Aware option, we told participants that a donation would be made to a real charity proportionate to their investments in that option.[8] After the decision task participants completed phase 3 with questionnaire regarding their demographics (occupation, age, gender, political party voting intentions, occupation, household income, education) and aspects of their real-life retirement savings behaviour. Voting intentions provide us with proxied for underlying attitudes affecting SRI, such as the green values identified in previous literature. We also elicited participants' "willingness to take risks, in general" on an eleven-point scale following Dohmen et al. (2011). While this questionnaire measure does not provide participants with compatible incentives, Dohmen et al. (2011) show that it can predict risky behaviour better than standard incentivised lottery tasks such as Holt and Laury (2002).

## 4. Results

### 4.1. Variables and descriptives

We examine responses at the level of the individual investment decision. Each participant made one such decision for every 2 years of a simulated working age between 18 and 65 (i.e. in 24 simulation periods), yielding a total of 11,016 individual investment decisions. We constructed a dichotomous dependent variable *SRI* measuring whether the participant in a given period invested in the Socially Aware option (0 = no, 1 = yes). The mean (across all participants, periods and treatment conditions) was 0.075 with a standard deviation of 0.264. The distribution of *SRI* is shown in Fig. 7. A total of 272 participants (59.3%) made no socially responsible investments in the entire simulation. While in absolute terms this level of altruism is much lower than in previous economic experiments, the distribution is similar. In particular, the skew with the majority of observations at the zero mark plus a marked tail at 100% is similar to altruistic giving in the so-called

[7] For the ten questions related to the dashboard, correct answers were awarded $0.10 and participants did not need perfect scores to proceed. The median accuracy percentage was 80% (M = 76.8%, SD = 28.7%).

[8] The instructions read: "In order to simulate the philanthropic nature of investing in the Socially Aware option we will take 10% of any positive returns you achieve while invested in this option and donate to the charity Doctors Without Borders on your behalf." The charity's receipt was shown on our research group's public FaceBook page, which was advertised in the instructions.

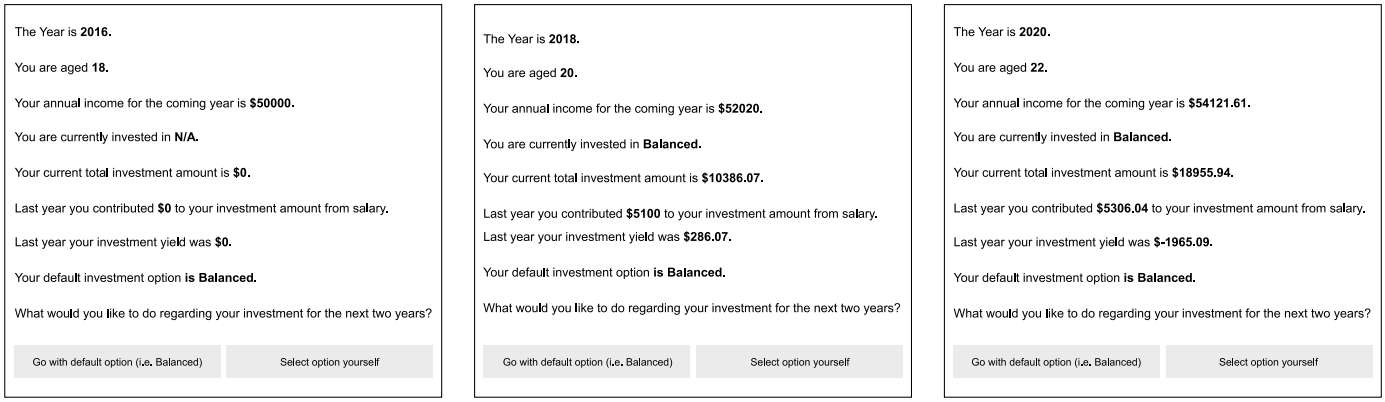



**Fig. 4.** Decision screens for the Static and Dynamic Default treatments.

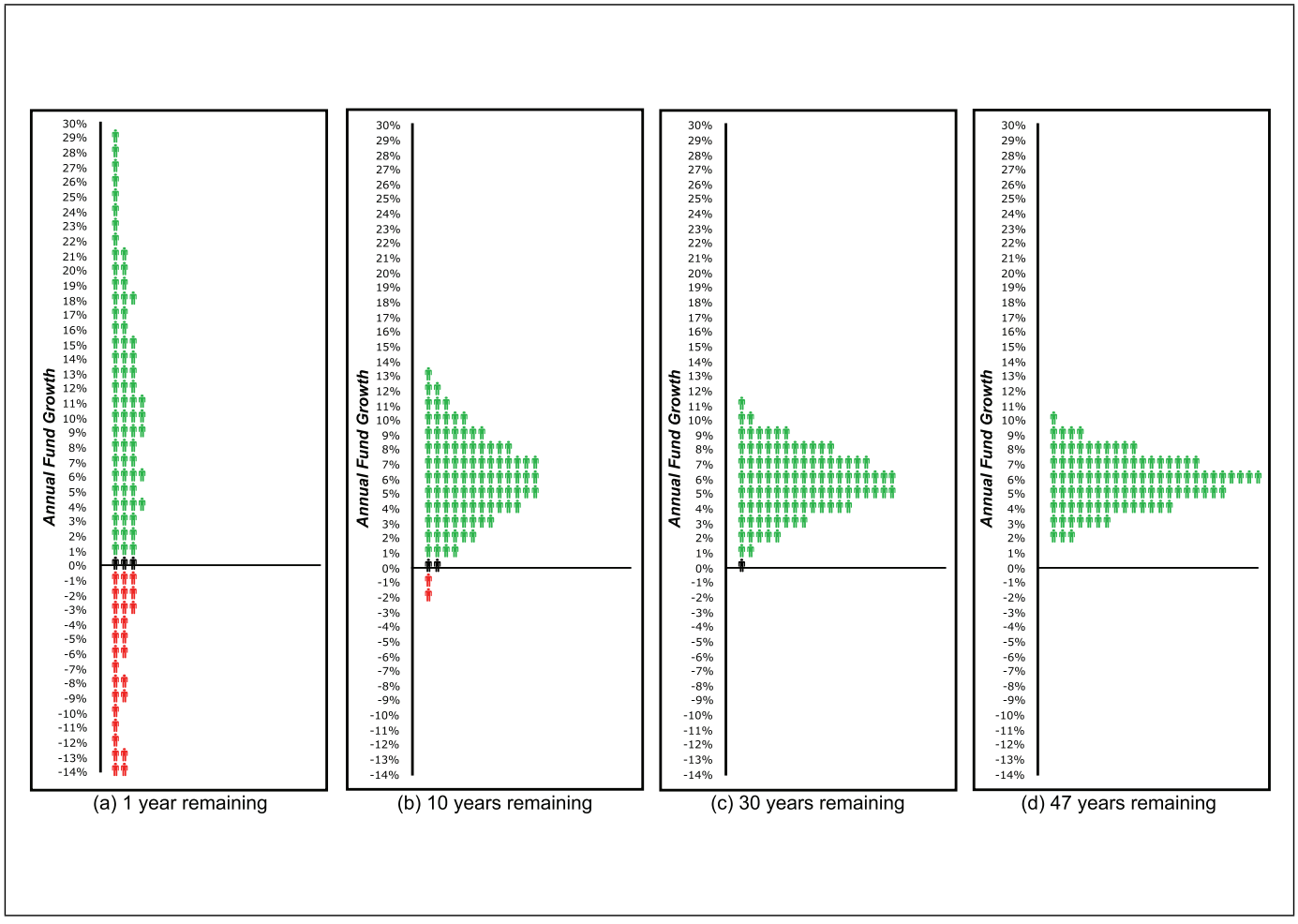



**Fig. 5.** Sample pictographs showing distribution of investment return outcomes for the socially responsible option in different simulation periods.

dictator game (see the meta-analysis by Engel (2011), p. 589). Fig. 8 shows the period trend of *SRI* over all conditions and participants. After rising until period 7 of the simulation, socially responsible investments decline steadily until the end.

What is the effect of our experimental treatments and individual demographics on SRI? Fig. 3 shows *SRI* averaged over all periods and participants for each of the nine treatment conditions along the information and default dimensions. Both types of default appear to reduce socially responsible investments. In terms of participant demographic characteristics, Fig. 9 shows average *SRI* by participants' political parties, employment status, income and education. Green Party supporters and students display the highest level of socially responsible investment. No clear association with income and education is apparent.

### 4.2. Univariate analysis of participant-level data

We first examined the effect of experimental treatments and demographics in a univariate framework. For this we created a participant-level dataset where *SRI* was aggregated as averages for each participant. Examining the two experimental treatment dimensions in isolation, ANOVA shows no difference in *SRI* depending whether a

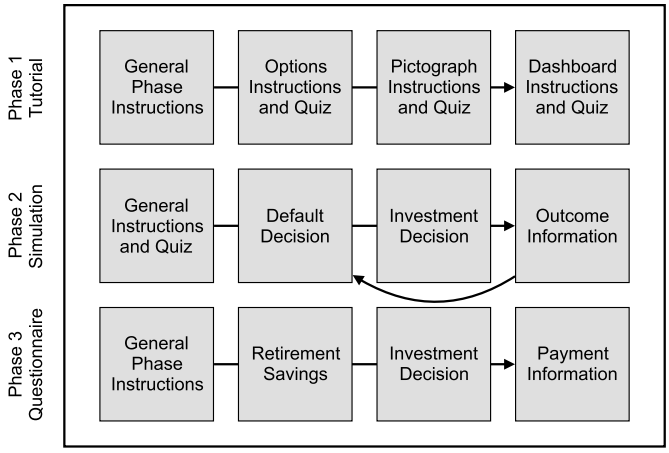



**Fig. 6.** Experimental phases. Presence of some components differ by experimental treatment. Curved arrow indicates 24 repetitions of the investment task.

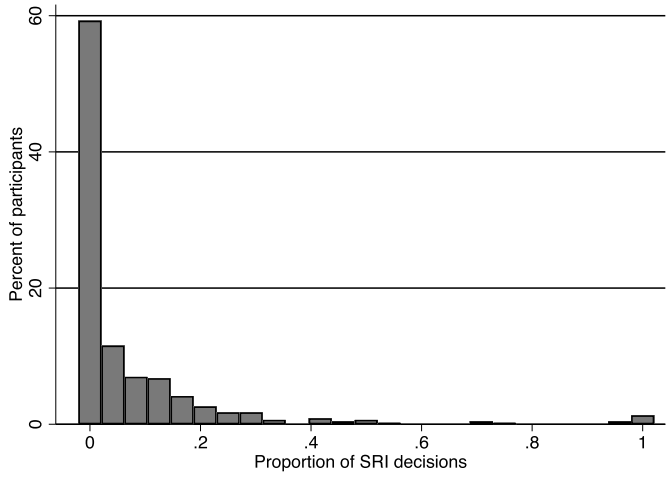



**Fig. 7.** Histogram of SRI decisions over all participants, periods and conditions.

participant was in the No Graphics (7.32%), Stable (8.28) or Dynamic (6.86) Graphics treatment ($p = 0.752$). On the other hand the default treatments produced significant effects: Participants' average *SRI* in the No Default (11.53%), Static Default (6.52) and Dynamic Default (4.39) conditions was significantly different ($p = 0.001$), evidencing a strong negative effect of defaults on SRI in the experiment.

We now look at demographic variables. The skewed distribution of SRI-behaviour (see Fig. 7) means parametric tests may not be appropriate. We therefore dichotomised the participant pool into those who made no socially responsible investments throughout the entire simulation (272 participants, 59% of the pool) and those who did (henceforth the SRI group). We then conducted a series of tests to see if demographics differ between these two groups. Such differences would then suggest demographic antecedents of SRI behaviour.

We first turn to two ordinally-measured independent factors, income and education. Fig. 9 suggest the relationship between income and SRI, if it exists at all, is not linear. Participants of the second-lowest income group give most followed by the two highest-earning groups. Univariate results must therefore be treated with caution. Nonetheless, members of the SRI group were of a marginally lower income group (Mann-Whitney $p = 0.050$). The same issue holds for education, where vocational education graduates but also highly-educated participants give most. There is no significant difference in education between the SRI group and other participants ($p = 0.960$).

We now examine several binary factors. In terms of gender, the composition of the SRI group is not different ($\chi^2$ $p = 0.435$). The average *SRI* of males is also no higher than that of females (Mann-Whitney $p = 0.910$). Of the occupational categories, students have the highest average for *SRI* (Fig. 9). However, the SRI group are no more likely to be students ($\chi^2$ $p = 0.113$). In terms of voting intentions, Green Party supporters seem to have the highest average *SRI* (Fig. 9). Indeed the SRI group are significantly more likely to have Green Party voting intentions ($\chi^2$ $p = 0.022$). Conversely, on average, those with Green Party voting intentions have greater average *SRI* ($p = 0.011$). Finally, when we compare the average age of the SRI group with the remaining participants it is significantly smaller (38.8 rather than 42.5 years, Mann-Whitney $p = 0.032$).[9]

### 4.3. Multivariate analysis of decision-level data

We also conducted multivariate analysis of the decision-level dataset in order to asses these effects simultaneously using controls for other influences. In particular, we tested the statistical significance of these apparent effects of experimental conditions and demographic variables on SRI using generalised estimating equations (GEE) with a logistic specification. We added participant-level random effects due to multiple binary decisions for each participant. The dependent variable is the individual decision made by participants (*SRI*) in each of the 24 simulation periods in a given experimental condition. The results are shown in Table 1. In addition to the main influences of interest (treatments and demographics) we added independent terms to capture the repeated nature of the SRI decision over multiple simulation periods. There is a significant negative trend for *SRI* over periods controlling for experimental conditions. We also added a variable for the return on investment achieved in the previous simulation period (Last Period Interest). This is, for every participant, the total amount of last period's interest earned from investing divided by the total fund balance in that period. Individual attitude to risk is also included as a control variable because risk is a criterion in the choice between the different fund options, which differ in riskiness (see Table 1). This control variable is insignificant, suggesting that in our investment task, Socially Aware option choices reflect socially responsible motives rather than risk considerations (see Section 3.1).

To test the effect of treatments, model 1 contains four dummy variables for static and dynamic defaults and information respectively. They capture the different influences of two dimensions of choice architecture on SRI. The results indicate that both types of default significantly reduce *SRI*. Neither information treatment had a significant effect. Model 2 examines whether there are interactions between the respective effects of the different treatments. None of the interactive terms are significant suggesting no such effects exist.

The third and fourth models panel in the table examine the effects of various individual demographics on *SRI*. We find no effects for gender, education or income. We also included dummy variables for the different types of employment status bar student, which is used as the benchmark. Compared with student participants, full and part time working people, those retired from or looking for jobs are less likely to make *SRI* investments. We also include dummy variables for political party support, using those respondents who chose "other party" as a benchmark. Neither support for politically conservative (Liberal-National Coalition), left-leaning (Labour) nor parties have significant effects. However, Green Party affects *SRI* positively.

Controlling for all these variables, older participants are more likely to invest in socially responsible options (age is positive and significant).

[9] We conducted a series of tests (ANOVA and Kruskall-Wallis) to establish whether the various demographic characteristics had equal representation over the nine treatment conditions. The tests for such differences were insignificant for all demographics even at the 10% level with one exception: For education, there is a marginally significant effect ($p = 0.094$) for ANOVA but not for Kruskal-Wallis.

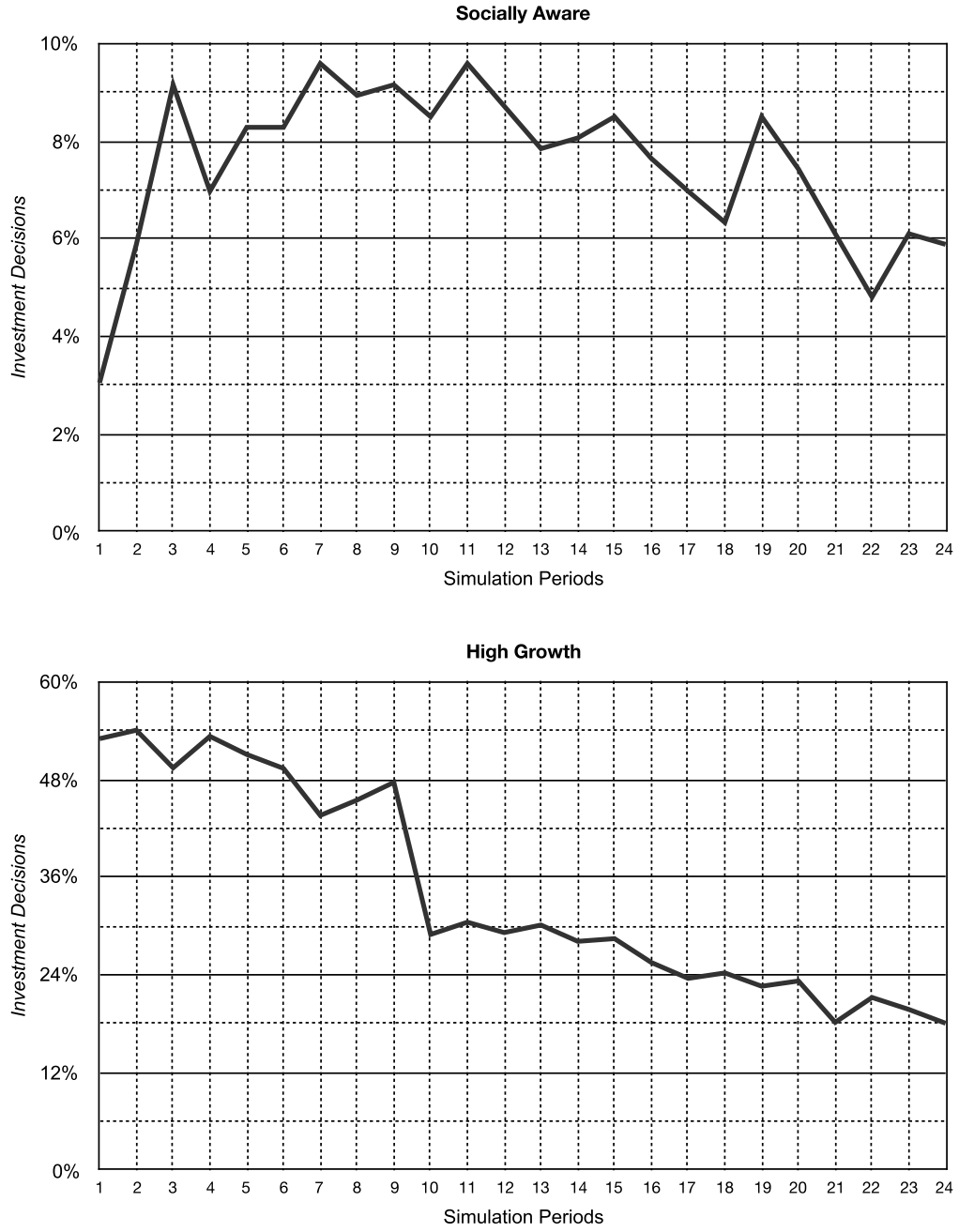



**Fig. 8.** Trends of Socially Aware (*SRI*) and High Growth (proportion averaged over all participants and experimental conditions) over simulation periods.

Note this result does not contradict the univariate one for the younger average age of the SRI group of participants. One possibility is a strong positive correlation between age and *SRI* within the SRI group that remains significant when the non-SRI participants are added. For example, if the older members of the SRI group give much more than the younger ones then age and *SRI* may be correlated across all participants even if the average age of the SRI group is lower. In model 4 we added age as a quadratic term to examine the possibility of non-linear effects of age. This could be the case for example if a curvilinear relationship exists. However, the squared term for age is insignificant.

We also examined the possibility of interactions between the effects various demographics and the different treatment have on socially responsible investing. In theory, different demographic characteristics (e.g. education) could moderate the influence of choice architecture (e.g. information). In particular, we examined interactions of every demographic (coded as dummies) with each of the four treatment dummies. None of the resulting terms were significant. We repeated this exercise, this time coding both static and dynamic treatments as 1, and the benchmark as 0. Again, no significant results were obtained. We do not display the models here.

## 5. Discussion

In this paper we empirically examined two influences on pension fund SRI: choice architecture and individual characteristics. Our study has two key methodological advantages: It was conducted as the first incentive compatible experiment on this topic, and it followed the field experiment approach for greater external validity. We now discuss our findings and draw the policy implications.

First, SRI behaviour changes over the course of the simulation and depending on previous interest accrued. This is true even if individuals' risk preferences are controlled for. These risk preferences provide an

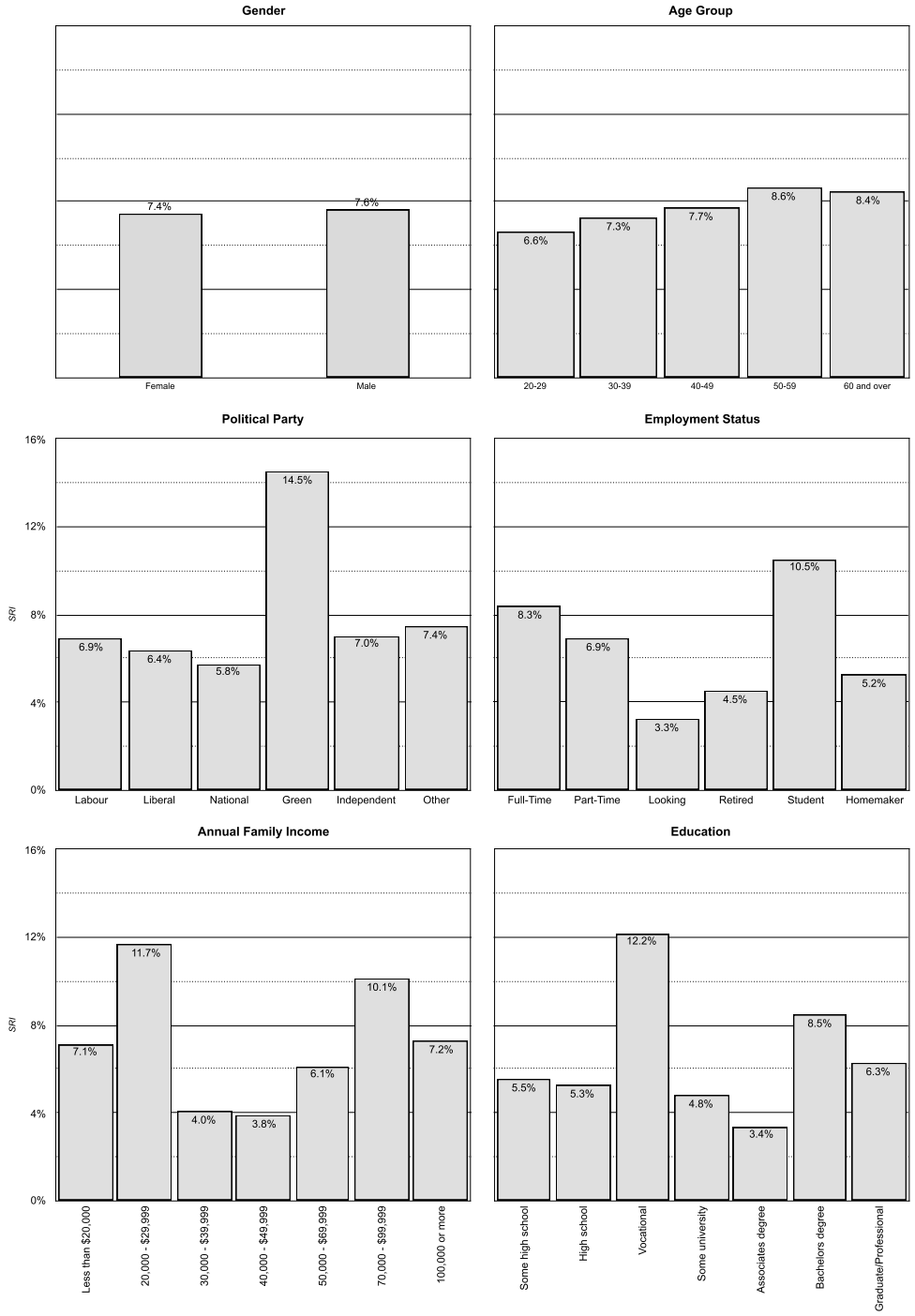



**Fig. 9.** Socially responsible investment decisions *SRI* (as a % of all investments) by participant demographics.

alternative reason for SRI to the extent that in our simulation the SRI option was associated with relatively high risk.[10] The negative trend in donations over repeated investments tallies with donor fatigue (Desmet, 1998; Bekkers and Wiepking, 2011) where repeated charity appeals diminish the amount given. Similarly, in more abstract dictator game studies, repeated decisions reduce the amount of altruism (Brosig-Koch et al., 2017). The interpretation of the positive effect of previous period's interest on SRI is that to participants, windfall gains generate a willingness to engage in ethical investments. This finding chimes also with previous experimental findings (e.g. Li et al., 2018).

We also found highly significant and negative effects for both types of default on SRI. Our simulated pension fund never set SRI options as default, either in the static or dynamic default treatments. Participants' decisions were, as a result, pulled away from SRI by the other options set as defaults. This modelling choice was again based on the practice of actual pension funds in the interest of the external validity of our study. The implication is that defaults, known to be powerful influences in other decision contexts, harbour great potential to promote SRI. This could be achieved through setting SRI options as default either by pension funds' voluntary action and/or regulation. Our experiment did

[10] This modelling choice was made because our field experiment was intended to mimic realistic pension fund investment scenarios as closely as possible rather than presenting abstract or unrealistic SRI tasks that may have afforded greater control.

**Table 1**
Logistic random-effects GEE estimations for *SRI*.

| DV: Socially Aware Option (*SRI*) | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Parameter | Coefficient(*p*) | Coefficient(*p*) | Coefficient(*p*) | Coefficient(*p*) |
| Period | −0.00412 (0.000)*** | −0.00407 (0.000)*** | −0.00433 (0.000)*** | −0.00433 (0.000)*** |
| Last Period | 1.168 (0.000)*** | 1.166 (0.000)*** | 1.181 (0.000)*** | 1.187 (0.000)*** |
| Interest | | | | |
| Static Default | −0.370 (0.003)** | −0.584 (0.005)** | −0.400 (0.001)*** | −0.413 (0.000)*** |
| Dynamic Default | −0.425 (0.001)** | −0.464 (0.027)* | −0.438 (0.000)*** | −0.441 (0.000)*** |
| Static Info | 0.120 (0.331) | −0.0109 (0.953) | 0.122 (0.287) | 0.124 (0.280) |
| Dynamic Info | −0.0464 (0.728) | −0.124 (0.515) | −0.0602 (0.627) | −0.0690 (0.578) |
| Static Default × Static Info | | 0.291 (0.323) | | |
| Static Default × Dynamic Info | | 0.379 (0.210) | | |
| Dynamic Default × Static Info | | 0.159 (0.585) | | |
| Dynamic Default × Dynamic Info | | −0.155 (0.647) | | |
| Male | | 0.0493 (0.646) | 0.0326 (0.764) | |
| Age | | | 0.0100 (0.017)* | 0.0444 (0.124) |
| $Age^2$ | | | | −0.000416 (0.229) |
| Education | | | 0.00229 (0.936) | −0.00117 (0.968) |
| Income | | | −0.0138 (0.654) | −0.0171 (0.579) |
| Risk | | | 0.0164 (0.495) | 0.0204 (0.397) |
| Full-Time | | | −0.364 (0.034)* | −0.428 (0.018)* |
| Part-Time | | | −0.423 (0.024)* | −0.459 (0.016)* |
| Homemaker | | | −0.470 (0.057) | −0.536 (0.034)* |
| Retired | | | −0.957 (0.000)*** | −0.941 (0.001)*** |
| Looking | | | −0.687 (0.009)** | −0.731 (0.006)** |
| Labour Party | | | −0.00858 (0.956) | 0.00242 (0.988) |
| Liberal-National Coalition | | | −0.0761 (0.628) | −0.0599 (0.704) |
| Green Party | | | 0.388 (0.036)* | 0.424 (0.023)* |
| Independent | | | −0.0609 (0.760) | −0.0552 (0.782) |
| Constant | −1.105 (0.000)*** | −1.040 (0.000)*** | −1.173 (0.000)*** | −1.756 (0.002)** |
| N | 10557 | 10557 | 10,557 | 10,557 |
| $\chi^2$ | 61.08 | 62.16 | 82.85 | 84.21 |

*p*-values in parentheses.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

not include a further treatment where SRI options were the default selection. Further work to confirm the positive effect of this on SRI is warranted.

Promoting SRI through default constitutes a nudge, i.e. effecting behaviour change through influencing people without their awareness. The ethical merits and issues with nudging have been extensively discussed in the literature (e.g. Thaler and Sunstein, 2003; Glaeser, 2006; Sunstein, 2014) and are beyond the scope of our paper. An alternative is provided by signposts, i.e. influencing people by providing better information (Soll et al., 2014; Ungemach et al., 2017). In our experiment this latter approach was examined through the use of static and dynamic infographics. We did not find this to significantly affect SRI decisions.

Our results regarding the demographic underpinnings of SRI are more equivocal similar to the mixed findings in previous empirical literature. In existing studies there is a plethora of nil and contradictory results for many demographic variables (Méndez-Rodríguez et al., 2014, pp. 27–30).[11] However, we do find that student participants invest more ethically than all other groups other than homemakers. Existing literature suggests that this effect may be down to green values (Lewis and Webley, 1994; Anand and Cowton, 1993), proxied in our study by party political affiliation. In support we also found that Green Party voting intentions are positively and significantly associated with SRI. The advantage of our multivariate approach is that we examine a host of different demographic factors simultaneously to establish their independent effects. For example, green values is a significant influence controlling for participant income, education, age and employment status.

Our overall policy conclusion is that there is an opportunity to use behavioural policies to raise SRI. These policies will likely have to resort to nudging the decisions of pension fund members through SRI option defaults. While the nudging approach has many critics based on its paternalism, we find no evidence that a merely informational signpost approach has significant effects on option choices. As a next step, future work should be conducted to conduct experiments with SRI options to verify the extent to which such nudges are successful.

[11] Webster (1975) suggests that "it would be naive to expect one or a few imperfect measures - of personality, attitude, or whatever-to predict accurately something as complex as [socially responsible] buyer behavior.

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## Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.socec.2019.04.005.

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