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Value matters or values matter? An analysis of heterogeneity in preferences for sustainable investments

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ABSTRACT

Pension fund investments have a substantial influence on sustainability. We analyze preferences for sustainable investment among a representative cross-section of 2486 pension fund participants in the Netherlands, through a questionnaire survey fielded in the LISS panel. In contrast to standard investment theory, we find that sustainable investments are commonly favored, even if they harm financial interests. To explain variation among participants' preferences for sustainable investments, we test socio-demographic factors suggested by dominant neoclassical investment and behavioral finance theories. Moreover, we add to the existing literature by developing an alternative cultural-theoretical explanation that stresses the role of value orientations. We estimate linear and generalized ordered logit regression models, and find little support for neoclassical and behavioral finance theories, but substantial support for the importance of value orientations. Given established patterns of value-change, this finding suggests that a further increase in the demand for sustainable investments across developed economies is a likely scenario.

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1. Introduction

Over the past decades, the financial assets of pension funds worldwide have grown massively, reaching 43.4 trillion USD in the OECD area in 2017 and on average accounting for 50.7% of GDP (OECD, 2018). With the deepening of financialization (see Epstein, 2005; Van der Zwan, 2014), pension funds are now a determining economic factor for sustainable development of societies. Hence, responsible pension investments are very important, and increasingly so. As 'universal investors' that invest in a large part and every sector of the economy, pension funds should have an economic interest in minimizing social costs (Monks and Minow, 1995), and the investment choices that they make – given the large size of the assets under their management – have a significant impact on third parties. Hawley and Williams (2000) see in the 'universal ownership' of fiduciary institutions,

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primarily pension funds – they own a large share of private enterprise – the rise of 'fiduciary capitalism'. Clark and Hebb (2004) introduced the notion of 'pension fund capitalism'. Moreover, pension funds have intergenerational responsibilities. Arguably, they must be long-horizon investors, looking beyond financial considerations, and consider environmental, social and governance (ESG) information in their investment policy. In this way, pension funds could make all the difference in achieving the United Nations Sustainable Development Goals.

Most OECD countries feature defined benefit (DB) pension plans, wherein a specific retirement benefit amount is promised in advance. Over the past decade, however, there has been a gradual shift to defined contribution (DC) pensions inside as well as outside the OECD. With DC, the employer promises specified contributions, but the benefits depend especially on investment returns. This shifts the investment, inflation and longevity risks associated with pensions to the individual participants (Broadbent et al., 2006; Blome et al., 2007; OECD, 2015). Reasons for this shift from DB to DC arrangements include the increased individualization, growing heterogeneity, and more demanding nature of pension fund participants. DC pension plans, with the option to exercise choice, are considered a solution for these developments (Bovenberg et al., 2012; EIOPA, 2013). Creating options to choose from within pension plans and increasing the involvement of pension fund participants, taking into account both their financial and non-financial preferences should be important to the 'universal investor' pension funds. They are, after all, essentially collective actors that aggregate the individual preferences of their beneficiaries into single decisions on the market.

However, following the general trend in investment literature of focusing on the economic tradeoff between risk and return, pension fund investment policy in practice has focused on the financial interests of the funds' beneficiaries (see, e.g. Vitols, 2011; Derwall et al., 2011; Renneboog et al., 2011). There still is little attention for non-financial preferences regarding environmental and social sustainability of investors in general and pension fund beneficiaries in particular (Boersch, 2010; Frijns, 2010; Peijnenburg et al., 2011; Delsen, 2012; Eurosif, 2018). Thus, pension funds carry out an investment policy that likely neglects these non-financial preferences of the beneficiaries, and the potential heterogeneity therein. *We therefore analyze the extent to which beneficiaries have preferences for sustainable pension fund investments, and how variation in these preferences can be explained.* Our study contributes to the academic study of sustainable investment in three ways.

First, we collect novel, large-scale microdata on pension fund participants' willingness to pay higher pension premiums or accept lower pensions in exchange for having their pension funds choose sustainable investments. Second, our data include a large set of socio-demographic predictors, allowing us to test the applicability of explanations derived from the socially responsible investment (SRI) literature to pension fund investments.

Third, we develop and test an alternative, cultural explanation for sustainable investment preferences, derived from sociology and political science theory. We draw in particular on Ingelhart's (1977, 1990) work on material and post-material value orientations. While the investment literature has started to expand neoclassical assumptions and incorporated insights from behavioral economics about psychological dispositions such as risk appetite and social preferences, as well as increasingly recognizing the importance of value

orientations, what value orientations matter and how remains obscure (*cf.* Williams, 2007). This is unfortunate because, in contrast to psychological dispositions such as risk appetite, the distribution of value orientations is known to systematically co-vary with contextual characteristics. In particular, shifts in this distribution follow predictable patterns of cohort-replacement, which in turn are linked to specific socio-economic contexts (e.g. Inglehart, 1977, 1990; Inglehart and Baker, 2000). Value orientations can thus be interpreted as endogenous preferences (*cf.* Bowles, 1998) that vary systematically across different macro-level contexts. If a micro link between preferences for sustainable investments and value orientations can be identified, this knowledge thus allows for a powerful tool in the evaluation of scenarios in the development over time and variation between countries in sustainable investment preferences for pension funds. Thus, while the current paper will only analyze a single country and cross-section of pension fund participants, i.e. the micro link; its results can form an important contribution to the development of such a toolkit.

We collect data on beneficiaries' preferences for sustainability through a questionnaire survey. Our data constitute a representative sample of pension fund participants aged 40 and over in the Netherlands ($N = 2486$). With a questionnaire item that forces respondents to choose a monetary tradeoff between sustainable investment of their pension fund against higher premiums or lower benefits, we create an ordinal measurement beneficiaries' willingness to pay for sustainable pension fund investment. We estimate linear (OLS) models and generalized ordered logit models that explain variation in this variable as a function of socio-demographic characteristics, risk appetite and value orientations of the respondents.

Our results suggest strong preferences for sustainability among beneficiaries, with roughly three quarters of respondents favoring sustainable investment of their pension funds in exchange for higher premiums or lower benefits. As expected based on cultural theory, respondents with post-material value orientations are particularly willing to pay for sustainable investment. We find mixed results regarding the impact of socio-demographic characteristics: gender, age, educational attainment and employment status have an effect but, contrary to what would be excepted based on previous SRI research, income, home ownership, religiosity and risk appetite do not.

In the next Section 2, we provide an overview of the investment literature applied to pension fund investments. Section 3 introduces our application of cultural theory to the explanation of preferences for sustainable pension fund investments and deduces hypotheses from this application. We then present in Section 4 arguments why the Netherlands offers an interesting and appropriate case for researching the willingness to pay for non-financial preferences of pension fund participants. The data and methods used to test these hypotheses are described in Section 5. The last two sections 6 and 7 present the analyses and discussion of the results and offer some policy recommendations.

2. Literature review: pension fund investment theory and practice

We started our literature review by collecting the published empirical studies on conventional and socially responsible investors, and on pension funds participants' preferences. In the literature search we used the following data bases: ISI Web of Science, Scopus and Google Scholar. Keywords used included: investment theory, investment decision, pension

funds, fiduciary duty, socially responsible investment, beneficiaries, preferences, values. From the resultant studies, we identified those relevant to our research question and ordered them accordingly what we view to be the two main theoretical approaches in the field: (a) neoclassical investment theory, and (b) behavioral finance theory.

2.1. Dominant neoclassical investment theory and practice

The neoclassical investment theory (mean-variance portfolio theory) is an important starting point of the investment policy of pension funds. The Asset Liability Management (ALM) studies widely used by pension funds in OECD countries, including the Netherlands, assume rationality of investors and a tendency towards equilibrium ('mean reversion') on financial markets (Blome et al., 2007; De Dreu and Bikker, 2012). Through ALM the investments and liabilities are examined in relation to each other over a long period. These ALM-studies allow pension funds to establish which investment policy produces the highest expected returns, and so the lowest average premium and most indexation, at acceptable risks.

In the mean-variance portfolio theory the investor is reduced to a 'homo economicus' that makes a rational tradeoff between risk and return of the available investment options. Individuals are presumed to be homogenously and constantly risk-averse (Markowitz, 1952; Roy, 1952). By looking at the expected return and variance of an asset, the investor seeks the lowest variance for a given expected return or seeks the highest expected return for a given variance level. The portfolio theory is an explanation for the fact that, in order to increase returns, pension funds have invested more in more risky assets. The latter increased the degree of financialization (see, e.g. Van der Zwan, 2014). The portfolio theory also explains why in empirical research the emphasis is on comparison of returns and risk between SRI and conventional investments (see, e.g. Williams, 2007; Renneboog et al., 2008; Derwall et al., 2011).

The mean-variance portfolio theory suggests that it is impossible for SRI to outperform conventional investments. SRI is less efficient than conventional investments, for it limits the investment universe and is at the expense of diversification of the portfolio. SRI implies that investors are willing to accept less than optimal financial results to meet their personal values with respect to social responsibility (Renneboog et al., 2011). However, empirical results justify the conclusion that taking into account ESG information does not deteriorate the risk-return profile (see Bauer et al., 2005; Renneboog et al., 2008; Riedl and Smeets, 2017; Jansson et al., 2014; Friede et al., 2015).

2.2. Behavioral finance

Recent, more realistic, socially and psychologically based behavioral finance literature ('behavioral finance') indicates that in addition to the traditional financial needs also other considerations and needs of investors can play a role (Mitchell and Utkus, 2004; Statman, 2014). For part of the investors, SRI not only means risk and yield optimization, but also represents individual and social values – non-financial benefits. The rational investor is replaced by the normal investor. The difference between a rational investor and a normal investor is the willingness to separate their role as investor from the role as consumer. The rational investor is only interested in wealth, the utilitarian benefits

of investments. The socially responsible investor mixes the role of investor and consumer. As a consumer, he cares about all the benefits, the utilitarian (high returns and low risk), the expressive (values, taste and status) and the emotional (feeling), of the products and services he buys with the accumulated wealth. Between these benefits there are tradeoffs; some investors are willing to pay with a lower utilitarian benefit for more expressive and emotional benefits (Williams, 2007; Statman, 2014; Barber et al., 2018). The willingness to pay mirrors the willingness to accept these tradeoffs.

Empirical results for various OECD countries support this connection between consumer and investor behavior. Most investors consider investments not only as investment products, also as consumer goods and are willing to give up some return for social or environmental impact (Borgers and Pownall, 2014; Rossi et al., 2018; Barber et al., 2018). SRI is not only values-driven (non-financial motivations), but also value (profit) driven (McLachlan and Gardner, 2004; Pérez-Gladish et al., 2012). Only a minority of socially responsible investors is exclusively guided by values. Williams (2007) found in his cross-country study that SRI is driven by preferences for non-financial income, i.e. more by social goals than by financial returns. Similarly, Bauer and Smeets (2015) find that return expectations are not the major driver of SRI. Other studies show that financial considerations dominate the investment choices made (Derwall et al., 2011; Renneboog et al., 2011; Riedl and Smeets, 2017; Bauer and Smeets, 2010). The extent to which socially responsible investors are willing to sacrifice financial returns is suggested to depend on their values, their social – and political preferences (Bollen, 2007; Bauer and Smeets, 2010, 2015; Jansson et al., 2014; Riedl and Smeets, 2017) (Table 1).

Based on the SRI literature the expected signs of the effects of personal and social-demographics factors on investment decisions are summarized in Table 1. Preferences

Table 1. Expected signs (hypotheses) of effects of personal and socio-economic characteristics on preferences for sustainable pension fund investments.

Variable	Expected sign	References
Gender (female)	+	McLachlan and Gardner, 2004; Williams, 2007; Junkus and Berry, 2010; Pérez-Gladish et al., 2012; Escrig-Olmedo et al., 2013; Bauer and Smeets, 2015; Rossi et al., 2018; Bauer et al., 2018
Age	-+	McLachlan and Gardner, 2004; Williams, 2007; Junkus and Berry, 2010; Pérez-Gladish et al., 2012; Escrig-Olmedo et al., 2013; Riedl and Smeets, 2017; Jansson et al., 2014; Bauer and Smeets, 2015; Rossi et al., 2018; Bauer et al., 2018
Education	+0	McLachlan and Gardner, 2004; Williams, 2007; Junkus and Berry, 2010; Riedl and Smeets, 2017; Pérez-Gladish et al., 2012; Escrig-Olmedo *et al.*, 2013; Jansson et al., 2014; Bauer and Smeets, 2015; Rossi et al., 2018; Bauer et al., 2018
Income	+-	McLachlan and Gardner, 2004; Williams, 2007; Junkus and Berry, 2010; Pérez-Gladish et al., 2012; Escrig-Olmedo et al., 2013; Bauer and Smeets, 2015; Rossi et al., 2018; Bauer et al., 2018
Wealth	+ -	Williams, 2007; Junkus and Berry, 2010; Bauer and Smeets, 2015
Household composition	Partner + - Children +-	Junkus and Berry, 2010; Rossi et al., 2018; Pérez-Gladish et al., 2012; Rossi et al., 2018
Primary occupation	Self-employed + Retired - +	Junkus and Berry, 2010; Escrig-Olmedo et al., 2013
Company size	+	Williams, 2007
Risk appetite	+0	Riedl and Smeets, 2017; Pérez-Gladish et al., 2012; Bauer and Smeets, 2015
Religious	+	Williams, 2007; Pérez-Gladish et al., 2012; Bauer and Smeets, 2015

Notes: + = significant positive effect; - = significant negative effect; 0 = not significant effect.

of pension fund members have become more heterogeneous due to the increasing variety of household composition, the increasing heterogeneity in career and life course, and the increasing level of prosperity (see, for example, Bovenberg et al., 2012). We expect pension fund members in terms of composition, preferences and values to be more heterogeneous than socially responsible investors (Jansson et al., 2014).

Research on preferences for SRI of pension fund members is still very limited and mostly of recent date. Surveys show that the vast majority (up to three quarters) of the Dutch pension fund participants are willing to pay a higher premium or to forego pension income for the realization of these non-financial preferences (Erbé, 2008; Motivaction, 2012; Borgers and Pownall, 2014; I&O Research, 2015; Apostolakis et al., 2016). Apostolakis et al. (2018) find that beneficiaries' attitudes and social norms impact on their willingness to adopt socially responsible portfolios, but that this also depends on consumer confidence and perceived effectiveness. Similarly, using a survey questionnaire, Jansson et al. (2014) find that beneficiaries in Sweden on average prefer their pension funds to engage in SRI, and that financial motives as well as self-transcendent value priorities drive heterogeneity herein.

The expressiveness of such survey results is sometimes doubted, as they measure no actual choices and may lead to socially desirable answers. However, a recent large scale field experiment (Bauer et al., 2018) comparing pension fund participants' SRI investment decision with real consequences to hypothetical decisions finds no differences, suggesting that hypothetical questionnaire items can validly measure SRI preferences. This experiment also showed that 66.7% of the participants favor the expansion of sustainable investing of their pension savings, the majority of which do so accepting lower financial returns in exchange. Differences in SRI preferences are found to be associated with social preferences and not driven by financial beliefs.

A second potential criticism of the analysis of pension fund participants' preferences for sustainable investments is that it may be doubtful whether people correctly assess and weigh the consequences of their choices (pension illiteracy). Research by Borgers and Pownall (2014) shows that, while roughly three-quarters of people in the Netherlands age 20 and over are willing to give up pension benefits in exchange for SRI, they indeed find it difficult to take into account non-financial preferences when making financial decisions, particularly those with low levels of financial sophistication. This may obscure the link between stated SRI preferences and actual utility derived from SRI. On the other hand, experimental research suggests that altruistic decisions are to large degree in fact consistent with utility maximization (Andreoni and Miller, 2002), which may well be extrapolated to SRI preferences.

3. Theory and hypotheses: materialism and post-materialism

The cultural-theoretical approach advocated by Inglehart (1971, 1977, 1990) can be interpreted as a modification of modernization theory. Modernization theory argues that long-term economic development, in particular industrialization, leads to a growing division of labor, commercialization, urbanization, bureaucratization, economic growth and economic scale. These developments imply an environment of increasing commitment to economic and technical rationality. Individuals respond to this environment by increasing adherence to individualism and instrumentalism (*cf.* Inkeles, 1960).

While Inglehart accepts that socio-economic context shapes individual modes of thinking, he argues that standard modernization theory has little to say about post-industrial societies. In such societies, post-material values gain importance. Post-material values are best understood in juxtaposition to material values. Whereas material values entail that individuals prefer the fulfillment of material needs (e.g. food, shelter, security, consumer goods), post-material values entail that individuals prefer fulfillment of non-material needs (e.g. freedom, self-expression, equality, environmental protection).

Inglehart's theory builds on Maslow's hierarchy of needs (1943), which states that human needs can be hierarchically ordered as ranging from physiological, through safety, belonging, and esteem to self-actualization, where lower level needs must be satisfied before higher level needs are considered. Two mechanisms then can account for the acquisition of post-material values according to Inglehart.

The first mechanism is known as the scarcity hypothesis, which states that the value orientations of individuals directly reflect their socio-economic environment. Adverse socio-economic conditions imply that individuals face difficulty in fulfilling lower level needs, which are thus prioritized, leading to materialist value orientations. With better socio-economic conditions, the fulfillment of lower level needs becomes easier and individuals care increasingly about the fulfillment of higher level needs, leading to post-material value orientations.

The second mechanism is known as the socialization hypothesis, which states that the value orientations are to a large extent shaped during individuals' formative years, the period between the onset of puberty and adulthood, and remain stable thereafter. Cohorts that experience their formative years during adverse socio-economic times are more likely to have material value orientations, whereas cohorts with formative years in better times are more likely to have post-material value orientations. The reasoning for the acquisition of (post-)material values is thus quite similar in both mechanisms, the main difference is in the time frame within which societies will change in response: this change would be instantaneous under the scarcity hypothesis, but more gradual and delayed under the socialization hypothesis as it would then be driven entirely by cohort-replacement. It is however in particular the socialization hypothesis that finds substantial empirical support (e.g. Inglehart, 1977, 1990).

The dependent variable in our study reflects preferences for sustainable investments. More precisely, we analyze to what extent pension fund participants prefer sustainable investments even if these investments entail receiving lower pensions or paying higher pension premiums. Applying Inglehart's post-materialism theory to our research context, we derive two hypotheses about this variable. For both hypotheses, we argue that post-materialism contributes to preferences for sustainable investing. This is because (a) post-material values imply precisely the kind of preferences that are satisfied with sustainable investments, i.e. environmental protection and self-expression; and (b) because our measurement of preferences for sustainable investments explicitly forces individuals to recognize that such investments may have adverse effects on their own monetary outcomes, thus being in conflict with material values. The first hypothesis is based on the knowledge that our research context the Netherlands represents a country that has enjoyed a high level of socio-economic development for a long period, and a country in which post-material values are indeed relatively prevalent (*cf*. World Values Survey, n.d.). Therefore, we hypothesize that:

Preferences for sustainable investments are substantial in the Netherlands.

Since we cannot test this hypothesis comparatively across countries, whether or not the preferences are in fact substantial will be evaluated with a qualitative assessment of the univariate distribution of our dependent variable. It should, however, be kept in mind that any tendency towards sustainable investments preferences would be at odds with standard neoclassical investment theory.

The second hypothesis we derive will test the implied micro-level link between post-material value orientation and sustainable investment preferences:

Higher levels of post-material value orientations are associated with stronger preferences for sustainable investments.

4. Dutch pension funds: a case in point

The Dutch occupational pension system is interesting and appropriate for the examination of the willingness to pay for non-financial preferences by pension fund participants. The Netherlands is one of the most post-material societies in the world (World Values Survey, n.d.). However, in the investment policy practice of Dutch pension funds, there is still little attention to non-financial preferences of pension fund members.

According to the influential Frijns Committee (2010) socially responsible acting is not an integrated part of risk management and investment policies of pension funds. It recommends to the boards of pension funds to take the preferences of the participants and the employers with regard to sustainability as a starting point for risk and investment policy. The occupational pension is an important fringe benefit (deferred wage). Compulsory participation explains why some 90% of the Dutch employees participate in a supplementary occupational scheme (second pension pillar), on top of the basic state pension (first pension pillar). For 20% of employees the employer concludes a pension insurance with an insurer; 80% of employees take part in industry, enterprise, or occupational pension fund. Around half of the Dutch self-employed participate in a supplementary pension scheme. Over 90% of the pension fund participants are covered by a DB scheme.

Typically the final pension benefit depends on the number of years worked and salary movements during the active period. The still dominant DB system implies that individual respondents to our questionnaire do not have to take the risk into account, only the payment of additional contribution or the lower benefit amount. The Netherlands belongs to the five largest pension fund markets within the OECD member countries. In 2017 the amount of assets held by pension funds was worth USD 1.6 billion (almost 184% of GDP) (OECD, 2018). Similar mandatory collective pension funds that cover the employees of more than one employer (enterprise) operate in various OECD countries (see Blome et al., 2007; Ebbinghaus, 2011).

Pension funds are not-for-profit institutions, with a long-term horizon and strategy, which, in principle, is in line with sustainability. Pension funds' assets are owned by the participants. Pension funds invest on behalf of the participants. Unlike regular shareholders, the owners of pension funds have no direct influence on the investment policies of pension funds. Freedom of choice is restricted or even absent. Dutch pension funds rank among the largest in the world (Vitols, 2011). Only a minority of the Dutch

pension funds consult the participants about investments which are done with their money (VBDO, 2014; Wagemans et al., 2018). Pension funds invest on behalf of the owners of the assets, the participants. In the dominant investment theory participants of pension funds only have financial interests. There is still little regard for non-financial preferences of investors and pension fund members.

Recently pension fund members are increasingly seen as consumers. Pensions are becoming less and less a condition of employment (fringe benefit), but are increasingly financial products that consumers value and have a certain feeling (Kortleve and Slager, 2010). Like in many European pension systems, paternalism prevails. Social partners and pension fund determine what participants need and what is good for them; to prevent unwanted effects of pension illiteracy among participants. By 2020 the Dutch government wants to realize more freedom of choice and more customization in the second pension pillar (Klijnsma, 2015). Neither reference is made to SRI nor to sustainable investments in this policy document.

5. Data and method

5.1. Data

In order to test our hypotheses, we developed the 'Stated Preference Analysis of Flexible Pension Plan Choices in the Netherlands' survey.[1] This survey was fielded in March 2014 in the LISS (Longitudinal Internet Studies for the Social sciences) panel, an Internet panel of respondents maintained by CentERdata at Tilburg University.[2] The questionnaire was designed by our research team, in close collaboration with the CentERdata, taking advantage of their extensive experience with survey research. To improve the validity of the survey, multiple pre-tests were fielded among the three members of the research team. We further reflect on the development of the relevant individual items and their validity below.

The LISS panel consists of a nationally representative sample of 5,000 Dutch households comprising 8,000 individuals. Surveys may lead to socially desirable answers from the respondents. This applies in particular to face-to-face interviews. As our survey was conducted online, the greater degree of anonymity provides less socially desirable answers (Teppa and Vis, 2012), which is especially desirable given that our dependent variable concerns people's stated preferences for sustainable investments.

We consulted existing studies on the preferences of Dutch pension fund members and their willingness to pay for sustainable investments (Erbé, 2008; Rietjens, 2011; Motivaction, 2012; Borgers and Pownall, 2014; I&O Research, 2015; |Apostolakis et al., 2016, 2018) to develop measurement of participants' willingness to pay. Due to our research aim of analyzing pension investments preferences, we restricted our sample to respondents aged 40 and older (5,034 respondents of the LISS panel) and that are pension fund participants. Younger people are a difficult target group for pension funds. In contrast to the maximization objective in the neoclassical economic theory they have little interest in pensions and are more often completely unconscious about pensions (see Mitchell and Utkus, 2004; Rietjens, 2011; Prast and Van Soest, 2014). This implies that the results of surveys on pensions among young people are unreliable. By restricting our sample to older pension fund participants, we are able to more accurately measure true and salient preferences.

The response rate of the survey amounted to 80.8%. Not all variables needed for our analyses were recorded in the survey. However, none of these variables are likely to show significant short-term variation and they were measured in other surveys fielded in the LISS panel very close in time to our original survey among the same respondents. This allowed us to supplement our dataset with data on the relevant variables from these other surveys.[3] After the deletion of cases with missing values, we retain 2486 respondents for analysis. This makes for a net-response of just under 49.38%, in line with most other survey research conducted in the Netherlands. A comparison of the dependent variable and a standard set of background characteristics in the initial dataset to the dataset excluding the cases with missing values[4] supports that the eventual sample we use to test our hypotheses is representative.

5.2. Measures

At the time of designing our survey, existing analyses of preferences for sustainable pension fund investments were extremely scarce and no validated measurements were available. Hence, in order to measure our dependent variable, the respondent's preference for sustainable pension fund investments (hereafter *preference for sustainability*), we developed our own measurement. We aimed for a measure that reflected the three main categories of factors considered in SRI (OECD, 2007, p. 4): social, environmental and ethical (SEE). SRI research is increasingly focused on non-ethical aspects; corporate governance is incorporated instead (OECD, 2007, p. 4–5). In addition to financial performance also environmental, social and governance (ESG)-performances are taken into consideration. SRI is considered a means to improve the risk-return profile. This materiality approach to SRI fits the neoclassical investment theory (Vitols, 2011; Delsen, 2012). In the normative approach to SRI social values and norms are a higher good than profit-making. People are willing to pay for SRI; tradeoffs, i.e. lower financial returns are accepted. It fits the behavioral finance theory. For answering our research question the more narrow SEE measure of SRI is more appropriate than the ESG measure.

As it would be practically impossible to measure observed preferences, we developed an efficient and easily comprehensible measurement of respondents' willingness to pay. To ensure respondents properly understand SRI, we included an introductory text explaining its meaning, using concrete examples of social and ethical factors: 'working conditions' (social), 'child labor and production of banned weapons' (ethical). For environmental factors, we deemed reference to the environment as sufficiently concrete for the respondents. Importantly, we aimed to reduce social desirability bias by forcing respondent's to explicitly recognize and choose a tradeoff between SRI and their personal financial reward. To again make this sufficiently concrete for the respondents, we explicitly referred to the two ways in which SRI may make them worse off financially: higher premiums (current consumption), or lower benefits (future consumption). The eventual survey question thus read as follows:

> In responsible investment account shall be taken of, inter alia, the environment, working conditions, child labor and production of banned weapons. Do you agree with the following statement:
>
> My pension fund should do responsible investment, even if this will require me to pay a higher pension premium or receive a lower pension.
>
> (If you do not have a pension fund please select not applicable)

The valid answering categories ranged from 1 'completely disagree' to 6 'strongly agree', with 7 'not applicable' coded as missing value. We treat this as a continuous variable on which higher values indicate a higher preference for sustainability. It is not currently possible to assess the predictive validity of this variable with respect to actual investment decisions. However, other research employing a variety of willingness to pay and hypothetical choice measurements, published on pension fund participants in the Netherlands after we fielded our survey (Bauer, Ruof and Smeets, 2018), finds highly comparable distributions of sustainability preferences. This does suggest that concurrent validity may be quite high.

For our main independent variable, *value orientation*, we employ a well-accepted survey measurement first developed by Inglehart (1971). For this measurement, the respondents are asked to rank four potential political goals in order of importance: (a) 'maintaining law and order in the country', (b) 'increasing citizens' political say', (c) 'preventing price increases', and (d) 'protecting freedom of speech'. The first and third goals (a and c) tap material values, whereas the second and third (b and d) tap post-material values. By asking respondents to rank these goals, they are thus forced to priorities between goals that reflect either material or post-material value orientations. The responses are subsequently combined into one ordinal variable measuring value orientation. This is achieved by considering the first and second-ranked goals for each respondent. If these two goals both reflect material values (i.e. a and c or c and a are ranked first and second), the respondent is coded as 'materialist'. If these goals both reflect post-material values, (i.e. b and d or d and b are ranked first and second), the respondent is coded as 'post-materialist'. Respondents whose first and second-ranked goals reflect a combination of material and post-material values are coded as 'mixed'. This measure is admittedly a very coarse reflection of the underlying continuum of value orientations from materialist to post-materialist. However, it does allow us to consistently differentiate between respondents with different value orientations and a large body of previous research has demonstrated its validity and reliability (e.g. Inglehart and Abramson, 1999). For inclusion in the multivariate analyses, the measure is recoded into two dummy variables, using 'materialist' as the reference category.

In order to measure *risk appetite,* we use a translation of the self-assessment measure from the German SOEP survey, which has been found to yield a valid indicator (e.g. Dohmen et al., 2005; Ding et al., 2010). The respondents were asked to self-rate their willingness to take risk on financial matters on a scale ranging from 0 'highly risk averse' to 10 'fully prepared to take risks'. We treat this as a continuous variable with higher values indicating more financial risk appetite.

In order to account for the impact of *religiosity*, we measured whether or not respondents considered themselves to be member of a certain religion or church community. In the multivariate analyses, we used dummy coding for this variables, with the religious serving as the reference category.

The respondents were also asked about the *company size* of the place where they work or worked, if applicable. We recoded this measurement into four categories, '1–24', '25–499', '≥500' employees, and 'not applicable'. Dummy coding was used for this variable in the multivariate analyses, with '1–24' serving as the reference category.

The LISS panel records and monthly updates a large set of personal characteristics[5], from which we include, following the standard literature on SRI (see also Table 1)

gender, *age*, *household composition*, *type of dwelling*, *education*, *primary occupation* and *net household income*. The 'gender' variable records whether respondents are male or female. Age is measured in years. The 'household composition' variable distinguishes between 'single', 'cohabitation[6] without children', 'cohabitation with children', 'single with children' and 'other' types of households. With 'type of dwelling', we include a measure of capital accumulation as it records whether the respondents live in rental dwelling or in self-owned dwelling. We recoded education (highest obtained diploma) into three categories; 'low'[7], 'middle'[8], and 'high'.[9] For primary occupation, we distinguish between 'paid employment', 'self-employed'[10], 'job seeker', 'pensioner', 'housekeeper', and 'not employed other'.[11] Net household income is measured in Euros.[12] All categorical variables were dummy-coded for inclusion in the multivariate analysis, with respectively 'male', 'single', 'self-owned', 'low' and 'paid employment' used as reference categories.

5.3. Methods

As a first step in our analysis, we will provide descriptive statistics on all variables, focusing in particular on the central tendency and distribution of the dependent variable preference for sustainability.

We then proceed to test our hypotheses by estimating two linear (OLS) regression models. As the effect of the respondents' background characteristics and socio-economic variables on preference for sustainability may be (partially) mediated through value orientations and risk appetite, we first estimate a model including all independent variables except for these two variables. In the second model, value orientations and risk appetite are added to the equation.

A potential problem for this approach is that our dependent variable may be interpreted more strictly as being at best ordinal in nature, especially as the answering categories presented to the respondents are not symmetric around the 'neutral' category due to a technical error resulting in the omission of one of the categories. In this case the assumptions of monotonic, linear relationships and constant, normally distributed errors of the (OLS) linear regression models may be problematic. We therefore assessed the robustness of our results by estimating the generalized ordered logit equivalents of the linear regression models presented here (see also Peterson and Harrell, 1990; Williams, 2016). Fortunately, the (averaged) marginal effects derived from these models are in line with the findings from the linear regression models, allowing us to here present the latter. This facilitates easier interpretation of the effects, has the added benefit that the estimated coefficients can be compared across the two estimated equations, and is less prone to overfitting the data. As the assumption of normally distributed, constant errors is likely at least somewhat problematic, we calculate heteroscedasticity-consistent standard errors for significance tests.

6. Results

6.1. Descriptive analyses

In Table 2, descriptive statistics on all variables are reported. Noteworthy is the relatively high mean value (4.39 on a scale from 1 to 6) of the dependent variable preference for

sustainability. The variable does in fact show substantial left skew (skewness = −0.72, median = 5), and roughly three-quarters of the respondents score a value of 4 or higher. This strongly suggests that, contrary to standard economic theory and pension fund investment policies, but in line with our first hypothesis and prior research, pension funds participants considerably favor sustainable investing even if this implies paying higher premiums or receiving lower pensions. Looking at the extremes of the scale, about 22% strongly agrees with sustainable investments, while only about 4% completely disagree with it. At the same time, strong preferences for sustainability are by no means universal as there is also some variation in the responses (s. d. = 1.34). A further analysis in order to explain this variation is therefore apposite.

The distribution of background characteristics is very much in line with what one would expect given our sample selection criteria. Three quarters of the respondents live in some form of cohabitation household (married or unmarried, with or without children), a similar number lives in a self-owned dwelling. Most respondents are still in

Table 2. Descriptive statistics ($N = 2486$).

	Min.	Max.	Mean/percent	Standard deviation
Preference for sustainability	1	6	4.39	1.34
Gender				
Male	0	1	53.86	
Female	0	1	46.14	
Age	40	94	60.24	11.26
Household composition				
Single	0		20.90	
Cohabitation without children	0	1	48.95	
Cohabitation with children	0	1	26.14	
Single with children	0	1	3.46	
Other		1	0.84	
Type of dwelling				
Self-owned	0	1	75.99	
Rental	0	1	24.01	
Education				
Low	0	1	34.39	
Middle	0	1	31.50	
High	0	1	34.11	
Primary occupation				
Paid employment	0	1	42.80	
Self-employed	0	1	4.34	
Job seeker	0	1	3.58	
Pensioner	0	1	35.48	
Housekeeper	0	1	6.15	
Not employed other	0	1	3.94	
Company size				
1–24	0	1	19.79	
25–499	0	1	38.17	
≥500	0	1	34.07	
not applicable	0	1	7.96	
Net household income (natural logarithm)	5.70	12.49	7.88	0.48
Religious				
yes	0	1	39.86	
no	0	1	60.14	
Risk appetite	0	10	3.95	2.30
Value orientation				
Materialist	0	1	20.84	
Mixed	0	1	65.81	
Post-materialist	0	1	13.35	

Source: LISS Panel.

paid employment, but about 35% are already pensioners. Value orientations distinguish between the materialists, about 21% of the sample; post-materialists, about 13% of the sample; with the remainder of the sample (about 66%) consisting of those with mixed value orientations. The modest share of post-materialists is in line with Inglehart's cohort-replacement theory: since our sample consists of people of 40 years or older, post-materialism is still relatively less prevalent in these cohorts.

6.2. Hypotheses tests

The results of the (OLS) regression analyses in Table 3 support for some of the hypotheses derived from SRI literature in Table 1, but no evidence in favor of most. Heterogeneity is less than expected from the pension literature (e.g. Bovenberg et al., 2012). Not controlling for the effects of risk appetite and value orientation, we find – in line with most earlier research – that women have stronger preferences for sustainability, and that such preferences increase with educational attainment. Our analysis also suggests that self-employed persons and housekeepers have a significantly higher willingness to pay for sustainability than those in paid employment. However, we do not find the effects of household composition and religiosity on the preference for sustainability, nor for home-ownership or income. Sustainability is not a luxury good. Unlike most research, age is found to have a positive effect, but it should be remembered that our sample includes only those aged 40 years and older, thus severely limiting the range of this variable, and that it is not possible to distinguish between the contribution of age, period and cohort effects to the association. There is no theoretical rational in the investment literature for the positive effects of education; for the gender, age and self-employed the rational is weak, requiring differences in risk and return perception of SRI (Junkus and Berry, 2010). A possible explanation is that environmental awareness and environmental concern are higher among women, and positively correlated with education level (see, e.g. Franzen and Meyer, 2010). The positive relation for self-employment may be related to the fact that it not only attracts optimistic people, it also is a consequence of financial optimism (Dawson et al., 2014).

Including risk appetite and value orientation in the model does not substantively change the findings for these background characteristics. We find no evidence suggesting that risk appetite has any influence on the preference for sustainability. Thus, while risk appetite may be very important in explaining differences in the preferences for the risk-return tradeoff inherent in the traditional investment literature, it appears to contribute little to our understanding of differences in the preference for sustainable investing.

What does contribute to our understanding of such differences however are value orientations. The effect of being more post-materialist is in fact in line with our hypothesis. Post-materialists have stronger preferences for sustainability than materialists, those with mixed value orientations are in between. The difference in predicted values between materialists and post-materialists on our six-point scale for the preference for sustainability amounts to almost 0.4 points.

Measures of model fit for both estimated models indicate that although we are able to explain a significant amount of variation, there is a sizeable amount of it we are not able to account for. R-squared measures should of course never be interpreted as a one-to-one reflection of the strength of explanatory power of the causal effects in the population. However, there is in this case at least reason to believe that much may still be gained

Table 3. (OLS) linear regression of preferences for sustainable pension fund investments on risk appetite and value heterogeneity and background characteristics.

	Model 1 b	Model 2 b
Intercept	3.008***	2.857***
	(0.546)	(0.547)
Gender (dummy)		
Male	Reference	Reference
Female	0.165**	0.163**
	(0.056)	(0.056)
Age	0.016***	0.015***
	(0.004)	(0.004)
Household composition (dummies)		
Single	Reference	Reference
Cohabitation without children	0.096	0.112
	(0.077)	(0.077)
Cohabitation with children	−0.105	−0.072
	(0.103)	(0.102)
Single with children	−0.076	−0.052
	(0.154)	(0.152)
Other	−0.413	−0.394
	(0.329)	(0.329)
Type of dwelling		
Self-owned	Reference	Reference
Rental	−0.002	−0.014
	(0.070)	(0.069)
Education (dummies)		
Low	Reference	Reference
Middle	0.162*	0.147*
	(0.070)	(0.070)
High	0.474***	0.436***
	(0.069)	(0.069)
Primary occupation		
Paid employment	Reference	Reference
Self-employed	0.252†	0.233†
	(0.137)	(0.139)
Job seeker	−0.012	−0.049
	(0.158)	(0.157)
Pensioner	−0.072	−0.079
	(0.093)	(0.093)
Housekeeper	0.262*	0.260*
	(0.113)	(0.113)
Not employed other	0.120	0.109
	(0.115)	(0.115)
Company size		
1–24	Reference	Reference
25–499	−0.054	−0.060
	(0.073)	(0.072)
≥500	−0.014	−0.023
	(0.076)	(0.075)
not applicable	−0.194†	−0.162
	(0.113)	(0.113)
Net household income (natural logarithm)	0.023	0.012
	(0.069)	(0.068)
Religious (dummy)		
yes	Reference	Reference
no	−0.028	−0.012
	(0.055)	(0.055)
Risk appetite		0.003
		(0.013)
Value orientation		
Materialist		Reference

(*Continued*)

Table 3. Continued.

	Model 1 b	Model 2 b
Mixed		0.277*** (0.069)
Post-materialist		0.394*** (0.093)
F	6.64***	6.87***
RMSE	1.313	1.308
F	6.34***	6.58***
R^2	0.046	0.055

Notes: b, unstandardized coefficient.
Robust (HC) standard errors in parentheses.
$^{\dagger}p < .1$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$; (two-tailed).
Source: LISS Panel.

by future development of novel explanations for differences between people in their preferences for sustainability.

In sum, the findings support our hypothesis that value orientations are valuable in understanding sustainability preferences and show some but rather meager support for standard explanations from the investment literature, and they point towards the need for further theoretical development.

6.3. Robustness analysis

The results of our analysis were subject to an extensive robustness analysis. For one, the independent variables age and income were inspected for the presence of non-linear effects (by analyzing the residuals and testing quadratic terms), for which we found no evidence.

Second, we re-estimated our models as generalized ordered logit models. Ordered logit models can be viewed as extensions of the standard binomial logit model that can be estimated on data where the dependent variable is ordinal, or equivalently as simplifications of the multinomial logit model where the different coefficients estimated for each independent variable is restricted to be of the same value. The coefficients represent the effect of the independent variables on the natural logarithm of the odds of falling within the lowest to each particular value of the dependent variable compared to the other categories (1 vs. 2–6; 1 and 2 vs. 3–6; 1–3 vs. 4–6, etc.). In the generalized ordered logit model, the effects are estimated (via maximum likelihood) in a single coefficient value if, roughly speaking, the model-implied underlying changes in probability can be adequately represented by a set parallel running S-curves (the proportional odds assumption of the model is then satisfied). If this is not the case, the effect is represented by five separate coefficient values, one for each of the contrasts. The advantage of this model is that it adequately deals with the ordinal nature of the dependent variable, that it does not suffer from the potential violations to assumptions that our OLS regressions may suffer from, and that it does so relatively efficiently by only lifting the restriction of equal coefficients across response categories when this is necessary.

After estimating the generalized ordered logit models, we calculated the averaged marginal effects. The results of this analysis showed that the estimates from the linear (OLS)

regression models are not seriously biased by the nature of the dependent variable. However, not all results were substantively identical. In particular, we found that the proportional odds assumption did not hold for the risk appetite variable.

However, while relaxing this assumption resulted in finding significant effects for at least some contrasts, these estimated effects were not in line with any theoretical expectation. Our conclusion is that these effects are more likely to be due to overfitting rather than representing any actual population effects. They are in any case not consistent with any theoretically justified hypothesis about the effect of risk appetite, thus validating our upholding of the null-hypothesis in this case, as in our main results.

7. Conclusions and policy recommendations

The results of our study are important to pension funds, institutional investors and investment professionals generally, and to governments. Firstly, we find that sustainable pension fund investment is considerably favored. Roughly three-quarters at least to some extent favor sustainable investing, even if this implies paying higher premiums (less current consumption) or receiving a lower pension (less future consumption). This strongly suggests that current pension fund policies, guided by the neoclassical economics focus on narrow financial self-interest, is unlikely to adequately represent the actual preferences of their participants. Secondly, our finding of a clear micro-level link between preferences for sustainable pension fund investments and participants' post-material value orientations provides valuable insight into how heterogeneity among participants arises. Moreover, this finding suggests that, at least in most of the Western world, the demand for sustainable pension fund investments is likely to further increase, as more post-material cohorts replace less post-material ones.

Regarding the explanatory power of standard investment theories, our results paint a mixed and somewhat underwhelming picture, showing no impact of income, house ownership, or risk appetite. We do find that women are more likely to prefer sustainability than men are, that these preference increase with age and with educational attainment, and that self-employed and housekeepers prefer sustainability more than those in paid employment, job seekers and pensioners.

Two main limitations apply to our study. First, the question remains to what extent stated willingness to pay is related to actual investment decisions with real financial consequences. Second, given that we analyzed observational data, the associations we estimated may not accurately reflect causal effects due to endogeneity, although we were able to control for a large set of variables.

In line with previous analyses on SRI (e.g. Williams, 2007; Pérez-Gladish et al., 2012) and analyses on preferences of pension fund participants (Borgers and Pownall, 2014; Apostolakis et al., 2016), we find that the explanatory power of the effects in our analysis is limited. This suggests that the literature on SRI in general and sustainable pension fund investments in particular are still in dire need of further development. We suggest three potential fruitful avenues.

First, little is known about the impact of beneficiaries' knowledge and evaluations of issues SRI aims to address in the first place. For instance, differences in their knowledge about climate change and its potential impact are likely to influence the utility they

derive from SRI and hence their willingness to pay for sustainable. Future survey research would hence be well served by including items on such issues.

Second and related, country-specific contexts related to the issues addressed by SRI, e.g. environmental pollution, working conditions, may also impact affect sustainability preferences. Better country-comparative microdata will be needed to investigate such explanations.

Third, age appears to impact positively on sustainability preferences in many studies, including ours, but the mechanisms for this effect are not well understood. In particular, it would be interesting for future research to disentangle lifecycle, period and cohort elements of this effect. This would be particularly facilitated by collecting longitudinal data on beneficiaries.

Considering the practical implications of our research, we end by noting that it is not so much whether non-financial factors can or should be taken into account, but how to do it, to what extent and under what conditions. According to Scholtens and Sprengers (2000) the Pension Act prompts pension funds to invest for high returns in the short term. Integration of sustainability indicators in the Pension Act could incite pension funds also to pursue a good and sustainable yield in the long term. Given the heterogeneity in preferences of participants it is difficult for fund managers to incorporate them in their investment decision. Uniform investment policy may favor or harm certain groups of participants. This can prevent pension funds from introducing a sustainable investment policy. However, there may be agreement on a number of basic values. Widely accepted social and environmental standards can serve as a proxy for the values of the participants. For example, international agreements on cluster bombs, environmental protection, human rights, working conditions and against corruption (Freshfields Bruckhaus Deringer, 2005). Influence ('voice') and direct involvement of participants in the decision-making process of their pension fund can lead to consensus on many issues. Shareholder, i.e. pension fund activism can also contribute to more sustainable investments. Another alternative is the development of sustainable investment choices for the participants or full investment autonomy (Richardson, 2007, p. 166; Jansson et al., 2014). However, this is only possible if the participants are financially responsible and capable of healthy financial decisions (Borgers and Pownall, 2014). People are on average unable to make consistent choices with respect to the risk-return tradeoff (Van Rooij et al., 2007). Moreover, heterogeneity is a necessary but not sufficient condition for the introduction of options. For adding sustainability characteristics to the choice frame work of risk and return increases the complexity of the financial products (Delsen, 2015). This extra dimension makes financial decisions more difficult and thus the ability of the average pension participant to incorporate both the financial and non-financial preferences in his decision. In addition, account should be taken of less economies of scale, degradation of the solidarity, distributional issues, and higher administrative burden and transaction costs for all parties.

Notes

1. The survey was fielded in the Dutch language; all reports on the survey presented here are English translations. The questionnaire also included vignette items for a related research project. For more details on our survey questions see https://www.dataarchive.lissdata.nl/study_units/view/500.

2. "The LISS panel is a representative sample of Dutch individuals who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the population register. Households that could not otherwise participate are provided with a computer and Internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including work, education, income, housing, time use, political views, values and personality." See also https://www.surveydata.nl/liss-panel-data-archive.
3. Respondents' (post)material value orientations were taken from wave 7 of the 'Politics and Values' LISS Core Study fielded in December 2013 and January 2014, their religious orientations were taken from wave 7 of the 'Religion and Ethnicity' LISS Core Study fielded in January and February 2014.
4. For instance by using z-tests to compare the proportions observed in each of the categories of the dependent variables, none of which were statistically significant. Similar tests on the distribution of age (in 10-year interval categories) and gender showed a slight underrepresentation of women compared to men in our eventual sample that however does not significantly affect our findings.
5. See https://www.lissdata.nl/about-panel/composition-and-response.
6. Married or unmarried.
7. Primary school or intermediate secondary education diploma (US: junior high school).
8. Higher secondary education/preparatory university education (US: senior high school) or intermediate vocational education (US: junior college).
9. Higher vocational education (US: college) or university.
10. Including family business, autonomous professional and freelancer.
11. Including exempt from job seeking, studying, work.
12. We use a version of this variable with missing values (about 7% in our sample) imputed by the LISS panel.

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