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Determinants of Individual Sustainable Investment Behavior – A Framed Field Experiment

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Abstract

This paper employs a new empirical approach for eliciting preferences for and determinants of sustainable investments at the individual investor level. We examine data from an incentivized framed field experiment that was part of a representative survey among financial decision makers in German households. The analysis reveals strong preferences for sustainable funds. These preferences are especially driven by non-pecuniary factors such as financial literacy, environmental values, and social norms. Interestingly, economic preferences or the Big Five personality traits are only of minor relevance. Our results provide useful implications for the discussion on how to mobilize individual investors for sustainable development.

Keywords: Sustainable investments; individual investors; determinants; revealed preferences; framed field experiment

JEL: G11, Q56, G02, A12, A13

1. Introduction

Sustainable investment¹, i.e. investment processes that account for environmental, social, and/or governance criteria, has developed from niche market to almost mainstream during recent years (e.g. Eurosif, 2018; US SIF, 2018). It is further a key component for achieving the Sustainable Development Goals as well as (inter-) national climate goals, as the associated tremendous investment needs have not yet been met and require the mobilization as well as up-scaling of private investments, e.g. for low-carbon infrastructure (e.g. OECD, 2017). Knowledge of the extent of sustainable investments among private investors and its determinants is thus valuable in order to design adequate, supporting policy measures. Therefore, this paper analyzes the determinants of sustainable investments at the individual (i.e. retail) investor level.

Previous empirical studies already reveal that both pecuniary and non-pecuniary factors play an important role for financial decisions in general (e.g. Hong and Kostovetsky, 2012) and particularly with regard to sustainable investments (e.g. Riedl and Smeets, 2017; Døskeland and Pedersen, 2019; Gutsche et al., 2019; Gutsche and Ziegler, 2019) as well as socially controversial investments (e.g. Hong and Kacperczyk, 2009). With a few exceptions (e.g. Barrada-Tarrazona et al., 2011; Riedl and Smeets, 2017), previous evidence is either based on indirect approaches based on market data (e.g. event studies or fund flow analyses) or more direct approaches based on data from surveys or stated choice experiments. Indirect approaches allow to analyze investors' revealed preferences for sustainability by, for example, considering stock market reactions after reconstitutions of sustainability stock indexes (e.g. Oberndorfer et al., 2013) or fund flows after the introduction of the Morningstar Sustainability Rating (e.g. Hartzmark and Sussman, 2019). However, these approaches do not allow to disentangle relevant

¹ Sustainable investment is also known as socially responsible investing (SRI). We use these terms interchangeably.

determinants of sustainable investments at the individual level. This can only be addressed by direct approaches such as surveys (e.g. Nilsson, 2008; Bauer and Smeets, 2015; Gutsche et al., 2019), stated choice experiments (e.g. Gutsche and Ziegler, 2019), or analyses of administrative data (e.g. Døskeland and Pedersen, 2016; Riedl and Smeets, 2017). Still, direct approaches might be prone to several biases such as hypothetical or retrospective bias (e.g. Gutsche and Ziegler, 2019) and are not representative for the entire population.² Moreover, previous studies largely neglect possibly important factors such as economic preferences or personality traits, which have been shown to be relevant for other economic outcomes in general, and financial decisions in particular.

This study addresses the aforementioned issues by analyzing investment data from a large framed field experiment that was conducted among a representative sample of financial decision makers in Germany during September and October 2019. Each participant was asked to allocate 500€ among four existing globally oriented equity funds, which varied, inter alia, in terms of past performance, annual management and front-up fees, and particularly the level of sustainability measured by the Morningstar Sustainability Rating. In order to make choices incentive-compatible, we informed the participants that 20 of them would be randomly selected after finishing the survey in October 2019 and that their investment decisions would be realized. We further explained that the investment would last for one year. Accordingly, we invested real money according to the investment decisions of 20 randomly selected participants in October 2019. After one year, i.e. in October 2020, we will sell the fund units and the selected participants will receive the actual value of their portfolio. For example, if the value of their portfolio increased from 500€ to 550€ by October 2020, they will receive 550€. In line with previous studies, we used a survey to collect data on several possible determinants, such as personal

² Representativeness is one of the five characteristics for an ideal data set of household data according to Campbell (2006).

values, social norms, economic preferences (i.e. risk, time, and social preferences) and personality traits (in terms of the Big Five, i.e. extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences).

We find that individual investors on average invest significantly more in sustainable funds than they would invest under a naïve diversification strategy (i.e. where they would just allocate their endowment equally across all alternatives). Our results thus imply strong preferences for investments in sustainable funds, even after controlling for financial differences between sustainable and conventional funds. This indicates that other and especially non-pecuniary motives play an important role for individual sustainable investment decisions. We particularly identify financial literacy, environmental values, and social norms as key determinants. Notably, economic preferences according to Falk et al. (2018) and the Big Five personality traits are only of minor relevance. We also find that sustainable investors tend to be young, female persons with above median (class) household net incomes.

Our paper makes two key contributions. First, by incentivizing the investment decisions in our experiment, we provide a new approach to elicit preferences for sustainable investments at the individual investor level. We therefore extend previous studies in this field that are based on survey or stated choice data, as discussed above. Secondly, we contribute to studies on the determinants of individual sustainable investments (e.g. Nilsson, 2008; Bauer and Smeets, 2015; Riedl and Smeets, 2017; Nakai et al., 2018; Brodback et al., 2019; Døskeland and Pedersen, 2016, 2019; Gutsche et al., 2019; Gutsche and Ziegler, 2019; Rossi et al., 2019). In particular, we thereby extend the set of potential determinants by implementing all dimensions of economic preferences according to Falk et al. (2018) as well as personality traits measured by the Big Five according to Gosling et al. (2003), consequently mitigating potential omitted variable bias. We thus implicitly also provide new empirical evidence on the role of economic preferences and personality traits on economic decisions in general (Borghans et al., 2008;

Almlund et al., 2011) and financial decisions in particular (e.g. Conlin et al., 2015; Gerhard et al., 2018). Finally, by considering economic preferences and personality traits simultaneously, we also contribute to the discussion on the relationship between these two sets of factors (e.g. Becker et al., 2012).

The remainder of the paper is structured as follows: Section 2 describes the survey and the experimental design. Section 3 analyzes the revealed preferences for sustainable and conventional equity funds. Section 4 reveals which individual characteristics are relevant for the individuals' investment decisions. Section 5 concludes.

2. Survey and experimental design

2.1. Survey

Our empirical analysis is based on investment data of 749 persons from a large framed field experiment that was conducted within a representative (in terms of age, gender, and place of residence) online survey among financial decision makers in Germany.³ The survey was carried out in cooperation with the professional market research institute Psyma+Consultic GmbH (Psyma) during September and October 2019. The target group of financial decision makers is defined in line with Gutsche and Ziegler (2019), who consider persons that are at least 18 years of age, mainly or equally responsible for financial decisions in the household, and familiar with investment activities. The last criterion is satisfied by only including those decision makers who (i) are currently invested in, (ii) had invested in, or (iii) have extensively informed themselves about stocks, equity funds, bonds, bond funds, or other investment products with variable returns (such as options, certificates, open real estate funds, closed-end funds, mixed funds).

³ Overall, the survey includes 2,500 respondents that participated in various treatments within the investment experiment. The baseline treatment with 749 participants serves as a control group and is the basis for the study at hand. The structure of this group is not significantly different from the structure of the total sample, i.e. also representative in terms of age, gender, and main place of residence at the federal state level.

The respondents were recruited from online panels by Psyma. Among other tasks, the institute was also responsible for programming the questionnaire and hosting the survey, and particularly the recruitment process. In order to derive a representative sample of financial decision makers in German households and not of German citizens in general, the recruitment procedure was split into two steps.⁴ Firstly, Psyma recruited people according to quotas for age, gender, and place of residence at the federal state level for the general German population. In a second step, we asked screening questions about the respondents' responsibility concerning financial decisions in the household and their previous investment experiences. Only those who fulfilled the aforementioned requirements were allowed to proceed with the questionnaire and participate in the field experiment. Furthermore, Psyma conducted quality checks (e.g. regarding systematic response patterns) on all completed questionnaires throughout the field time. Low quality interviews were excluded from the sample and new respondents were re-recruited accordingly.

The survey comprised several parts referring to general and sustainable investments, economic preferences and personality traits, financial literacy, individual environmental and pro-social attitudes, several contextual factors, and sociodemographic and -economic characteristics. The main part consists of a framed field experiment mapping an investment decision among a number of real globally oriented equity funds that differ particularly with respect to their sustainability level.

2.2. Experimental design

The investment experiment started with a detailed description of the choice situation. We asked the participants to allocate 500€ among four existing globally oriented equity funds, which varied, *inter alia*, in terms of past performance, annual management and front-up fees, and particularly the level of sustainability measured by the Morningstar Sustainability Rating. In order to

⁴ Thus, for our sample, we expected a larger share of male, highly educated, and high-income persons compared to the general German population.

make choices incentive-compatible, we informed the participants that 20 of them would be randomly selected after finishing the survey in October 2019 and that their investment decisions would be realized. Subsequently, we did indeed invest real money according to their investment decisions, after the survey. We further explained that the investment would last for one year. After this year, i.e. in October 2020, we would sell the fund units and the selected participants would receive the current value of their portfolio. For example, if the value of their portfolio increased from 500€ to 550€ by October 2020, they would receive 550€. Or if the value of their portfolio decreased to 450€ by October 2020, they would receive 450€. Further, we informed the participants that they could invest the entire 500€ into a single fund or distribute the amount evenly or unevenly between the different funds with the minimum investment amount being 50€.

Next, the participants received a choice set with four equity funds. The characteristics of the funds were described by eight attributes:

- Risk and return profile
- Maximum front-up fees
- Maximum redemption fees
- Running costs (i.e. annual management costs)
- Strength of sustainability
- Returns in the last year
- Average returns in the last three years
- Average returns in the last five years

In addition, participants could choose to receive further information on the funds by clicking on a dialogue button that opened links to a number of documents such as the key investor information document or the sales prospectus. Figure 1 presents a screenshot of an exemplary

choice set (in German) that were given to the participants. Appendix A provides an English translation of the instructions.

-- include Figure 1 here --

Each choice set was constructed by a random draw of four out of eight equity funds from an underlying universe. The eight funds for the investment universe were carefully selected from a wide range of equity funds. All funds are globally oriented equity funds, reinvest the returns in the fund, and are traded in euros. In addition, none of the selected funds has a sustainability mandate nor includes any reference to its sustainability level in its name. Furthermore, and most importantly, in line with Hartzmark and Sussman (2019), we distinguish sustainable funds from conventional funds by using the Morningstar Sustainability Rating as an indicator for a fund's sustainability performance. Four funds in the funds universe have a high Morningstar Sustainability Rating with four or five Morningstar globes, and four funds have a low Morningstar sustainability ranking with one or two Morningstar globes.⁵ Within each choice set at least one fund is a sustainable fund, i.e. a fund with a high Morningstar Sustainability Rating, and at least one is a conventional fund, i.e. a fund with a low Morningstar sustainability ranking. Hence, the number of sustainable funds in a choice set can vary between one and three. Table 1 provides an overview of the eight funds in our investment universe.

-- include Table 1 here --

Table 1 shows that the funds do not only vary in terms of sustainability ratings, but also regarding financial attributes, i.e. front-up fees, annual management fees, returns in the last year, average returns in the last three years, and average returns in the last five years. In order to achieve a good match between sustainable and conventional funds, we aimed to obtain similar means

⁵ See https://www.morningstar.com/content/dam/marketing/shared/research/methodology/744156_Morningstar_Sustainability_Rating_for_Funds_Methodology.pdf for a detailed description of the Morningstar sustainability rating methodology, accessed on July 27th, 2020.

for the financial attributes of the four equity funds with a high Morningstar Sustainability Rating and the four equity funds with a low Morningstar Sustainability Rating from the underlying universe.

Table 2 reports the expected and actual means for each financial attribute for both sub universes – i.e. for funds with a high Morningstar Sustainability Rating and funds with a low Morningstar Sustainability Rating. The expected means are calculated as arithmetic means based on the information presented in Table 1, and thus calculated before the random selection of funds.⁶ Comparing the expected means for the two sub universes reveals relatively small differences (see sixth column in Table 2) indicating that we were successful in selecting suitable funds for the underlying universe. For example, the last year's mean return for funds with a high sustainability rating is 0.16 percentage points higher than for funds with a low sustainability rating. We only find somewhat larger differences with regard to the average returns in the last three years (1.49 percentage points) and the annual management fees (-0.54 percentage points). The actual mean values are calculated based on the actual performance of funds with a high and low sustainability rating across all choice sets, respectively, and thus calculated after the random selection of funds. The seventh column in Table 2 reveals that, compared to the four funds with low Morningstar Sustainability Ratings, the four sustainable funds on average have experienced slightly higher returns in the last year (0.06 percentage points), higher average returns in the last three years (1.51 percentage points), but slightly lower average returns in the last five years (-0.16 percentage points). Moreover, the “portfolio” of sustainable funds has lower average annual management fees (-0.51 percentage points), but slightly higher front-up fees (0.20 percentage points). Due to the random selection, these values deviate slightly from the expected

⁶ For example, we derive the expected mean of the returns in the last year for funds with a high sustainability rating as follows: $\frac{-7.90-3.40-9.38-5.90}{4} = 6.65$. Analogously, we calculate the expected mean of the returns in the last year for funds with a low sustainability rating as follows: $\frac{-9.20-1.66-6.87-9.50}{4} = -6.81$.

values. However, the slightness of these differences indicates that our random selection worked well.

-- include Table 2 here --

3. Preferences for sustainable funds

We construct two measures to capture the respondents' sustainable investment behavior. The first measure is the amount of money invested in sustainable funds (in €), i.e. the amount of money a respondent allocated to equity funds with a high Morningstar Sustainability Rating, i.e. with four or five Morningstar globes.⁷ As the choice sets and thus the number of sustainable funds vary across respondents, respondents might invest more in sustainable funds just because they find a higher number of these funds in their choice set. In other words, respondents who simply apply a naïve diversification strategy (also known as 1/n strategy, see e.g. Benartzi and Thaler, 2001), i.e. allocate their endowment equally across all four alternatives, would invest more in sustainable funds if they were offered three of these funds instead of just one. We thus additionally consider the difference (in €) between the amount a respondent actually invested in sustainable funds and the amount they would invest in sustainable funds under a naïve diversification strategy. Consequently, the active choice of sustainable funds is associated with higher values of such a difference.

Table 3 reports how much money the respondents allocated to sustainable funds on average. On average, respondents allocated 286.87€, and thus about 57% of their initial endowment to equity funds with a high Morningstar Sustainability Rating. If they just followed the 1/n strategy, and thus allocated their endowment equally across all alternatives, they would have invested 234.81€ into sustainable funds on average. Thus, on average respondents invested

⁷ In the following, we denote equity funds with a high Morningstar Sustainability Rating, i.e. those with four or five globes, as sustainable funds.

52.05€ more in sustainable funds than what they would have invested under a naïve diversification investment strategy. This indicates that respondents actively selected sustainable funds, meaning on average they preferred sustainable funds over funds with a low Morningstar Sustainability Rating, i.e. conventional funds.⁸

-- include Table 3 here --

This simple comparison neglects the observed differences in financial attributes between sustainable and conventional funds reported in the seventh column of Table 2. As differences in financial performance might severely affect respondents' choices, we need to control for these differences. To this end, for each choice set or respondent i ($i = 1, \dots, 749$) and each of the five financial attributes k ($k = 1, \dots, 5$), we calculate the differences in means between sustainable and conventional funds:

$$\text{Difference in means}_{ik} = \overline{\text{High sustainability rating}}_{ik} - \overline{\text{Low sustainability rating}}_{ik}$$

The variables 'difference in means for returns in the last year', 'difference in means for average returns in the last three years', 'difference in means for average returns in the last five years', 'difference in means for annual management fees', and 'difference in means for front-up fees' then denote the actual differences in means of the corresponding financial attributes between sustainable and conventional funds within a given choice set (measured in percentage points). The means for these variables are reported in the last column of Table 2 and have already been discussed in the last section.

Table 4 reports the OLS parameter estimates in two linear regression models. In the first model, we regress the amount invested in sustainable funds on the financial controls defined above. The estimated constant term in this model can thus be interpreted as the average amount of money invested in sustainable funds after controlling for differences between sustainable and

⁸ Analogously to the previous case, we denote equity funds with a low Morningstar Sustainability Rating, i.e. those with one or two globes, as conventional funds.

conventional funds. In the second model, the dependent variable is the difference between the amount invested in sustainable funds and the amount invested in sustainable funds under the 1/n strategy. Analogously, the corresponding estimated constant term is the amount of money respondents allocated to sustainable funds exceeding the money amount they would have invested under a naïve diversification strategy. We see that both constant terms are highly significantly different from zero supporting our previous descriptive findings. That is, after controlling for financial differences, respondents allocate on average 278.49€ to sustainable funds, and thus 48.40€ more than what they would have allocated under a naïve diversification strategy.⁹ This first result of our study is in line with the findings by Gutsche and Ziegler (2019) who report strong stated preferences and a high willingness to pay for sustainable investment products, and particularly sustainable equity funds.

-- include Table 4 here --

The fact that none of the parameters for the financial control variables is significantly different from zero, might be surprising. However, this can be explained by the high correlation between the different attributes (see Table C.2 in Appendix C) and possibly also by the low variation within the attribute levels, as we only considered eight different funds. Nonetheless, the corresponding F tests confirm that the financial controls have a highly significant joint impact on the dependent variables in both specifications, indicating towards the relevance of these financial attributes. Moreover, almost all estimated parameters have the expected signs, i.e. positive for the three past performance variables and negative for the two fee variables. Only the estimated parameter for ‘difference in average annual management fees’ in the second model specification is unexpectedly positive.

⁹ Including the actual differences in means of the financial attributes between sustainable and conventional funds into the sample regression function of the first model just gives us the estimated amount invested in sustainable funds without controlling for financial differences: $0.438 \cdot 0.06 + 5.077 \cdot 1.51 + 11.157 \cdot (-0.16) + (-7.825) \cdot (-0.51) + (-7.750) \cdot 0.20 + 278.488 = 286.84 \approx 286.87$.

Nevertheless, we address this issue further by regressing the amount invested in sustainable funds on each financial control variable separately. Table 5 reports the OLS estimation results for the resulting five linear regression models. This approach leads to highly significant parameters for all five variables and all estimated parameters have the expected signs. That is, all past performance measures are positively related to investments in sustainable funds indicating that respondents chased past returns. We additionally see that the estimated parameter for ‘difference in means for average returns in the last five years’ exceeds the parameters for the other two past performance variables. This indicates that respondents particularly focused on long-term past performance, which is line with the results reported by Gutsche and Ziegler (2019). Moreover, both types of fees are negatively related to the amount invested in sustainable funds. We find the same patterns when we consider the difference between the amount invested in sustainable funds and the amount invested in sustainable funds under the 1/n strategy as dependent variable. That is, in contrast to the results for this variable in Table 4, we also find the expected negative sign for ‘difference in means for annual management fees’.

-- include Table 5 here --

4. Relevance of individual characteristics for investments in sustainable funds

The previous results indicate strong revealed preferences for sustainable funds, even after controlling for differences in financial performance. In this section, we turn to the question of which individual characteristics and non-pecuniary factors are relevant for sustainable investment. To this end, we first derive potential determinants at the individual level based on previous studies and secondly include these factors as explanatory variables in our regression approaches.

4.1 Description of individual characteristics

4.1.1 Financial expectations

It is well-known that individual investors do not only take objective financial performance (i.e. the aforementioned financial attributes) into consideration, but also perceived benefits and costs. We therefore follow previous studies analyzing individual sustainable investment behavior (e.g. Bauer and Smeets, 2015; Riedl and Smeets, 2017; Gutsche et al., 2019) and construct two dummy variables capturing the individuals' perception towards returns and risk of sustainable equity funds compared to their conventional counterparts. The variable 'perceived higher returns sustainable funds' takes the value one if the respondent perceived returns of sustainable equity funds to be rather or much higher than returns of conventional equity funds.¹⁰ In the same vein, the variable 'perceived higher risk SRI' takes the value one if the respondent rather or totally agreed with the statement "Sustainable equity funds are riskier than conventional equity funds." Naturally, we expect that persons perceiving sustainable equity funds as having higher returns compared to conventional equity funds allocate more money to the previous type of funds. Likewise, persons should invest less money in sustainable equity funds if they perceive them to be riskier than conventional equity funds.

Table 6 reports selected descriptive statistics for the individual characteristics considered as explanatory variables in the main econometric analysis. It reveals that 20% of the respondents perceived sustainable equity funds to have higher returns than their counterparts. Similarly, 21% of the respondents perceived sustainable equity funds as riskier than conventional equity funds. These results are similar to those by Riedl and Smeets (2017) who report that 14.41% (17.04%) of the conventional (sustainable) investors expected higher returns for sustainable equity funds, and 16.62% (18.84%) perceived sustainable equity funds to be riskier than their

¹⁰ Appendix B provides an English translation of the survey questions and the corresponding response categories for all explanatory variables.

conventional counterparts. However, the results rather differ from those reported by Bauer and Smeets (2015) as well as those from Gutsche et al. (2019), which can be explained by different underlying target groups and slightly different wordings of the questions.¹¹

-- include Table 6 here --

4.1.2 Financial literacy

We further consider individual financial literacy, which is positively related to a variety of financial decisions, such as stock market participation (e.g. van Rooij et al., 2011) or retirement planning (e.g. van Rooij et al., 2012). Since sustainable investment products are more complex by design than their conventional counterparts, individuals with too little financial knowledge tend to face higher processing costs for understanding relevant information and are thus less likely to invest in a sustainable manner (e.g. Gutsche and Zwergel, 2020). However, the relevance of financial literacy for individual sustainable investment behavior is far less clear. Empirical evidence on this topic is contradicting and a comparison of such findings is complicated by the fact that different measures for financial literacy as well as various behaviors are considered.¹² For our main analysis, we follow Rossi et al. (2019) and include a widely accepted measure designed by Lusardi and Mitchell (2008) that aims to capture individual financial literacy objectively. This measure is based on three questions referring to interest rates, inflation,

¹¹ For example, Bauer and Smeets (2015) considered clients from two sustainability banks and Gutsche et al. (2019) asked for the perceived performance of sustainable investments in general, and not particularly for sustainable equity funds.

¹² For instance, previous studies find no significant relationship between self-rated financial knowledge and the amount invested at a sustainability bank (e.g. Bauer and Smeets, 2015) or the importance of social responsibility in investment decisions (e.g. Brodback et al., 2019). Similarly, depending on the model specification, Riedl and Smeets (2017) find a non-significant or only weakly positive relation between self-assessed investment knowledge and the probability to hold sustainable funds. Interestingly, they even find a weakly significant negative relation to the holdings of sustainable funds as share in the individuals' total portfolio. This is partly in line with Rossi et al. (2019) who find that persons scoring high on self-assessed financial literacy have lower stated preferences for investments at a sustainability bank and particularly in sustainable equity funds. However, though some of these scales are validated (e.g. Bauer and Smeets, 2015), self-assessed financial literacy is a very subjective measure and could be driven by overconfidence (e.g. Rossi et al., 2019). Rossi et al. (2019) address this issue by additionally considering an objective measure designed by Lusardi and Mitchell (2008). Notably, when including this indicator, their results partly change, for example, from significantly negative to positive effects in the case of sustainability banks. However, they still find a highly significant negative effect with respect to sustainable equity funds.

and risk diversification, respectively, which try to reveal the respondents' fundamental economic and finance knowledge. The variable 'financial literacy' comprises the number of correct answers and thus ranges between zero and three. Table 6 shows that most respondents answered all three questions correctly, which leads to 2.46 correct answers on average. This value is higher compared to previous studies considering financial literacy for representative German households (e.g. Bucher-Koenen and Lusardi, 2011) and can be traced back to our specific sample of rather financially experienced financial decision makers. In order to compare our results with previous studies considering self-assessed financial knowledge, we also included a question capturing self-assessed financial literacy following Riedl and Smeets (2017). We discuss the corresponding results in Section 4.2.

4.1.3 Contextual factors

Thirdly, we consider social contextual factors, such as the behavior and expectations of peers. These factors play an important role for individual economic and environmentally-friendly behavior (e.g. Nyborg et al., 2016), and also for financial behavior, such as stock market participation (e.g. Hong et al., 2004; Brown et al., 2008; Georgarakos and Inderst, 2014), retirement saving decisions (e.g. Beshears et al., 2015), and particularly individual sustainable investment decisions (e.g. Riedl and Smeets, 2017; Gutsche et al., 2019). Social norms might affect individual behavior via several channels. One potential channel is social signaling (e.g. Riedl and Smeets, 2017). As investment decisions and the intention to invest cannot be observed by others, people need to talk about their sustainable investment behavior to others in order to signal pro-environmental behavior (e.g. Riedl and Smeets, 2017). Further, word-to-mouth learning could be an important driver for investment decisions (e.g. Hong et al., 2004). Therefore, in line with Riedl and Smeets (2017), we additionally construct the dummy variable 'talk about investments' that takes the value one if the respondent rather or totally agreed with the statement "I often talk to others about investments." Besides pure social signaling, persons might try to

avoid social sanctions by relevant peers by adjusting their behavior towards the prevailing norms of the social environment (e.g. Akerlof and Kranton, 2000). In order to capture this motive, we follow Gutsche et al. (2019) and construct the dummy variable ‘expectations social environment’ that takes the value one if the respondent rather or totally agreed with the statement “My social environment (e.g. family, friends, colleagues) expects me to behave sustainably.” Finally, also following Gutsche et al. (2019), we construct the dummy variable ‘volunteering’ that takes the value one if the respondent indicated to be engaged in volunteering activities. This variable captures an individuals’ sociability, but also individual social values. Table 6 shows that 29% of the respondents indicated that they often talk about investments. About 39% of the respondents reported that their social environment expects them to behave in a sustainable manner and 35% of the respondents indicated that they do volunteer work.

4.1.4 Political orientation

We also account for an individual’s political orientation, as left-aligned persons tend to invest in a sustainable manner (e.g. Hood et al., 2014; Gutsche and Ziegler, 2019), but avoid socially controversial investing (e.g. Hong and Kostovetsky, 2012). However, there is also incompatible evidence finding a negative association between actual sustainable investment and preferences for left-wing parties (e.g. Gutsche et al., 2019), which can be explained by general stock market aversion among left-wing oriented individuals (e.g. Kaustia and Torstila, 2011). Following Ziegler (2017, 2019), we measure the respondents’ individual political identification by the four dummy variables ‘conservative political identification’, ‘liberal political identification’, ‘social political identification’, and ‘ecological political identification’. For example, the variable ‘conservative political identification’ takes the value one if the respondent rather or totally agreed with the statement “I identify myself with conservatively oriented politics.” The other three variables are constructed analogously. In contrast to simpler measures for political orientation (e.g. right-/left-wing indicators), which are usually based on stated preferences for different

political parties (e.g. Gutsche and Ziegler, 2019), this operationalization allows to draw a more differentiated picture of the impact of political orientation (e.g. Ziegler, 2017). As our experimental design is similar to the setting applied by Gutsche and Ziegler (2019), we rather expect that persons with socially oriented as well as ecologically oriented political identifications invest more money in sustainable equity funds. Table 6 shows that the majority of respondents indicated a socially or ecologically oriented political orientation (63% and 56%, respectively), and only 29% and 35% stated to be conservative- and liberal-oriented, respectively.

4.1.5 Environmental values

In addition, we include the widely used New Environmental Paradigm (NEP) scale (e.g. Dunlap et al., 2000) to capture general individual environmental values. Instead of using the original scale with 15 items, we follow Whitmarsh (2008) who finds that respondents had problems interpreting nine of the 15 items. The resulting six-item NEP scale has been applied in a variety of studies on energy- and climate-change-related topics (e.g. Schwirplies and Ziegler, 2016; Ziegler, 2017, 2019). To construct this measure, the respondents were asked to indicate to what extent they agree with six statements, while three statements were environmentally positively worded (e.g. “Humans are severely abusing the planet.”) and three statements were environmentally negatively worded (e.g. “Humans have the right to modify the natural environment to suit their needs.”).¹³ On this basis, we constructed one dummy variable for each statement. In the case of environmentally positively (negatively) worded statements each dummy variable takes the value one if the respondent rather or totally agreed (rather or totally disagreed) with the corresponding statement. The variable ‘NEP’ is then constructed as the sum of these six dummy variables and consequently ranges between zero and six. The mean is 4.56 and thus

¹³ The other two environmentally positively worded statements were “Plants and animals have the same right to exist as humans.” and “The balance of nature is very delicate and easily upset.” The further environmentally negatively worded statements were “Nature is strong enough to cope with the impacts of modern industrial nations.” and “Humans were meant to rule over the rest of nature.”

indicates rather high environmental values on average among the respondents (see Table 6), which is in line with previous studies (e.g. Ziegler, 2019).

4.1.6 Risk preferences and trust

In line with previous studies, we also consider individual risk preferences and trust, which are both relevant for various economic and financial decisions (e.g. Guiso et al., 2008; Falk et al., 2018). Referring to sustainable investments, one could argue that risk tolerant persons evaluate the risk of climate change (or other ecological, social, or ethical threats) as less severe than risk averse persons and thus tend to invest less in sustainable equity funds. Though, previous empirical evidence on the relevance of risk preferences for individual sustainable investment behavior is ambiguous.¹⁴ In contrast, trust has been found to be positively related to sustainable investments (e.g. Nilsson, 2008; Gutsche and Zwergel, 2020).

We measure risk preferences by, for example, following Dohmen et al. (2011) or Falk et al. (2018). The dummy variable ‘risk taking’ takes the value one if the respondent indicated to be rather or very willing to take risks in general. Table 6 shows that about 32% of the respondents indicate to be willing to take risks. Our measure for trust is based on three items according to Dohmen et al. (2012). Correspondingly, we asked the respondents to indicate to what extent they agree with the following three statements: “In general, one can trust people.”, “These days you cannot rely on anybody else.”, and “When dealing with strangers, it is better to be careful before you trust them.” We constructed one dummy variable for each statement. The first dummy variable takes the value one if the respondent rather or totally agreed with the first statement, while the other two dummy variables take the value one if the respondent rather or

¹⁴ Bauer and Smeets (2015) find that risk tolerant clients allocate a smaller amount of their investments to sustainability banks. Similarly, Bassen et al. (2019) find that risk tolerant persons put less weight on funds’ climate performance in comparison to their financial performance. In contrast, Riedl and Smeets (2017) find a positive correlation between risk tolerance and the amount invested in sustainable equity funds, but no significant impact on the probability to invest in a sustainable manner. Similarly, Nakai et al. (2018) find no significant effects on the stated preferences for investments in socially responsible companies.

totally disagreed with the latter two statements, respectively. The variable ‘trust’ is the sum of these three dummy variables and ranges between zero and three. The mean for this variable amounts to 0.82 indicating relatively low levels of general trust among the respondents (see Table 6).

4.1.7 Socio-demographic variables

Finally, we consider socio-demographic and socio-economic variables. Although some previous studies show that these factors are less important for individual sustainable investment behavior (e.g. Gutsche et al., 2019), they are likely related to other explanatory variables, such as risk preferences or trust (e.g. Falk et al., 2018). In order to mitigate potential hypothetical bias, we thus control for six socio-demographic variables. The variable ‘age’ denotes the respondents’ age in years. The other five variables are dummy variables that take the value one if the respondent is a woman (‘female’), has at least an advanced technical college certificate or a high school graduation (‘high education’), is married or lives together with their partner (‘living together or married’), lives in a household with a net income that is above the median class and thus above 3,000€ (‘household net income above class median’), and lives in one of the West German federal states excluding Berlin (‘Western Germany’), respectively. A comparison with the general German population in 2018 shows that the respondents in our sample are on average older (49.61 years vs 44.40 years¹⁵), rather male (61% vs 49%¹⁶), and have higher levels of education (64% vs 32%¹⁷). This is in line with our expectations (see footnote 4), since our sample consists of rather experienced financial decision makers in German households and not of “normal” citizens.

¹⁵ See <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabelle/liste-zensus-geschlecht-staatsangehoerigkeit.html>, accessed on July 16th, 2020.

¹⁶ See <https://de.statista.com/statistik/daten/studie/723069/umfrage/durchschnittsalter-der-bevoelkerung-in-deutschland-nach-staatsangehoerigkeit/>, accessed on July 16th, 2020.

¹⁷ See <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung-Forschung-Kultur/Bildungsstand/Tabelle/bildungsabschluss.html>, accessed on July 16th, 2020.

4.2 Econometric analysis

We analyze the relationship between these factors and the amount invested in sustainable funds in a linear regression framework. To this end, we extend the model specification considered in Table 4 and regress the amount invested in sustainable funds on the number of sustainable funds in the choice sets, our financial control variables, and the variables defined in the last section. Again, the inclusion of the number of sustainable funds controls for the fact that the number of sustainable funds varies across respondents and that respondents might follow a naïve diversification strategy. Table 7 reports the corresponding OLS estimates.

-- insert Table 7 here --

As expected, we see that respondents, who had more sustainable funds in their choice set, invested significantly more money into sustainable funds. The amount invested in sustainable funds increases by about 115€ with each additional sustainable fund in the choice set, highlighting the importance of including this control variable. Moreover, the results for the financial controls are in line with the results reported in Table 4 and the corresponding F test again confirms the relevance of these variables. In contrast, the two variables aimed to capture individual financial expectations, i.e. ‘perceived higher returns sustainable funds’ and ‘perceived higher risk sustainable funds’, are not significantly related to investments in sustainable funds. Given the rather ambiguous results in previous studies in regard to these variables (e.g. Riedl and Smeets, 2017; Gutsche et al., 2019), this finding is not completely surprising, although it does reveal that other and especially non-pecuniary individual motives and characteristics are more important.

One of these relevant factors is individual financial literacy, which is significantly positively related to the amount invested in sustainable funds. On average and holding everything else

fixed,¹⁸ one correct answer more in the corresponding test leads to an increase of the amount invested into sustainable funds by 16.61€. Accordingly, respondents that answer all questions of this test correctly invest $16.61\text{€} \cdot 3 = 49.83\text{€}$ more into sustainable funds than persons with no correct answers. Thus, in contrast to several previous studies (e.g. Bauer and Smeets, 2015; Riedl and Smeets, 2017; Rossi et al., 2019), we find a statistically as well as economically relevant and especially positive relationship between financial literacy and sustainable investment behavior. One reason for the diverging results could be that we use the objective measure by Lusardi and Mitchell (2008) instead of a very subjective measure for self-assessed financial literacy that can be driven by overconfidence (e.g. Rossi et al., 2019). Rossi et al. (2019) also discuss this point and test whether their main results, which are based on a measure for self-assessed financial literacy, change if they consider the objective measure by Lusardi and Mitchell (2008). Indeed, their results partly change. For example, self-assessed financial literacy is significantly negatively related to individual stated preferences towards putting money on a savings account at a sustainability bank. In contrast, they do not find a significantly positive nor even a significant effect when considering the objective measure for financial literacy. Accordingly, in line with Riedl and Smeets (2017), we also constructed the dummy variable ‘good knowledge’ that takes the value one if the respondent rather or totally agreed with the statement “I have a good knowledge of financial investments” and included this variable instead of the objective measure in the model specification shown in Table 2.¹⁹ Indeed, we find no significant relationship between this variable and the amount invested in sustainable funds.²⁰ Thus, the researchers’ choice of the measure for capturing individual financial literacy is decisive for the

¹⁸ For reasons of brevity, we neglect this phrase in the interpretation of the further estimated parameters.

¹⁹ Notably, only about 39% of the respondents stated to have a good financial knowledge (see Table C.1 in Appendix C). Thus, our objective measure with a mean of 2.46 (see Table 6) expresses a higher financial knowledge than we would expect based on our self-assessed measure. This is also reflected by the rather low Pearson correlation coefficient between these two variables of 0.13 (see Table C.4 in Appendix C). In sum, this suggests that these indicators measure different things indeed.

²⁰ We do not report the corresponding estimation results due to brevity. Though, the results are available upon request.

estimation results and particularly for potential recommendations made for policy makers or practitioners derived from these results. Based on our results, we would rather argue that individual financial literacy is an important driver for sustainable investments. Thereby, our results underline the finding by Gutsche and Zwergel (2020) showing that excessive processing and information costs are important obstacles to sustainable investments.

Turning to interactions with peers, we find a statistically and economically significant negative effect for the variable ‘talk about investments’. Thus, against our expectations and in contrast to Riedl and Smeets (2017) and Gutsche et al. (2019), we find that persons stating that they often talk about investments with their peers invest 22.99€ less into sustainable funds than their counterparts. This finding implicitly contradicts the idea that investors talk about investments in order to signal prosocial investment activities. Alternatively, our finding rather suggests that persons who often talk about investments have rather negative opinions about sustainable investments. To follow up on this point, we considered the relationship between ‘talk about investments’ and ‘perceived higher returns sustainable funds’ as well as ‘perceived higher risk sustainable funds’, respectively.²¹ Interestingly, we find a rather (low) positive correlation for these two pairs of variables. This indicates that people who often talk about investments tend to perceive the returns (risk) of sustainable funds to be higher than those of conventional funds (see Table C.3 in Appendix C). Therefore, we cannot provide a satisfying explanation for this finding and leave this question open for future research. Our second variable, capturing potential peer effects (‘expectations social environment’), also has a significant relationship with the amount invested in sustainable funds, however, with the expected sign. We find that persons stating that their social environment expects them to behave in a sustainable manner, invest 21.61€ more into sustainable funds than those persons who do not feel pressure. This result is

²¹ Relatedly, given that environmental values and ecological political identity are positively related to individual sustainable investments (see below) and that left-aligned individuals tend to shun stock markets (e.g. Kaustia and Torstila, 2011), talking about investments might not be en vogue among sustainable investors. However, our follow-up analyses did not reveal any evidence supporting this idea.

in line with evidence based on survey data reported by Gutsche et al. (2019) and clearly shows that perceived social (injunctive) norms play an important role for individual sustainable investments. Notably, and also not in line with previous evidence (e.g. Gutsche et al., 2019), we find that persons who are engaged in volunteer activities invest significantly less (i.e. 36.40€) in sustainable funds. This finding suggests a potential crowding-out effect of sustainable investments due to other pro-environmental or pro-social activities, which could be explained by the moral licensing theory.

With respect to political identification, we find negative signs for the parameter estimates of ‘conservative political’ and ‘liberal political identification’, but the correlations are not significantly different from zero. We only find a robust significant and positive relationship between individual ecological political identification and sustainable investments. Accordingly, persons with an ecologically oriented policy identification invest 26.42€ more in sustainable funds than their counterparts. This finding highlights the relevance of political identification for sustainable investment decisions and is in line with previous results with regard to individual investors (e.g. Gutsche and Ziegler, 2019), but also mutual fund managers (e.g. Hong and Kostovetsky, 2012). Similarly, our results also reveal the relevance of general environmental values for individual sustainable investments, as the NEP score is highly significantly related to the dependent variable. An increase of the NEP score by one, leads to an increase of the amount invested in sustainable funds by 10.74€. Thus, a person with an average environmental awareness would invest a substantial amount of $(4.56 - 1) \cdot 10.74€ = 38.23€$ more into sustainable funds than a person with the lowest possible NEP score of one.

Considering trust and risk-taking preferences, we find that individual trust is weakly significantly and positively related to the amount invested in sustainable funds. However, we do not find any significant results for ‘risk taking’. Hence, our results support the view that trust is a relevant driver for sustainable investments (e.g. Nilsson, 2008; Gutsche and Zwergel, 2020) or

stock market participation in general (e.g. Guiso et al., 2008). Yet, our results are not in line with previous studies reporting evidence that individual risk preferences are significantly related to sustainable investments (e.g. Bauer and Smeets, 2015; Riedl and Smeets, 2017; Bassen et al., 2019). One could argue that our results are biased, as we neglect other economic preferences (e.g. time preferences, altruism, or reciprocity) or personality traits (e.g. the Big Five), which could be related to sustainable investments and individual risk preferences or trust, respectively (e.g. Becker et al., 2012; Falk et al., 2018). We follow-up on this point in our robustness checks (see next section) but see that our main results reported in Table 6 remain stable.

Finally, a respondent's age is significantly negatively related to investments in sustainable funds. Our results imply that the amount invested in sustainable funds decreases by 1.28€ with every further year of age. Additionally, women invest significantly more money (i.e. 24.61€) into sustainable funds than men. 'Household net income above median class' is also positively related to the amount invested in sustainable funds. Our results imply that persons with a household net income of more than 3,000€ invest 19.91€ more in sustainable funds. This finding is very interesting in the light of the discussion that private investors need to be mobilized in order to finance and achieve international and national climate policy goals as well as the related transition process.

4.3 Robustness checks

Finally, we consider alternative model specifications with additional explanatory and alternate dependent variables in order to check the stability of our estimation results. We firstly consider the relevance of perceived psychological benefits as well as concerns about climate change. To this end, we additionally include a measure to capture feelings of warm glow (e.g. Andreoni, 1990) from acting in a sustainable manner. The dummy variable 'warm glow' takes the value one if the respondent rather or totally agreed with the statement "It makes me feel good to act sustainably." In line with previous studies in the field of individual sustainable investments (e.g.

Gutsche et al., 2019; Gutsche and Ziegler, 2019) or sustainable activities (e.g. Schwirplies and Ziegler, 2016), we expect that people receiving feelings of warm glow from sustainable behavior allocate a larger share of their endowment to sustainable funds. In order to capture the respondents' concerns about climate change, we asked the respondents to indicate to what extent, if at all, they are concerned about climate change. The corresponding dummy variable 'concerned about climate change' takes the value one if a respondent stated to be rather, very, or extremely concerned about climate change. Not surprisingly, about 77% of the respondents indicated that they feel good when acting sustainably and a share of 88% is concerned about climate change (see Table C.1 in Appendix C). When we include these variables separately in the main model from the last section, we find that both variables are individually significantly positively related to the amount invested in sustainable funds. This finding translates into an increased sustainable investment of about 32€ for 'warm glow' and about 29€ for 'concerned about climate change'.²² The other parameters remain largely stable, though 'expectations social environment' loses significance when including 'warm glow'. Additionally, the parameter estimates for 'ecological political identification', 'NEP', and 'trust' drop slightly when including one of these two additional variables. When we include both variables jointly, 'warm glow' mutes the effect of 'concerned about climate change', 'ecological political identification', and 'trust', but all further results remain stable. These varying results can be explained by non-trivial pairwise correlations between 'warm glow', 'concerned about climate change', and other explanatory variables that point to the idea that persons derive utility from sustainable and particularly environmentally-friendly behavior (see Table C.4 and Table C.5 in Appendix C). In sum, we thus clearly find evidence that individual environmental awareness and ideology, which might also be expressed by concerns about climate change, are key drivers of sustainable

²² We do not report the estimation results of our robustness checks due to brevity, but they are available upon request.

investments and obviously more important than social issues expressed by ‘social political identification’ or ‘volunteering’.

Secondly, we analyze the role of other economic preferences beyond risk preferences or trust, i.e. time preferences, altruism, and positive as well as negative reciprocity. In general, economic preferences are important determinants of several economic outcomes (e.g. Falk et al., 2018). However, if at all, previous studies in the field of individual sustainable investments only consider single factors (usually risk preferences, altruism, and/or trust) and not the full set of economic preferences.²³ The latter could be problematic in terms of potential omitted variable bias, given that indicators for economic preferences are typically correlated with each other (e.g. Falk et al., 2018). We capture individual time preferences by constructing the dummy variable ‘patience’ that takes the value one if the respondent indicated to be rather or very willing to give up something that is beneficial for them today in order to benefit more from it in the future (e.g. Falk et al., 2018). Altruism is measured by the dummy variable ‘altruism’ that takes the value one if the respondent indicated to be rather or very willing to give to good causes without expecting anything in return (e.g. Falk et al., 2018). The measures for positive and negative reciprocity are constructed based on three items for each variable according to Dohmen et al. (2009). For each item we constructed a dummy variable that takes the value one if the respondent rather or totally agreed with the corresponding statement. The two variables ‘positive reciprocity’ and ‘negative reciprocity’ are then the sum of the three corresponding dummy variables

²³ Besides this rather methodological argument, at least time preferences and altruism could also be relevant in terms of content. Patient persons could be more likely to behave in a sustainable manner, and thus allocate more resources to sustainable investments. However, extant studies in the field of SRI either find no conclusive results (e.g. Nakai et al., 2018) or that investors with longer investment horizons put a higher weight on a fund’s financial performance than on climate performance (e.g. Bassen et al., 2019). In contrast, empirical evidence for altruism is rather consistent and reveals an intuitively expected positive relationship towards the probability to invest in a sustainable manner (e.g. Riedl and Smeets, 2017) or the importance of social responsibility in investment decisions (e.g. Brodback et al., 2019). We therefore also expect that altruistic persons invest a larger share of their endowment into sustainable equity funds.

and thus range between zero and three. Higher values correspond with higher levels of positive and negative reciprocity, respectively.

When adding these variables to our main specification, all main results remain stable. However, we find no evidence for a significant relationship between economic preferences and the amount invested in sustainable funds. This result applies to all single variables (i.e. none of the corresponding robust z-statistics is larger than 1.645), and thus also to ‘trust’. Given the non-trivial correlations between our measures for economic preferences (see Table C.4 in Appendix C), one could argue that these insignificant results are a consequence of multicollinearity issues. However, we also see that the set of all measures for economic preferences has no significant impact on the amount invested in sustainable funds, as the corresponding F test on joint significance shows very high p-values. Thus, our results are not in line with previous studies reporting evidence that risk preferences (e.g. Bauer and Smeets, 2015; Riedl and Smeets, 2017; Bassen et al., 2019), altruism (e.g. Riedl and Smeets, 2017; Brodback et al., 2019), or trust (e.g. Nilsson, 2008; Gutsche and Zwergel, 2020) are related to individual sustainable investments.

We finally follow Gerhard et al. (2018) who show that a holistic approach that includes individual attitudes, cognitive skills (e.g. in terms of financial literacy), but also personality traits, explains savings behavior more adequately than approaches only considering a few potential factors. We therefore additionally control for individual personality traits, which are defined as “[...] relatively enduring patterns of thoughts, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances.” (Roberts, 2009, p. 140). Prior research has shown that personality traits are related to a variety of economic outcomes (e.g. Borghans et al., 2008; Almlund et al., 2011; Becker et al., 2012) and particularly individual financial behavior, such as savings behavior (e.g. Cobb-Clark et al., 2016; Gerhard et al., 2018), stock market participation (e.g. Conlin et al., 2015; Bucciol and Zarri, 2017), or portfolio monitoring

behavior (e.g. Gherzi et al., 2014). Yet, no study has analyzed their role in the context of individual SRI. However, the recent study by Jacksohn et al. (2019) find that personality traits only play a minor role in the context of individual investments in renewable energy technologies and that economic benefits as well as socio-demographic factors seem to be more important.

While many measurement systems for personality traits exist, we consider the most prominent taxonomy, i.e. the Big Five (e.g. Borghans et al., 2008; Almlund et al., 2011). The Big Five, i.e. openness to experiences²⁴, conscientiousness²⁵, extraversion²⁶, agreeableness²⁷, and emotional stability (or neuroticism)²⁸, measure personality traits at the highest level of abstraction. They can be further divided into several underlying facets (e.g. Almlund et al., 2011; Becker et al., 2012) and have been applied by several researchers in the field of financial economics (e.g. Brown and Taylor, 2014; Cobb-Clark et al., 2016; Buccioli and Zarri, 2017; Gerhard et al., 2018). We used the Ten Item Personality Inventory (TIPI) introduced by Gosling et al. (2003)

²⁴ Openness to experience describes a person's tendency to being "open to new aesthetic, cultural, or intellectual experiences" (Dictionary of Psychology of the American Psychological Association, APAa, 2020). Given that sustainable investment is still on its way to become mainstream, which should be rather new to the majority of individual investors, we expect that persons who are open to new experiences invest more into sustainable equity funds.

²⁵ Conscientiousness is defined as "the tendency to be organized, responsible, and hardworking" (APA, 2020b). Thus, this trait is typically related to the ability to plan, be self-disciplined, and to delay gratification (e.g. Nyhus and Webley, 2001). Nyhus and Webley (2001) argue that such persons are more likely to handle their finances and thus have a higher willingness as well as ability to save money. In the context of sustainable investments, one could argue that conscientious persons are more farsighted, and thus take long-term consequences of (un-) sustainable activities into consideration. Consequently, we expect that those persons allocate a higher share of their endowment to sustainable funds.

²⁶ Extraversion describes "relatively outgoing, gregarious, sociable, and openly expressive" persons (APA, 2020c) and tends to be negatively related to a variety of financial decisions (e.g. Nyhus and Webley, 2001; Brown and Taylor, 2014; Buccioli and Zarri, 2017; Gerhard et al., 2018). Nyhus and Webley (2001) argue that extraverted people are more strongly affected by financial behavior of their peers, as they meet and talk to persons more regularly. Therefore, its effect in the context of sustainable investments is yet unclear and could severely depend on the attitudes of the social environment towards sustainable equity funds.

²⁷ Agreeableness is described as "the tendency to act in a cooperative, unselfish manner" (APA, 2020d). Accordingly, Nyhus and Webley (2001) argue that agreeableness is positively related to a person's pro-social behavior towards others, which might translate into increased and more charitable giving. Consequently, these persons might have less money to save for themselves. This argumentation is in line with findings in several studies revealing that agreeableness is negatively related to household savings (e.g. Nyhus and Webley, 2001; Gerhard et al., 2018) and stock market participation (e.g. Buccioli and Zarri, 2017). Consequently, we expect a positive relation between agreeableness and investments in sustainable funds.

²⁸ Finally, emotional stability describes the "predictability and consistency in emotional reactions, with absence of rapid mood changes" (APA, 2020e). We do not formulate any expectations on its association to individual sustainable investments.

to capture these five personality traits.²⁹ The resulting variables ‘openness to experiences’, ‘conscientiousness’, ‘extraversion’, ‘agreeableness’, and ‘emotional stability’ range between one and five, while a higher value is associated with a higher degree of the corresponding personality trait. However, the addition of these variables to our main specification reveals no empirical support for the idea that personality traits affect sustainable investment. As in the case of economic preferences, this applies to all single variables and to the whole set of personality traits, as all tests on individual and joint significance lead to very high p-values. Finally, we follow the discussion by Becker et al. (2012) arguing that explanatory power can be increased by including economic preferences and personality traits simultaneously. Though, we do not even find an increase in the unadjusted R-squared. In sum, our results rather suggest that both economic preferences and personality traits are only of minor importance for investments in sustainable funds.

In a final robustness check, we change our dependent variables. Thus, we also regress the difference between the amount invested in sustainable funds and the amount invested in sustainable funds under the 1/n strategy on the previously discussed variables. In all cases, our results remain very stable and we come to the same conclusions as before.

²⁹ This scale does not allow to measure underlying facets in detail, its brevity is very appealing for online surveys, and has been applied to several economically- and environmentally-relevant fields, such as environmental engagement (e.g. Milfont and Sibley, 2012) and choices over public environmental goods (e.g. Boyce et al., 2019). Accordingly, we presented ten pairs of character traits (two pairs for each of the Big Five traits) to the respondents and asked them to indicate how strongly they agree to what extent each pair applies to them. For example, the pairs “open to new experiences” and “conventional, uncreative” are used to capture openness to experience, while the first pair is the standard item and the latter the reverse-scored item. The other pairs were “dependable, self-disciplined” and “disorganized, careless” for conscientiousness, “extraverted, enthusiastic” and “reserved, quiet” for extraversion, “critical, quarrelsome” and “sympathic, warm” for agreeableness, and “anxious, easily upset” and “calm, emotionally stable” for emotional stability. The respondents were again asked to answer on a scale with five ordered response categories, i.e. “totally disagree”, “rather disagree”, “undecided”, “rather agree”, and “totally agree”. For calculating a score for each personality trait, we translated these categories into numbers ranging from one to five (where 1 stands for “totally disagree” and 5 stands for “totally agree”) for standard items and numbers ranging from five to one for reverse-scored items. The score for each Big Five personality trait is then just the average of the scores for the corresponding items and ranges from one to five.

5. Conclusion

This paper investigates revealed preferences for sustainable and conventional equity funds among financial decision makers in German households. For the investigation, we consider a group of citizens, representative for such decision makers. The analysis is interesting, particularly in light of the necessity to mobilize private investors in order to achieve the Sustainable Development Goals and actively involve society in the corresponding transformation process. In contrast to most previous empirical studies in this research area, our empirical analysis is based on revealed preferences data, collected in an incentivized framed field experiment. We thereby overcome well-known limitations of stated preferences approaches as discussed by Gutsche and Ziegler (2019).

Our analysis reveals that respondents actively allocated money to sustainable funds and thus on average preferred sustainable funds over their conventional counterparts. This finding holds, even after controlling for financial differences between sustainable and conventional funds, indicating that other and especially non-pecuniary motives play an important role for individual sustainable investment decisions. We particularly identify financial literacy, environmental values, and social norms as key determinants. Additionally, sustainable investors tend to be young, female persons with above median (class) household net incomes.

Notably, we reveal several unexpected results. Both economic preferences and psychological personality traits are only of minor relevance for the amount allocated to sustainable funds. Among economic preferences, only trust is weakly positively related to sustainable investments supporting previous results by Nilsson (2008) or Gutsche and Zwergel (2020). Additionally, we do not find support for the social signaling hypothesis by Riedl and Smeets (2017), and even find an unexpected opposite effect. The same applies to our observation that persons doing volunteering work invest significantly less into sustainable funds than their counterparts, suggesting potential crowding-out effects due to moral licensing.

Our results are thus relevant for both researchers and practitioners in several dimensions. We make two important observations with respect to financial literacy. First, in contrast to several previous studies (e.g. Bauer and Smeets, 2015; Riedl and Smeets, 2017; Rossi et al., 2019), we reveal a substantial, robust, positive relationship between financial literacy and sustainable investment behavior. Our results are therefore in line with Gutsche and Zwergel (2020) showing that excessive processing and information costs are important obstacles for sustainable investments. This indicates that educational campaigns to foster financial knowledge of individuals could be a central measure in order to mobilize investors for sustainable investments. Secondly, we show that the researchers' choice between a subjective or objective measure for individual financial literacy is decisive for the estimation results and thus for policy recommendations derived from these results. Given potential limitations of subjective measures, which could be driven by, for example, overconfidence, we strongly recommend the inclusion of more objective measures, as designed by Lusardi and Mitchell (2008).

Our findings additionally indicate that environmental awareness and concerns, e.g. about the consequences of climate change, are relevant for individual investment decisions. This finding thus adds empirical evidence to the question, whether investors consider climate risks in their investment decisions (see e.g. Krueger et al., 2020 on institutional investors). Therefore, disclosure of information on the relevance of climate change on financial markets and financial stability, but also vice versa, i.e. on the impact of investments on climate change could be crucial measures to foster sustainable investments. From this perspective, it will be very interesting to analyze the impact of ongoing political measures on investment decisions such as the new taxonomy for sustainable finance developed at European Union level (e.g. EU Technical Expert Group on Sustainable Finance, 2020). Finally, our results also highlight the relevance of peers for financial decisions. Given the significant positive relationship between perceived expectations of the social environment and the amount invested in sustainable funds, disclosure of

information on the behavior of others (e.g. a relevant reference group) could also be a promising tool to mobilize private investors. However, since information on behavior of others can also have an undesired, negative impacts on individual financial decisions (e.g. Beshears et al., 2015), it remains an open question for further research, whether injunctive or descriptive social norms can unfold a similar impact as observed, for example, in the case of energy consumption (e.g. Allcott, 2011).

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Tables

Table 1: Overview of all equity funds included in the experiment’s investment universe

Attribute	High Morningstar Sustainability Rating				Low Morningstar Sustainability Rating			
	A	B	C	D	E	F	G	H
Risk and return profile	5	5	5	6	5	5	6	5
Maximum front-up fees	4.00%	5.00%	5.00%	6.00%	4.50%	4.50%	4.00%	6.10%
Maximum redemption fees	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Annual management fees	0.75%	2.28%	1.41%	1.89%	2.15%	1.70%	1.72%	2.92%
Strength of sustainability	Very high	High	High	Very high	Very low	Low	Low	Very low
Returns in the last year	-7.90%	-3.40%	-9.38%	-5.90%	-9.20%	-1.66%	-6.87%	-9.50%
Average returns in the last three years	2.60%	0.75%	3.37%	3.59%	1.80%	2.91%	3.24%	-3.31%
Average returns in the last five years	6.11%	7.20%	4.62%	6.93%	8.22%	7.69%	7.50%	2.24%

Note: This table provides an overview of the eight funds included in the investment universe. Four funds in the funds universe have a high Morningstar Sustainability Rating with four or five Morningstar globes, and four funds have a low Morningstar sustainability ranking with one or two Morningstar globes. The funds do not only vary in terms of sustainability ratings, but also regarding financial attributes, such as front-up fees, annual management fees, returns in the last year, average returns in the last three years, and average returns in the last five years. The original names of the selected equity funds are: (A) “Löwen-Aktienfonds”, (B) “BNY Mellon Global Funds PLC - BNY Mellon Global Opportunities Fund EUR A Acc”, (C) “Global Advantage Funds - Major Markets High Value A Acc”, (D) “MFS Meridian Funds - Global Equity Fund A1 EUR”, (E) “KEPLER Growth Aktienfonds (T)”, (F) “Amundi Funds - Global Equity Conservative A EUR (C)”, (G) “Raiffeisen-MegaTrends-Aktien R T”, and (H) “ALL-IN-ONE”.

Table 2: Comparison of means of financial attributes for equity funds with high and low Morningstar Sustainability Ratings

	Equity funds with high sustainability ratings		Equity funds with low sustainability ratings		Differences in means	
	Expected mean	Actual mean	Expected mean	Actual mean	Expected	Actual
Returns in the last year	-6.65%	-6.75%	-6.81%	-6.81%	0.16 pp	0.06 pp
Average returns in the last three years	2.58%	2.59%	1.16%	1.09%	1.49 pp	1.51 pp
Average returns in the last five year	6.21%	6.16%	6.41%	6.31%	-0.10 pp	-0.16 pp
Annual management fees	1.58%	1.58%	2.12%	2.09%	-0.54 pp	-0.51 pp
Front-up fees	5.00%	5.00%	4.78%	4.80%	0.20 pp	0.20 pp

Note: This table reports the expected and actual means for each financial attribute for both sub universes – i.e. for funds with a high Morningstar Sustainability Rating and funds with a low Morningstar Sustainability Rating. The expected means are calculated as arithmetic means based on the information presented in Table 1, and thus before the random selection of funds. For example, we derive the expected mean of the returns in the last year for funds with a high sustainability rating as follows: $(-7.90-3.40-9.38-5.90)/4=6.65$. Analogously, we calculate expected mean of the returns in the last year for funds with a low sustainability rating as follows: $(-9.20-1.66-6.87-9.50)/4=-6.81$. The sixth column compares the expected means for the two sub universes. For example, the last year's mean return for funds with a high sustainability rating is 0.16 percentage points higher than for funds with a low sustainability rating. The actual mean values are calculated based on the actual performance of funds with a high and low sustainability rating across all choice sets, respectively, and thus after the random selection of funds. Due to the random selection, these values deviate slightly from the expected values. Though, these differences are very small, indicating that our random selection worked well.

Table 3: Investments in sustainable funds

	Mean	Standard deviation	Min	Max
Amount invested in sustainable funds (in €)	286.87	164.47	0	500
Amount invested in sustainable funds under the 1/n strategy (in €)	234.81	87.67	125	375
Difference between amount invested in sustainable funds and amount invested in sustainable funds under the 1/n strategy (in €)	52.05	142.62	-375	375

Note: This table describes the respondents' sustainable investment behavior. Therefore, it reports selected descriptive statistics for the amount of money invested in sustainable funds (in €), i.e. the money amount a respondent allocated to equity funds with a Morningstar Sustainability Rating of four or five globes. As the choice sets and thus the number of sustainable funds vary across respondents, they might invest more in sustainable funds just because they find more of these funds in their choice set. In other words, respondents who simply apply a naïve diversification strategy (also known as 1/n strategy, e.g. Benartzi and Thaler, 2001), i.e. allocate their endowment equally across all four alternatives, would invest more in sustainable funds if they were offered three of these funds instead of just one. The table thus additionally reports information on the amount a respondent would invest in sustainable funds under the 1/n strategy. Finally, the table describes the difference (in €) between the amount a respondent actually invested in sustainable funds and the amount they would invest under a naïve diversification strategy. Thus, the active choice of sustainable funds is associated with higher values of this difference.

Table 4: Estimated effects of financial controls on investments in sustainable equity funds

Explanatory variables	Dependent variables	
	Amount invested in sustainable funds	Difference between amount invested in sustainable funds and amount invested in sustainable funds under the 1/n strategy
Difference in means for returns in the last year	0.438 (0.135)	1.872 (0.721)
Difference in means for average returns in the last three years	5.077 (0.633)	10.209 (1.471)
Difference in means for average returns in the last five years	11.157 (1.234)	0.509 (0.067)
Difference in means for annual management fees	-7.825 (-0.233)	12.360 (0.428)
Difference in means for front-up fees	-7.750 (-0.349)	-27.130 (-1.423)
Constant	278.488*** (18.835)	48.399*** (3.964)
Number of observations	749	749
Adjusted R-squared	0.034	0.040

Note: This table reports OLS estimates of parameters in linear regression models, dependent variables ‘amount invested in sustainable funds’ and ‘difference between amount invested in sustainable funds and amount invested in sustainable funds under the 1/n strategy’. The z-statistics (in parentheses) are heteroskedasticity-robust. * (**, ***) means that the corresponding parameter is different from zero at the 10% (5%, 1%) significance level.

Table 5: Estimated effects of single financial controls on investments in sustainable funds

Explanatory variables	Amount invested in sustainable funds				
	(1)	(2)	(3)	(4)	(5)
Difference in means for returns in the last year	5.319** (2.155)	--	--	--	--
Difference in means for average returns in the last three years	--	15.334*** (5.267)	--	--	--
Difference in means for average returns in the last five years	--	--	18.167*** (5.528)	--	--
Difference in means for annual management fees	--	--	--	-42.080*** (-3.803)	--
Difference in means for front-up fees	--	--	--	--	-35.376*** (-4.216)
Constant	286.536*** (47.811)	263.767*** (34.741)	289.735*** (49.209)	265.285*** (32.320)	293.936*** (47.657)
Number of observations	749	749	749	749	749
Adjusted R-squared	0.005	0.030	0.034	0.018	0.022

Note: This table reports OLS estimates of parameters in five linear regression models, dependent variable ‘amount invested in sustainable funds’. The z-statistics (in parentheses) are heteroskedasticity-robust. * (**, ***) means that the corresponding parameter is different from zero at the 10% (5%, 1%) significance level.

Table 6: Descriptive statistics of individual characteristics

Explanatory Variable	Number of observations	Mean	Standard deviation	Min	Max
Perceived higher returns sustainable funds	749	0.20	0.40	0	1
Perceived higher risk sustainable funds	749	0.21	0.41	0	1
Financial literacy	749	2.46	0.76	0	3
Talk about investments	749	0.29	0.46	0	1
Expectations social environment	749	0.39	0.49	0	1
Volunteering	749	0.35	0.48	0	1
Conservative political identification	749	0.29	0.45	0	1
Liberal political identification	749	0.35	0.48	0	1
Social political identification	749	0.63	0.48	0	1
Ecological political identification	749	0.56	0.50	0	1
NEP	749	4.56	1.55	0	6
Risk taking	749	0.32	0.47	0	1
Trust	749	0.82	0.96	0	3
Age	749	49.61	17.44	18	84
Female	749	0.39	0.49	0	1
High education	749	0.64	0.48	0	1
Married or living together	749	0.64	0.48	0	1
Household net income above median class	685	0.48	0.50	0	1
Western Germany	749	0.82	0.38	0	1

Note: This table reports selected descriptive statistics for the individual characteristics considered as explanatory variables in the main econometric analysis. The number of observations for ‘household net income above median class’ only amounts to 685, since we included the option “don’t know” for this question.

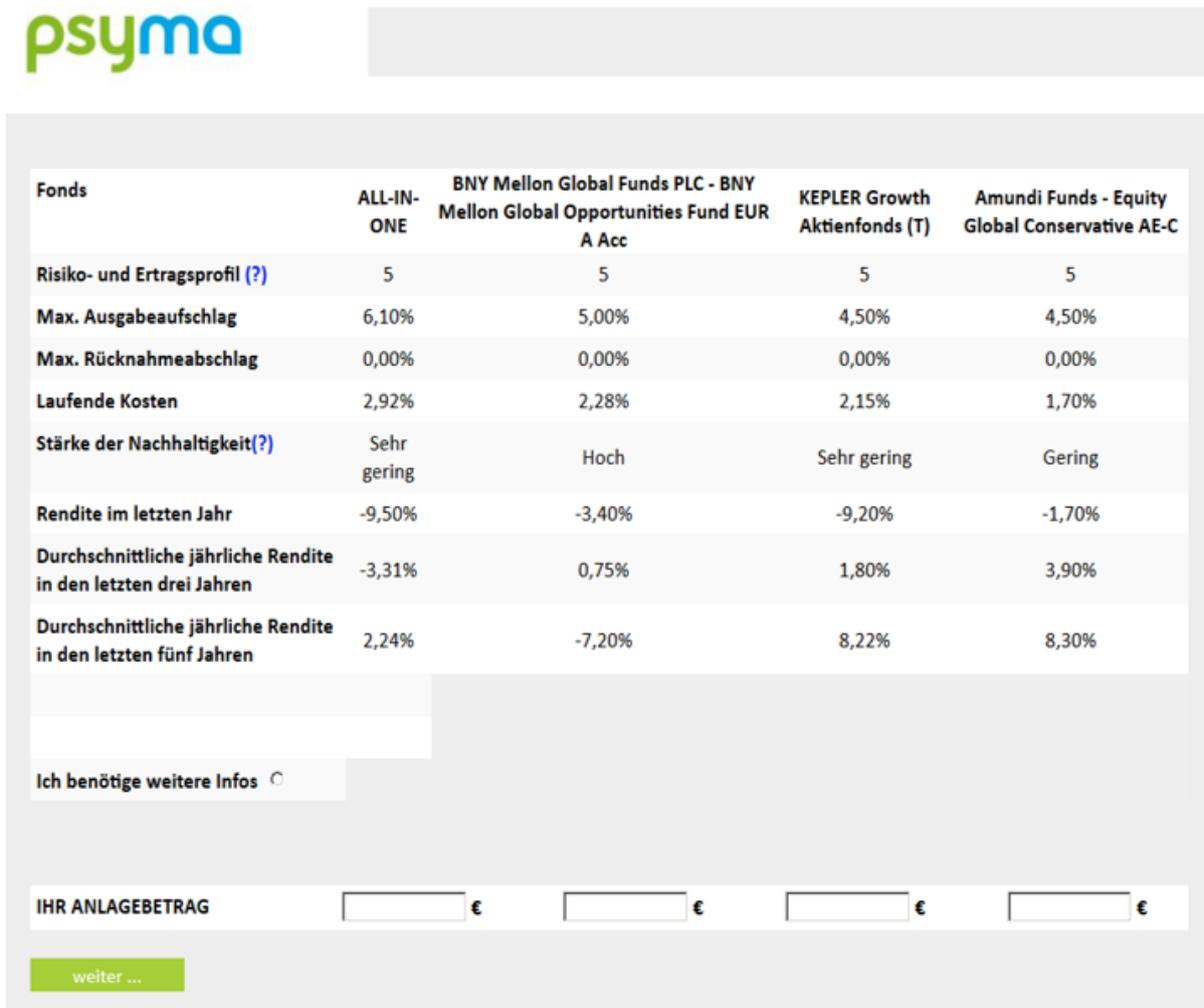
Table 7: Estimated effects of individual characteristics on investments in sustainable funds

Explanatory variables	Amount invested in sustainable funds	
	Estimates	z-statistics
Number of sustainable funds in the choice set	115.156***	16.490
Difference in means for returns in the last year	2.617	1.005
Difference in means for average returns in the last three years	12.216*	1.741
Difference in means for average returns in the last five years	0.277	0.036
Difference in means for annual management fees	23.098	0.807
Difference in means for front-up fees	-27.583	-1.481
Perceived higher returns sustainable funds	1.440	0.110
Perceived higher risk sustainable funds	12.328	1.003
Financial literacy	16.611**	2.401
Talk about investments	-22.992*	-1.929
Expectations social environment	21.611**	1.993
Volunteering	-36.402***	-3.211
Conservative political identification	-11.602	-1.020
Liberal political identification	-10.743	-0.953
Social political identification	5.915	0.466
Ecological political identification	26.424**	2.179
NEP	10.743***	2.810
Trust	10.609*	1.830
Risk Taking	-11.811	-1.036
Age	-1.281***	-3.922
Female	24.613**	2.189
High education	4.026	0.356
Married or living together	0.883	0.074
Household net income above median class	19.911*	1.727
Western Germany	8.932	0.664
Constant	4.403	0.122
Number of observations	685	
Adjusted R-squared	0.347	

Note: This table reports OLS estimates of parameters in linear regression models, dependent variables ‘Amount invested in sustainable funds’. The z-statistics (in parentheses) are heteroscedasticity-robust. * (**, ***) means that the corresponding parameter is different from zero at the 10% (5%, 1%) significance level.

Figures

Figure 1: Screenshot of an exemplary choice set (in German)



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Fonds	ALL-IN-ONE	BNY Mellon Global Funds PLC - BNY Mellon Global Opportunities Fund EUR A Acc	KEPLER Growth Aktienfonds (T)	Amundi Funds - Equity Global Conservative AE-C
Risiko- und Ertragsprofil (?)	5	5	5	5
Max. Ausgabeaufschlag	6,10%	5,00%	4,50%	4,50%
Max. Rücknahmeabschlag	0,00%	0,00%	0,00%	0,00%
Laufende Kosten	2,92%	2,28%	2,15%	1,70%
Stärke der Nachhaltigkeit(?)	Sehr gering	Hoch	Sehr gering	Gering
Rendite im letzten Jahr	-9,50%	-3,40%	-9,20%	-1,70%
Durchschnittliche jährliche Rendite in den letzten drei Jahren	-3,31%	0,75%	1,80%	3,90%
Durchschnittliche jährliche Rendite in den letzten fünf Jahren	2,24%	-7,20%	8,22%	8,30%

Ich benötige weitere Infos 

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[weiter ...](#)

Note: This figure shows a screenshot of an exemplary choice set used in the investment experiment (in German language). The respondents had the task to allocate 500€ among four globally oriented real equity funds. They could invest the entire 500€ into one fund or distribute the amount evenly or unevenly between the different funds. If they chose to invest in a fund, they must invest at least 50€. We used the following eight attributes to describe the four alternatives: the risk and return profile, maximum front-up fee, maximum redemption fee, running costs (i.e. annual management costs), strength of sustainability (based on the Morningstar Sustainability Rating), return in the last year, average returns in the last three years, and average returns in the last five years. The participants could choose to receive further information on the funds by clicking on a dialogue button that opened links to a number of documents such as the key investor information document or the sales prospectus.

Appendix A: Description of the experiment (translated into English)

[First part of the text:]

Please read through the following text in peace, after 30 seconds you can click on proceed.

We would now like to return once again to the subject of financial investments. In the following you have the opportunity to participate in an experiment. You may make an investment decision with a freely available amount of 500€. After the survey, 20 people will be randomly selected among all participants. For these 20 persons, the corresponding investment decision is going to be realized by us after completing the survey in October 2019.

The investment is conducted for exactly one year. After that, i.e. in October 2020, the equity fund units are returned and the selected persons receive the current value of their portfolio.

Examples:

If you are one of the 20 selected persons, your investment decision will be realized in October 2019.

If the value of your portfolio rises to 550€ by October 2020, you will be paid 550€.

However, if the value of your portfolio decreases to 450€ by October 2020, you will receive 450€.

At the end of the selection process, everyone is going to be informed whether they have been selected or not. We guarantee that all this information is true and correct. Please also note that you are completely free in this decision. Since the selection of the twenty winners is random, you should make your decision below as if you were sure to be drawn.

[Second part of the text:]

Please read through the following text in peace, after 30 seconds you can click on proceed.

In the following, four equity funds (i.e. funds with more than 50% of the fund assets in equities) are available now. All four funds are globally oriented equity funds, reinvest the returns in the fund, and are traded in euros. Information on the similarities of or differences between the funds, for instance, with regard to past performance, risk, or cost structures, can be found in the following tables and additional materials.

Please allocate 500€ among these four funds to create your own portfolio. You can invest the entire 500€ into one fund, or distribute the amount evenly or unevenly between the different

funds. To do this, please enter the desired investment amounts in euros in the corresponding columns. If you wish to invest in a fund, you must invest at least 50€.

By clicking on 'Next' you receive more information on the characteristics of the equity funds available. After reviewing the fund profiles, please distribute the 500€ between the four equity funds.

Appendix B: Survey questions for variables in the econometric analysis (translated into English)

Question / item for variable 'age' and for guaranteeing the representativeness of our sample:
Please indicate your age in years.

_____ years

Question for variable 'female' and for guaranteeing the representativeness of our sample:
Are you ... ?

- Male
 - Female
 - Divers
-

Question for variable 'Western Germany' and for guaranteeing the representativeness of our sample:

Please indicate the federal state in which you have your primary residence.

- Baden-Wurttemberg
 - Bavaria
 - Berlin
 - Brandenburg
 - Bremen
 - Hamburg
 - Hesse
 - Mecklenburg-Western Pomerania
 - Lower Saxony
 - North Rhine-Westphalia
 - Rhineland-Palatinate
 - Saarland
 - Saxony
 - Saxony-Anhalt
 - Schleswig-Holstein
 - Thuringia
-

Screening question to identify financial decision makers in German households:

Please indicate which of the following statements applies to you personally when it comes to financial matters, e.g. investments.

- I decide in my household alone.
 - I decide together with my partner.
 - I do not decide but someone else.
-

The following three questions are screening questions to identify financial decision makers in German households who have made some experience with financial products already:

Please indicate in which of the following investment forms you have currently invested your money.

Please select all applicable answers.

- Savings book
- Call money account
- Stocks
- Equity funds (including ETFs or index funds)
- Bonds
- Bond funds
- Cooperative shares
- Other fixed-interest forms of investment (e.g. mortgage bonds, treasury bonds, savings agreement, time deposit, subordinated loan)
- Other non-fixed-income forms of investment (e.g. warrants, certificates, open-ended real estate funds, closed-end funds, mixed funds)
- In none of the listed forms of investment

Please indicate in which of the following investment forms you have invested your money in the past.

Please select all applicable answers.

- Stocks
- Equity funds (including ETFs or index funds)
- Bonds
- Bond funds
- Other non-fixed-income forms of investment (e.g. warrants, certificates, open-ended real estate funds, closed-end funds, mixed funds)
- In none of the listed forms of investment

Please indicate which of the following plant types you have already been informed about in detail.

Please select all applicable answers.

- Stocks
- Equity funds (including ETFs or index funds)
- Bonds
- Bond funds
- Other non-fixed-income forms of investment (e.g. warrants, certificates, open-ended real estate funds, closed-end funds, mixed funds)
- In none of the listed forms of investment

Question for variables 'talk about investments' and 'good knowledge':

Please indicate to what extent you agree with the following statements:

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
I often talk to others about investments.	<input type="checkbox"/>				
I have a good knowledge of financial investments.	<input type="checkbox"/>				

In the following we ask you some questions about your personality and individual attitudes.

The first question is about your attitudes towards sustainable development. By this we mean a development that satisfies the needs of the present generation without compromising the ability of future generations to meet their own needs. Usually, ecological, social and economic aspects are taken into account. Personal sustainable behavior thus contributes to sustainable development.

The following three items are relevant to construct the variables 'expectations social environment' and 'warm glow':

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
My social environment (e.g. family, friends, colleagues) expects me to behave sustainably.	<input type="checkbox"/>				
It makes me feel good to act sustainably.	<input type="checkbox"/>				

The following six items are relevant to construct the index variable 'NEP':

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
Humans have the right to modify the natural environment to suit their needs.	<input type="checkbox"/>				
Humans are severely abusing the planet.	<input type="checkbox"/>				
Plants and animals have the same right to exist as humans.	<input type="checkbox"/>				
Nature is strong enough to cope with the impacts of modern industrial nations.	<input type="checkbox"/>				
Humans were meant to rule over the rest of nature.	<input type="checkbox"/>				
The balance of nature is very delicate and easily upset.	<input type="checkbox"/>				

Question for variable 'risk taking':

How willing are you to take risks in general?

Completely unwilling to take risks	Rather unwilling to take risks	Undecided	Rather willing to take risks	Very willing to take risks
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question for variable 'patience':

How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?

Completely unwilling	Rather unwilling	Undecided	Rather willing	Very willing
<input type="checkbox"/>				

Question for variable 'altruism':

How willing are you to give to good causes without expecting anything in return?

Completely unwilling	Rather unwilling	Undecided	Rather willing	Very willing
<input type="checkbox"/>				

The following three items are relevant to construct the variable 'trust':

Now we are interested in your view of other people. Please indicate to what extent you agree with the following statements:

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
In general, one can trust people.	<input type="checkbox"/>				
These days you cannot rely on anybody else.	<input type="checkbox"/>				
When dealing with strangers, it is better to be careful before you trust them.	<input type="checkbox"/>				

The following six items are relevant to construct the variables 'positive reciprocity' and 'negative reciprocity'

In the following we will once again discuss your personal settings for dealing with other people. Please indicate again to what extent you agree with the following statements:

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
If someone does me a favor, I am willing to return it.	<input type="checkbox"/>				
I am particularly trying to help someone who has helped me before.	<input type="checkbox"/>				
I am willing to pay costs to help someone who has helped me before.	<input type="checkbox"/>				
If I am faced with a great injustice, I will avenge myself at the next opportunity.	<input type="checkbox"/>				

If someone puts me in a difficult position, I'll do the same with him.	<input type="checkbox"/>				
If someone insults me, I will also be offensive to him.	<input type="checkbox"/>				

The variables 'openness to experiences', 'conscientiousness', 'extraversion', 'agreeableness', and 'emotional stability' are based on the following question which is based on the Ten Item Personality Inventory according to Gosling et al. (2003):

Please indicate to what extent you agree with the following character traits for yourself.

(For each pair of traits, look at the one that applies most to you, and even if one of the two traits applies more than the other, please make a statement.)

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
Extroverted, enthusiastic	<input type="checkbox"/>				
Critical, quarrelsome	<input type="checkbox"/>				
Dependable, self-disciplined	<input type="checkbox"/>				
Anxious, easily upset	<input type="checkbox"/>				
Open to new experiences, complex	<input type="checkbox"/>				
Reserved, quiet	<input type="checkbox"/>				
Sympathetic, warm	<input type="checkbox"/>				
Disorganized, careless	<input type="checkbox"/>				
Calm, emotionally stable	<input type="checkbox"/>				
Conventional, uncreative	<input type="checkbox"/>				

The following four items are relevant for the variables ‘conservative political identification’, ‘liberal political identification’, ‘social political identification’, and ‘ecological political identification’:

Please indicate to what extent you agree with the following statements on your political views.

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
I identify myself with conservatively oriented policy.	<input type="checkbox"/>				
I identify myself with liberally oriented policy.	<input type="checkbox"/>				
I identify myself with socially oriented policy.	<input type="checkbox"/>				
I identify myself with ecologically oriented policy.	<input type="checkbox"/>				

The following two questions are relevant for the variables ‘perceived higher return sustainable funds’ and ‘perceived higher risk sustainable funds’:

How high do you rate the return of sustainable equity funds compared to conventional equity funds?

Much lower	Rather lower	Neither lower or higher	Rather higher	Much higher
<input type="checkbox"/>				

Please indicate to what extent you agree with the following statements:

	Totally disagree	Rather disagree	Undecided	Rather agree	Totally agree
Sustainable equity funds are riskier than conventional equity funds.	<input type="checkbox"/>				

The following question is the basis for the variable ‘concerned about climate change’:

How concerned, if at all, are you about climate change?

Not concerned at all	Not very concerned	Rather concerned	Very concerned	Extremely concerned
<input type="checkbox"/>				

The variable 'financial literacy' is based on the following statements following Lusardi and Mitchell (2008):

Imagine you have €100 on a savings account and the interest rate is 2% per year. Please give your estimate of how much money you would have on the savings book after five years if you never withdraw money or interest payments during this time.

Less than 102€	Exactly 102€	More than 102€	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Imagine that the interest rate on your savings book is 1% per year and inflation is 2% per year. Please give your estimate of how much you could buy with the money in your savings account after one year.

Less than today	Exactly the same	More than today	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please state your opinion as to whether the following statement is true or false: "The purchase of an individual share usually has a more secure return than an equity fund".

Right	Wrong	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The variable 'married or living together' is derived on the basis of the following question:

Please indicate your marital status.

Single	Living together, but not married	Living together and living together with spouse	Divorced or living separated	Widowed
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The variable 'high education' is derived on the basis of the following question:

Please indicate your highest school or university degree.

- No educational level.
- I'm currently going to school.
- I'm currently studying.
- German "Hauptschulabschluss"

- Secondary school certificate (German “Mittlere Reife”)
 - Graduation from Polytechnic Secondary School (8th/10th grade)
 - Admission to a university of applied sciences (Fachhochschulreife) (degree of a Fachoberschule)
 - High school graduation (German “Abitur”)
 - Advanced technical college certificate
 - Doctorate / habilitation
 - Other educational level: _____
-

The variable ‘Household net income above median class’ derived on the basis of the following question:

Please indicate the monthly net household income of all persons currently living permanently in your household:

(The household income is the sum of the incomes of all persons living together in a household and can be composed of different sources of income. Please refer to the current monthly net amount, i.e. after deduction of taxes and social security contributions, and add regular payments such as pensions, unemployment benefit, housing benefit, child benefit, BAföG, alimony payments, etc. If you are not sure, please estimate the monthly amount.)

- Less than 500€
 - 500€ to less than 1000€
 - 1000€ to less than 1500€
 - 1500€ to less than 2000€
 - 2000€ to less than 2500€
 - 2500€ to less than 3000€
 - 3000€ to less than 3500€
 - 3500€ to less than 4000€
 - 4000€ to less than 4500€
 - 4500€ to less than 5000€
 - 5000€ or more
 - Don’t know
-

The following question is relevant for the variable 'volunteering':

Do you engage in volunteer work?

Yes

No

Appendix C: Additional tables

Table C.1: Descriptive statistics for additional explanatory variables

Explanatory Variable	Number of observations	Mean	Standard deviation	Min	Max
Good knowledge	749	0.39	0.49	0	1
Warm glow	749	0.77	0.42	0	1
Concerned about climate change	744	0.88	0.33	0	1
Patience	749	0.67	0.47	0	1
Altruism	749	0.65	0.48	0	1
Positive reciprocity	749	2.62	0.74	0	3
Negative reciprocity	749	0.53	0.91	0	3
Openness to experiences	749	3.77	0.69	1.5	5
Conscientiousness	749	4.28	0.64	1.5	5
Extraversion	749	2.77	0.88	1	5
Agreeableness	749	3.83	0.72	1	5
Emotional stability	749	3.76	0.79	1	5

Note: This table reports selected descriptive statistics for the individual characteristics considered as explanatory variables in the robustness checks and further analyses. The number of observations for ‘concerned about climate change’ only amounts to 744, since we included the option “don’t know” for this question.

Table C.2: Overview of correlation coefficients between financial control variables

#	Explanatory variable	Difference in means for returns in the last year	Difference in means for average returns in the last three years	Difference in means for average returns in the last five years	Difference in means for annual management fees	Difference in means for front-up fees
1	Difference in means for returns in the last year	1.00	--	--	--	--
2	Difference in means for average returns in the last three years	0.19***	1.00	--	--	--
3	Difference in means for average returns in the last five years	0.54***	0.69***	1.00	--	--
4	Difference in means for annual management fees	0.00	-0.73***	-0.37***	1.00	--
5	Difference in means for front-up fees	-0.09**	-0.58***	-0.56***	0.81***	1.00

Note: This table reports the Pearson correlation coefficients between the financial control variables considered in the main analysis. * (**, ***) means that the corresponding correlation coefficient is different from zero at the 10% (5%, 1%) significance level.

Table C.3: Overview of correlation coefficients between main explanatory variables

#	Explanatory variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Perceived higher returns sustainable funds	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	Perceived higher risk sustainable funds	0.07 ^b	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3	Financial literacy	-0.07 ^a	-0.02	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4	Talk about investments	0.15 ^c	0.04	-0.01	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5	Expectations social environment	0.06 ^a	0.05	0.00	0.14 ^c	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	Volunteering	0.03	0.09 ^b	0.05	0.01	0.17 ^c	1.00	--	--	--	--	--	--	--	--	--	--	--	--	--
7	Conservative political identification	-0.03	0.09 ^b	0.08 ^b	-0.00	0.00	0.02	1.00	--	--	--	--	--	--	--	--	--	--	--	--
8	Liberal political identification	0.06 ^a	0.04	0.12 ^c	0.07 ^b	0.08 ^b	-0.02	0.20 ^c	1.00	--	--	--	--	--	--	--	--	--	--	--
9	Social political identification	0.00	0.03	0.11 ^c	-0.00	0.21 ^c	0.11 ^c	-0.11 ^c	0.08 ^b	1.00	--	--	--	--	--	--	--	--	--	--
10	Ecological political identification	0.06 ^a	0.06	0.05	0.02	0.22 ^c	0.12 ^c	-0.11 ^c	0.15 ^c	0.46 ^c	1.00	--	--	--	--	--	--	--	--	--
11	NEP	0.04	-0.01	0.00	-0.06	0.02	0.06	-0.22 ^c	-0.09 ^b	0.23 ^c	0.25 ^c	1.00	--	--	--	--	--	--	--	--
12	Risk taking	0.13 ^c	0.13 ^c	0.01	0.24 ^c	0.07 ^a	-0.06 ^a	0.03	0.05	0.01	0.04	-0.07 ^b	1.00	--	--	--	--	--	--	--
13	Trust	0.02	-0.03	0.12 ^c	0.03	0.16 ^c	0.17 ^c	-0.04	0.04	0.21 ^c	0.21 ^c	0.05	0.00	1.00	--	--	--	--	--	--
14	Age	-0.05	-0.04	0.16 ^c	-0.17 ^c	0.04	0.02	0.07 ^b	0.10 ^c	0.15 ^c	0.04	0.10 ^c	-0.12 ^c	0.12 ^c	1.00	--	--	--	--	--
15	Female	0.01	-0.01	-0.23 ^c	0.01	0.01	0.04	-0.17 ^c	-0.04	0.01	0.05	0.18 ^c	-0.10 ^c	-0.02	-0.20 ^c	1.00	--	--	--	--
16	High education	-0.01	0.01	0.08 ^b	0.09 ^b	0.02	0.04	-0.01	0.06 ^a	0.03	0.11 ^c	-0.07 ^b	0.03	0.05	-0.19 ^c	-0.04	1.00	--	--	--
17	Married or living together	0.05	0.01	-0.02	0.05	0.03	0.01	0.06	0.05	-0.02	-0.04	0.02	0.02	0.00	0.18 ^c	-0.08 ^b	-0.04	1.00	--	--
18	Household net income above median class	0.02	-0.10 ^c	0.10 ^b	0.11 ^c	0.04	0.06 ^a	0.02	0.07 ^a	-0.04	0.00	-0.07 ^a	0.07 ^a	0.09 ^b	0.00	-0.10 ^c	0.16 ^c	0.37 ^c	1.00	--
19	Western Germany	-0.02	0.00	0.06	-0.03	0.01	0.04	0.04	0.06	-0.00	0.12 ^c	0.11 ^c	-0.03	0.10 ^c	0.03	0.01	-0.03	-0.06	0.05	1.00

Note: This table reports the Pearson correlation coefficients between the explanatory variables considered in the main analysis. a (b, c) means that the corresponding correlation coefficient is different from zero at the 10% (5%, 1%) significance level.

Table C.4: Overview of correlation coefficients between main explanatory variables and additional explanatory variables in the robustness checks

#	Explanatory variable	Good knowledge	Warm glow	Concerned about climate change	Patience	Altruism	Positive reciprocity	Negative reciprocity	Openness to experiences	Conscientiousness	Extraversion	Agreeableness	Emotional stability
1	Perceived higher returns sustainable funds	0.10***	0.11***	0.07*	0.11***	0.16***	0.01	0.02	0.08**	0.04	0.10***	0.04	0.08**
2	Perceived higher risk sustainable funds	0.03	0.02	-0.01	0.05	0.04	-0.02	0.05	0.00	-0.02	0.04	0.02	-0.03
3	Financial literacy	0.13***	-0.06	-0.05	0.01	-0.09**	0.06	-0.11***	-0.07*	0.03	-0.07*	-0.08**	0.11***
4	Talk about investments	0.36***	0.10***	0.03	0.15***	0.01	0.01	0.13***	0.11***	-0.03	0.15***	-0.04	0.01
5	Expectations social environment	0.10***	0.27***	0.13***	0.17***	0.14***	0.12***	0.04	0.15***	0.04	0.09**	0.12***	0.07*
6	Volunteering	-0.04	0.07*	0.05	0.07**	0.20***	0.08**	-0.09**	0.13***	0.07*	0.06*	0.10***	0.04
7	Conservative political identification	0.06*	-0.12***	-0.24***	-0.05	-0.13***	-0.04	0.15***	-0.15***	-0.00	-0.05	-0.11***	0.00
8	Liberal political identification	0.17***	0.01	-0.10***	-0.02	0.03	0.03	0.04	-0.03	0.09**	0.00	0.05	0.12***
9	Social political identification	0.01	0.24***	0.21***	0.15***	0.22***	0.18***	-0.11***	0.13***	0.02	0.01	0.14***	0.02
10	Ecological political identification	0.02	0.36***	0.26***	0.23***	0.23***	0.18***	-0.07**	0.15***	0.09**	-0.02	0.16***	0.06
11	NEP	-0.09**	0.33***	0.31***	0.20***	0.18***	0.28***	-0.08**	0.18***	0.21***	-0.06	0.18***	0.03
12	Risk taking	0.24***	0.05	-0.03	0.21***	0.06*	0.08**	0.07**	0.15***	0.00	0.17***	-0.05	0.08**
13	Trust	0.06*	0.16***	0.09**	0.11***	0.24***	0.15***	-0.20***	0.19***	0.07*	0.10***	0.22***	0.20***
14	Age	0.04	-0.07*	-0.09**	-0.06*	0.07*	0.10***	-0.09**	0.02	0.16***	-0.08**	0.11***	0.23***
15	Female	-0.17***	0.19***	0.09**	0.04	0.15***	0.03	-0.02	0.14***	0.11***	0.09**	0.17***	-0.19***
16	High education	0.10***	-0.01	0.0019	0.02	-0.06*	0.01	-0.05	0.11***	-0.07*	-0.00	-0.08**	-0.00
17	Married or living together	0.12***	-0.01	-0.06*	-0.05	0.03	0.01	0.03	0.00	0.09**	0.07**	0.01	0.07*
18	Household net income above median class	0.12***	-0.02	-0.03	-0.00	0.02	-0.03	-0.01	0.05	0.00	0.09**	-0.02	0.07*
19	Western Germany	0.06	0.08**	0.07**	0.02	0.05	0.00	0.00	-0.01	0.00	-0.05	0.04	0.03

Note: This table reports the Pearson correlation coefficients between main explanatory variables and additional explanatory variables in the robustness checks. * (**, ***) means that the corresponding correlation coefficient is different from zero at the 10% (5%, 1%) significance level.

Table C.5: Overview of correlation coefficients between additional explanatory variables in the robustness checks

#	Explanatory variable	Good knowledge	Warm glow	Concerned about climate change	Patience	Altruism	Positive reciprocity	Negative reciprocity	Openness to experiences	Conscientiousness	Extraversion	Agreeableness	Emotional stability
1	Good knowledge	1.00	--	--	--	--	--	--	--	--	--	--	--
2	Warm glow	0.04	1.00	--	--	--	--	--	--	--	--	--	--
3	Concerned about climate change	-0.03	0.30***	1.00	--	--	--	--	--	--	--	--	--
4	Patience	0.11***	0.26***	0.12***	1.00	--	--	--	--	--	--	--	--
5	Altruism	-0.04	0.26***	0.17***	0.25***	1.00	--	--	--	--	--	--	--
6	Positive reciprocity	0.07*	0.28***	0.07*	0.25***	0.19***	1.00	--	--	--	--	--	--
7	Negative reciprocity	0.12***	0.00	-0.06*	-0.01	-0.09**	0.04	1.00	--	--	--	--	--
8	Openness to experiences	0.11***	0.19***	0.08**	0.20***	0.22***	0.20***	-0.09**	1.00	--	--	--	--
9	Conscientiousness	0.05	0.10***	0.05	0.17***	0.14***	0.23***	-0.15***	0.25***	1.00	--	--	--
10	Extraversion	0.09**	0.09**	0.03	0.05	0.12***	-0.02	-0.02	0.31***	-0.01	1.00	--	--
11	Agreeableness	0.00	0.20***	0.12***	0.10***	0.26***	0.18***	-0.21***	0.21***	0.38***	0.03	1.00	--
12	Emotional stability	0.14***	0.02	-0.05	0.10***	0.07*	0.10***	-0.10***	0.19***	0.33***	-0.01	0.26***	1.00

Note: This table reports the Pearson correlation coefficients between additional explanatory variables in the robustness checks. * (**, ***) means that the corresponding correlation coefficient is different from zero at the 10% (5%, 1%) significance level.