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Abstract

This paper examines the willingness of private financial decision makers to pay for socially responsible investments (SRI). Our empirical analysis is based on unique data from a representative computer-based survey in Germany that especially comprised two stated choice experiments. The experiments referred to choices among several equity funds and among several three-year fixed-interest investment products and especially comprised sustainability criteria and financial performance indicators as main attributes. Our econometric analysis with mixed logit models reveals strong stated preferences and thus a considerable willingness to pay for sustainable investments. For example, the estimated mean willingness to sacrifice yearly nominal interest rates for sustainable fixed-interest investment products amounts to 0.21 percentage points among a variation between 1.30% and 2.10%. These results are very stable across several robustness checks that also include different techniques to mitigate possible hypothetical biases. Our latent class logit model analysis confirms a high extent of unobserved heterogeneity between different investor groups and especially reveals that specific social values and norms play an important role. Investor groups with strong considerations of norms by the social environment with respect to SRI and especially with high feelings of warm glow from SRI, a strong environmental awareness, and an affinity to left-wing parties have a substantially higher estimated mean willingness to pay for sustainable investments.

Keywords: Socially responsible investments; stated choice experiments; mixed logit models; latent class logit models; willingness to pay; social values and norms

JEL: G11, Q56, M14, G02, A13, C25

1. Introduction

Sustainable or socially responsible investments (SRI) play an increasing role on financial markets, especially in the USA (e.g. US SIF, 2014) and Europe (e.g. Eurosif, 2014). This type of investments takes into account environmental, social, and/or ethical concerns (e.g. Derwall et al., 2011, Døskeland and Pederson, 2016). The principle of sustainable investments can be based on negative screens, whereby certain investments are avoided such as in the case of so-called sin stocks (especially alcohol, tobacco, weapons, gambling) (e.g. Barreda-Tarrazona et al., 2011), on positive screens, whereby only specific firms are included in the investment universe (e.g. firms from the environmental industry), and/or on best-in-class screens, whereby sustainability leaders from each sector are identified such as in the case of the Dow Jones Sustainability Indexes (e.g. Oberndorfer et al., 2013). According to traditional finance theory, SRI would only be considered if they are at least as attractive as other investments in terms of risk and returns (e.g. Bauer and Smeets, 2015). In fact, some studies (e.g. Derwall et al., 2005, Kempf and Osthoff, 2007, Edmans, 2011, Eccles et al., 2014) show that sustainable investments are financially worthwhile.

However, other analyses find either that there is a financial price to be paid for SRI (e.g. Belghitar et al., 2014) or higher abnormal returns for sin stocks (e.g. Hong and Kacperczyk, 2009, Derwall et al., 2011). Therefore, a series of studies examines whether also non-financial motives are relevant for sustainable investments and thus whether investors are (on average) willing to pay for SRI (i.e. sacrifice returns). For example, Renneboog et al. (2011) show that money flows of SRI funds are less related to past returns than conventional fund flows. Two further studies of money flows for SRI funds (Bollen, 2007, Benson and Humphrey, 2008) also suggest that SRI investors are less concerned about returns than conventional investors so that non-financial motives obviously matter. Another argument for the relevance of non-financial motives is based on the so-called shunned-stock hypothesis in the context of sustainable investments, which suggests that unsustainable stocks such as sin stocks have higher expected returns since a group of investors (which must not be too small, e.g. Heinkel et al., 2001) shun these stocks due to personal values and/or social norms (e.g. Borgers et al., 2015). Therefore, the significantly positive abnormal returns in, for example, Fabozzi et al. (2008), Hong and Kacperczyk (2009), or Derwall et al. (2011) support the validity of the shunned-stock hypothesis and thus the relevance of non-financial motives for SRI.

However, these studies are no direct analyses of the motives for SRI at the individual level. Against this background, another strand of the literature examines econometrically the rele-

vance of financial versus non-financial motives of investors for SRI. Most of these studies (e.g. Nilsson, 2008, Bauer and Smeets, 2015, Wins and Zwergel, 2016, Gutsche et al., 2016, Riedl and Smeets, 2016) consider perceived risk and returns of SRI besides several indicators for social values and norms. While Nilsson (2008), Bauer and Smeets (2015), and Wins and Zwergel (2016) use unrepresentative survey data from Swedish, Dutch, and German investors, the study of Gutsche et al. (2016) is based on data from a representative survey among financial decision makers in Germany. Furthermore, the study of Riedl and Smeets (2016) is based on unrepresentative administrative investor data from a mutual fund provider in the Netherlands, which are combined with additional survey and experimental data for these investors. The five empirical studies report insignificant effects of perceived risk and inconsistent and rather weak effects of perceived returns on SRI, but a strong relevance of social values and norms.

While these studies also support the high relevance of non-financial motives for SRI, none of them directly consider the WTP for sustainable investments. In fact, the estimation of WTP on the basis of perceived or expected returns would be extremely vague and thus unreliable. But even the use of real returns of funds is highly problematic. While the corresponding studies on money flows suggest that investors consider past returns for their investment decision, it is not clear whether these returns persist in the future (e.g. Benson and Humphrey, 2008). Therefore, the WTP for SRI which indicates the amount of return investors are willing to sacrifice for the sustainable component can, strictly speaking, not be estimated for funds or other investments without fixed returns since the amount of money that is possibly sacrificed is ambiguous. Instead, the estimation of this WTP is obviously only reliable on the basis of data for investments with fixed returns. To the best of our knowledge, however, the WTP has not been estimated on the basis of corresponding real market data so far. In fact, this is not very surprising since such empirical analyses require specific data and especially panel data in order to receive reliable estimation results.

Against this background, several studies are based on stated preferences (SP) data, which refer to choices for hypothetical situations (e.g. Hensher et al., 2010). SP data are useful for the analysis of preferences for new products, new attributes of products, or products with a low market penetration. These analyses can be very simple in the context of sustainable investments. For example, Dorfleitner and Utz (2014) and Borgers and Pownall (2014) directly asked their German and Dutch participants how much return they would sacrifice for a sustainable investment. Furthermore, Lewis and Mackenzie (2000) presented different scenarios

comprising one sustainable and one conventional investment product with different returns to ethical investors in the UK and asked them for their preference. In order to make hypothetical scenarios more realistic, Webley et al. (2001) use data from an experimental survey of, however, only 56 British investors, where the participants had to make decisions about their real investment portfolio in several scenarios that vary in the future financial performance of sustainable and conventional investments. Pasewark and Riley (2010) asked students to make a hypothetical investment of 10000 US dollars either in a sustainable bond (i.e. a non-tobacco firm) or in an unsustainable bond (i.e. a tobacco firm) which differ in the fixed interest rates.

Two recent SP experiments, which tried to further increase the closeness to reality, can be found in Barreda-Tarrazona et al. (2011) and Berry and Yeung (2013). Barreda-Tarrazona et al. (2011) use data from a laboratory experiment with Spanish students, which especially includes monetary incentives, i.e. the participants had to invest real money in real existing mutual funds. However, the used amount of individual investments is rather small (i.e. 16 Euro). Furthermore, as discussed above, major shortcomings of their approach are the artificial and thus also hypothetical scenarios for risk and return of the funds and the only consideration of past returns so that the future returns and thus the future payments are uncertain for the participants. Recently, Berry and Yeung (2013) analyze data from an SP experiment with a small sample of British ethical investors, where the participants had to choose one of five selected percentages between 0% and 15% from a hypothetical portfolio of 100000 British pounds for ten investment opportunities with different levels of financial performance and sustainability. However, a main concern of this study and other previous studies refers to the conjoint analysis approach, which includes some rankings or ratings of the investment opportunities.

Hensher et al. (2010) extensively discuss several problems with this approach, which at best only provides information on preferences. However, in many real market situations such as in the case of investments, decision makers have to make specific choices, for example, between sustainable and unsustainable investments. Therefore, Hensher et al. (2010) or also Louviere et al. (2010) highly recommend the use of stated choice (SC) experiments, which refer to decision contexts where choices are made on the basis of hypothetical situations that are described by different levels of the same attributes that can be observed in actual markets or not. While, to the best of our knowledge, no previous study has used this approach for the analysis of WTP for SRI, it is widespread in other economic sub-disciplines such as in transport economics to examine, for example, the WTP for improvements in the driving environment in the choice among road types for specific trips (e.g. Hensher and Sullivan, 2003) or the WTP for

fuel availability in the choice among vehicles (e.g. Achtnicht et al., 2012), in energy economics to examine, for example, the WTP for service attributes (e.g. Goett et al., 2000) or the WTP for renewable and nuclear energy (e.g. Murakami et al., 2015) in the choice among energy suppliers or tariffs, or in environmental economics to examine, for example, the WTP for reducing the risks of microbial and cancer illnesses and deaths in the choice among public drinking water programs (e.g. Adamowicz et al., 2011).

This paper analyzes two SC experiments with a (online) representative sample of financial decision makers in Germany. One experiment referred to the choice among equity funds and especially comprised sustainability criteria and past returns as main attributes. However, due to the problems of estimating WTP on the basis of past returns as discussed above, this paper focuses on a second experiment that referred to the choice among three-year fixed-interest investment products and comprised yearly interest rates between 1.30% and 2.10% besides sustainability criteria as main attributes. Our econometric analysis with mixed logit models (MLM) implies strong stated preferences for sustainable equity funds and sustainable fixed-interest investment products. The corresponding estimated mean willingness to sacrifice yearly interest rates for sustainable fixed-interest investment products is considerable and amounts to 0.21 percentage points. While it might be argued that this value is overestimated due to the hypothetical character of the SC experiment, it should be noted that we have included techniques to mitigate possible hypothetical biases and that our estimation results remain very stable in several robustness checks.

Our study contributes to the literature in several lines. It especially contributes to the literature on financial and non-financial motives for SRI. As discussed above, compared with previous studies, the application of SC experiments for fixed-interest investment products allows us to directly and more reliably estimate the WTP for sustainable investments. Furthermore, in contrast to most previous empirical studies, the representativeness of our sample allows a drastically higher generalizability and thus external validity of our estimation results. However, our SC experiments do not only consider general sustainability criteria and past returns or fixed interest rates, but also examine the relevance of sustainability certifications and additionally transparency logos for investment products (e.g. Gutsche and Zwergel, 2016). Therefore, our empirical analysis is able to provide an even broader picture on the preferences for several variants of SRI on the financial markets. Our MLM analysis reveals that the estimated mean willingness to sacrifice interest rates for fixed-interest investment products with a transparency logo is slightly higher than for fixed-interest investment products that consider sustainabil-

ity criteria. Furthermore, the estimated mean willingness to sacrifice interest rates for certified sustainable fixed-interest investment products is more than twice as high as the estimated mean willingness to sacrifice interest rates for uncertified sustainable fixed-interest investment products.

Another main contribution of our study refers to the literature on social values and norms in the individual investment behavior. The combination of our SC data with variables for social values and norms allows us to estimate the WTP for SRI for different investor groups and thus to complement and even expand previous studies which econometrically examine the effects of social values and norms on sustainable investments (e.g. Nilsson, 2008, Bauer and Smeets, 2015, Wins and Zwergel, 2016, Gutsche et al., 2016, Riedl and Smeets, 2016). Our econometric analysis is mainly based on the application of latent class logit models (LCLM) (e.g. Greene and Hensher, 2003). In such discrete choice models, the investors are probabilistically assigned to different classes, whereby the membership to a class depends on several social values and norms besides other individual characteristics. As a consequence, the WTP for sustainable investments can be estimated for different investor classes. Our estimation results confirm a high extent of unobserved heterogeneity between different investor groups and imply a mean willingness to sacrifice interest rates for sustainable fixed-interest investment products that is nearly ten times as high for investor groups with specific social values and norms, i.e. for investors with strong considerations of norms by the social environment with respect to SRI and especially with high feelings of warm glow (e.g. Andreoni, 1990) from SRI, a strong environmental awareness, and an affinity to left-wing parties, compared with their counterparts.

The remainder of the paper is structured as follows: Section 2 describes the data from the survey including the two SC experiments. Section 3 discusses the estimation results on the basis of our mixed and latent class logit analyses. Finally, section 4 concludes.

2. Data and variables

2.1. Stated choice experiments

Our empirical analysis is based on data from a computer-based survey that was carried out in cooperation with the German market research institute GfK SE, which drew a sample from its internal representative online panel (in terms of age, gender, and place of origin) during December 2013 and January 2014. The population of the survey are financial decision makers in

Germany, which are defined as persons who are at least 18 years old and mainly or equally responsible for financial decisions in the households. To ensure that the respondents have a minimum of investment experiences, we further required the interviewees to have at least a savings account. Overall, 1173 respondents participated in the survey. Using a quality saving system that was provided by GfK SE, 172 respondents were excluded from the original sample due to qualitatively insufficient response behavior (e.g. in terms of duration of their responses). Therefore, 1001 respondents are the basis of our empirical analysis. The survey comprised several parts. One part referred to general investment decisions, specifically to SRI, to other pro-environmental and pro-social attitudes and behaviors, to several values and norms, as well as to socio-demographic and socio-economic variables. The main part referred to two SC experiments which comprised choices among several investment products.

The first SC experiment referred to fixed-interest investment products. It started with a detailed description of the choice situation. The 1001 participants were asked to choose among four alternative fixed-interest investment products with an investment horizon of three years. The experiment was based on six choice sets. The respondents were informed that some of the displayed investment products are currently not provided by banks, but they were asked to imagine that these products can in fact be purchased. The four investment product alternatives were described by four attributes, respectively:[1]

- Provider
- Yearly nominal interest rate
- Sustainability criteria
- Transparency logo

The upper part of Table 1 summarizes these attributes and the corresponding attribute levels in the SC experiment. It reveals that five different providers are included, namely municipal savings banks, co-operative banks, direct banks, sustainability banks, and big banks. With respect to yearly nominal interest rates as the only financial performance attribute, five levels between 1.30% and 2.10% are considered. On the basis of these two attributes, it is, for example, possible to estimate the mean WTP for sustainability banks. However, our main interest refers to the WTP for sustainability criteria of the investment products. We consider three levels for this attribute, namely “no consideration”, “consideration without sustainability certificate”, and “consideration with sustainability certificate”. In line with our description of the

[1] The respondents were asked to assume that all investment product alternatives are completely identical besides these four attributes (e.g. in terms of investment type or deposit guarantees).

experiment, the consideration of sustainability criteria means that the investment products take ecological, social, and/or ethical criteria into account. In addition, a certificate means that the consideration of sustainability criteria was tested and confirmed by an independent organization. Finally, transparency logos are considered as fourth attribute with three levels, namely "no transparency logo", "transparency logo issued by an NGO", and "transparency logo issued by the state". According to our description of the experiment, a transparency logo means that the investment products publicly provide detailed information about the investment strategy. Table 2 reports an exemplary choice set for this first SC experiment. In addition, Figure 1 presents the corresponding original screenshot (in German) of this choice set.

The second SC experiment referred to the choice among four different equity funds. Since a reliable assessment of several equity funds requires a certain amount of knowledge and experience of this type of investment products, not all respondents were allowed to participate in this experiment. Only participants who indicated that they have already invested in or are sufficiently informed about equity funds or stocks were included. Thus, only 801 respondents took part in this second SC experiment. It started again with a detailed description of the choice situation and was based on eight choice sets. The participants were again informed that some of the displayed funds are currently not provided on the capital market, but they were asked to imagine that these funds can in fact be purchased. The four equity funds alternatives were described by five attributes, respectively:[2]

- Value of the subscription fee
- Net return in the last year
- Average yearly net return in the last five years
- Sustainability criteria
- Transparency logo

The lower part of Table 1 summarizes these attributes and the corresponding attribute levels in the SC experiment. In contrast to the first SC experiment, this experiment thus comprised three attributes of financial performance. While the values of the subscription fee are fixed amounts that vary between 3.00%, 4.00%, and 5.00%, the five values of the net returns in the last year between 4.00% and 8.00% and the five values of the average yearly net return in the last five years between 3.00% and 9.00% are obviously past returns so that it is not clear whether they persist in the future. Therefore, the inclusion of the latter two financial perfor-

[2] Again, the respondents were asked to assume that all equity fund alternatives are completely identical besides these five attributes.

mance variables as basis for the estimation of WTP should be treated with extreme caution, as discussed above. The two remaining non-financial attributes, i.e. sustainability criteria and transparency logo, are completely identical to the first SC experiment and thus comprise the same three levels, respectively. Table 3 reports an exemplary choice set for this second SC experiment.

The exemplary choice sets in Table 2 and Table 3 as well as the screenshot in Figure 1 reveal that both SC experiments are unlabeled as it is common in such empirical studies (e.g. Goett et al., 2000, Adamowicz et al., 2011, Murakami et al., 2015). The consideration of the four attributes in the first SC experiment and the five attributes in the second SC experiment was based on consultations by practitioners on the capital market before the survey so that a high practical relevance of the experiments and thus the empirical results is ensured. Furthermore, the span of the attribute levels for the yearly nominal interest rates in the first experiment and for the three financial performance attributes in the second experiment were based on usual values on the capital market during the time of the survey at the end of 2013. The experimental designs were generated by GfK SE with the Sawtooth Software. In order to keep both the statistical efficiency as well as the precision of estimated interaction terms at an acceptable level, a "Balanced Overlap" design approach was applied (e.g. Chrzan and Orme, 2000). In total 50 different versions of randomized choice sets were created for each SC experiment and assigned to the respondents.

2.2. Variables in the econometric analysis

The dependent variable in our econometric analysis refers to the choice among the four equity funds and among the four three-year fixed-interest investment products. The explanatory variables are based on the four attributes in the first experiment and the five attributes in the second experiment as discussed above. While the financial performance attributes are treated as continuous variables and thus directly included, the other attributes are discrete so that dummy variables for each level are defined. In the case of our main interesting variable, i.e. sustainability criteria, the dummy variable for the level "no consideration of sustainability criteria" is used as base category. While one model specification includes the remaining two dummy variables "consideration of sustainability criteria without certificate" and "consideration of sustainability criteria with certificate", another specification only includes the dummy variable "consideration of sustainability criteria", which summarizes the previous two dummy variables. Similarly, the dummy variable for the level "no transparency logo" is used as base

category. While the one model specification includes the remaining two dummy variables "transparency logo issued by an NGO" and "transparency logo issued by the state", the other specification only includes the dummy variable "transparency logo", which summarizes the previous two dummy variables. With respect to the provider in the first SC experiment, the dummy variable "big bank" is used as base category so that the dummy variables "municipal savings bank", "co-operative bank", "direct bank", and "sustainability bank" are included in the econometric analysis.

While the inclusion of these explanatory variables is sufficient to estimate mean WTP for sustainable investments, we additionally compare the WTP for different investor groups. We especially focus on the relevance of social values and norms such as warm glow (e.g. Andreoni, 1990), which can be described as a good feeling through the act of giving. Such feelings can lead to psychological benefits and thus higher utility levels from SRI. The dummy variable "warm glow" takes the value one if a respondent agreed rather strongly or very strongly to the statement "it makes me feel good to hold sustainable investments" or to the statement "I feel responsible for a sustainable development and want to contribute by sustainable investments".[3] Also in line with the results of Bauer and Smeets (2015), we expect that feelings of warm glow lead to higher WTP for SRI. Preferences and the WTP for sustainable investments can also be affected by social norms or social pressure. In order to avoid social sanctions, individuals often adjust their behavior by complying with the norms of the social environment (e.g. Akerlof and Kranton, 2000, Nyborg and Rege, 2003). Therefore, we expect that such social norms lead to higher WTP for SRI. We consider the dummy variable "expectation social environment" that takes the value one if a respondent agreed rather strongly or very strongly to the statement "my social environment (e.g. family, friends, colleagues) expects me to hold sustainable investments".[4]

In addition to these two variables, we examine indicators for environmental awareness and political identification, respectively. With respect to the former indicator, the dummy variable "membership environmental organization" takes the value one if a respondent is a member of a group or organization engaged in the conservation and protection of the environment and nature. Since ecological financial investments as a main component of SRI are one dimension of pro-environmental behavior, we expect that environmental values such as the membership

[3] In the survey the participants were asked how strongly they agree with the two statements on a symmetric scale with five ordered response categories, i.e. "very weakly", "rather weakly", "neither weakly nor strongly", "rather strongly", and "very strongly".

[4] Again, the participants had to choose among the five ordered response categories "very weakly", "rather weakly", "neither weakly nor strongly", "rather strongly", and "very strongly".

in an environmental organization do not only affect, for example, pro-environmental behavior like the payment of a price premium for electricity to finance a wind turbine or the consumption of less electricity (e.g. Kotchen and Moore, 2008), but also lead to higher WTP for SRI. For the analysis of political orientation, the participants were asked with which political party they are most likely affiliated. In order to examine the relevance of a left-wing political identification, we consider the dummy variable "affinity left-wing parties" that takes the value one if a respondent is mainly affiliated with the Social Democrats (SPD), the Green Party (Bündnis 90 / Die Grünen), or the Left Party (Die Linke).[5] In line with previous studies on the effect of a left-wing identification on pro-environmental behavior like climate protection activities (e.g. Schwirplies and Ziegler, 2016) and especially on SRI or socially controversial investing (e.g. Hong and Kostovetsky, 2012, Hood et al., 2014), we expect a higher WTP for SRI in the population group with this orientation.

We also examine five socio-demographic variables. The dummy variable "female" takes the value one if a respondent is a woman, while "age" is the age of a participant in years. On the basis of the latter variable, we define the dummy variable "older respondent" that takes the value one if "age" is higher than the average age of the respondents in the sample (i.e. 43.91 years). The dummy variable "high education" takes the value one if the highest level of education is at least secondary (i.e. high school graduation) and the dummy variable "living together or married" takes the value one for these two marital statuses. Finally, the dummy variable "Western Germany" takes the value one if a respondent lives in one of the West German federal states. Table 4 reports the number of observations and the mean for all nine indicators for social values and norms as well as socio-demographic variables.

3. Econometric analysis

3.1. Mixed logit model analysis

3.1.1 Econometric approach

The basis of our discrete choice analysis is that a respondent chooses in each choice set of both SC experiments among four mutually exclusive investment products as discussed above. The hypothetical utility of respondent i ($i = 1,\ldots,N$) for alternative j ($j = 1,\ldots,4$) in choice set

[5] The questionnaire comprised four further dominating political parties in Germany during the time of the survey at the end of 2013, besides these three parties and "another party", namely the Christian Democrats (CDU/CSU), the Liberals (FDP), the main right-wing party (AfD), and the Pirate Party (Piratenpartei).

m (m = 1,…,M with M = 6 in the first SC experiment and M = 8 in the second SC experiment) is:

$$U_{ijm} = \beta_i' x_{ijm} + \varepsilon_{ijm}$$

The latent variables U_{ijm} thus depend on the vectors $x_{ijm} = (x_{ijm1},\ldots,x_{ijmK})'$ of explanatory variables that are based on the four or five attributes and the corresponding unknown parameter vectors $\beta_i = (\beta_{i1},...,\beta_{iK})'$, where K = 7 or K = 9 in the first SC experiment and K = 4 or K = 6 in the second SC experiment.[6] The values of U_{ijm} cannot be observed and depend on the error terms ε_{ijm}, which summarize all unobserved factors. According to the random utility maximization theory (e.g. McFadden, 1974), participant i chooses category j in choice set m if the utility of alternative j is the largest among all alternatives. The corresponding choice probability is (e.g. Rolfe et al., 2000):

$$P_{ijm} = P(U_{ijm} > U_{ij'm};\ \forall j \neq j') = P\left(\beta_i' x_{ijm} + \varepsilon_{ijm} > \beta_i' x_{ij'm} + \varepsilon_{ij'm};\ \forall j \neq j'\right)$$

With $\beta_i = \beta$ (i = 1,…,N) the assumption of independently and standard (type 1) extreme value distributed error terms ε_{ijm} leads to the common multinomial or in this approach with only alternative-specific attributes to the conditional logit model. This model approach is characterized by the very restrictive independence of irrelevant alternatives (IIA) property, which implies that the choice probabilities between two alternatives are independent of the existence of further alternatives. However, if the IIA assumption is not correct, the parameter estimates are inconsistent.

In fact, this IIA assumption is mostly not adequate (e.g. Hoyos, 2010). In particular, conditional logit models cannot capture unobserved taste heterogeneity and correlations due to the panel nature of our data since each respondent was asked over several choice sets (e.g. Adamowicz et al., 2011). Therefore, we consider much more flexible mixed logit models (MLM) (e.g. McFadden and Train, 2000, Hensher and Greene, 2003). While these models still assume independently and standard (type 1) extreme value distributed error terms ε_{ijm}, they are not based on the restrictive IIA assumption, but allow for taste heterogeneity between the participants and thus are able to incorporate correlations between the choice alternatives. MLM (i.e. random parameters logit models as specific variants) specifically assume that the parameters β_{ik} (i = 1,…,N) of those explanatory variables that do not refer to financial performance are continuously distributed across i (e.g. Greene, 2012):

[6] We do not include alternative-specific constants as it is common in econometric analyses with data from unlabeled SC experiments (e.g. Goett et al., 2000, Hensher et al., 2005).

$$\beta_{ik} = \beta_k + \sigma_k u_{ik}$$

The u_{ik} capture the individual specific heterogeneity and are jointly (in our case) normally distributed with mean zero and standard deviation one. Furthermore, σ_k is the standard deviation of the distribution of β_{ik} around β_k. The mean of β_{ik} is thus β_k. In contrast, the parameters of the financial performance variables are specified to be fixed as it is common practice if the estimated parameters are used for WTP estimations (e.g. Goett et al., 2000, Hensher et al., 2005). Conditional on knowing $\beta_i = (\beta_{i1},...,\beta_{iK})'$, the probability that respondent i chooses category j in choice set m is:

$$P_{ijm}(\beta_i) = \frac{e^{\beta_i' x_{ijm}}}{\sum_{j'=1}^{4} e^{\beta_i' x_{ij'm}}}$$

If $P_{im}(\beta_i)$ symbolizes the conditional probability that a specific alternative j is chosen by respondent i in choice set m, the joint conditional probability of the observed sequence of choices across all $M = 6$ or $M = 8$ choice sets is:

$$P_i(\beta_i) = \prod_{m=1}^{M} P_{im}(\beta_i)$$

If $\varphi(\beta_i)$ is the joint density function of the normally distributed β_i, the unconditional probability of the observed sequence of choices is the conditional probability integrated over the distribution of β_i:

$$P_i = \int_{\beta_i} P_i(\beta_i)\varphi(\beta_i)d\beta_i$$

The loglikelihood function $\ln L = \sum_{i=1}^{N} lnP_i$ is then the sum of the (naturally) logarithmized probabilities across all N respondents. However, the problem is that these probabilities are characterized by multiple integrals, which cannot be computed with deterministic numerical integration methods. Therefore, the application of the common maximum likelihood method is not feasible. Instead, the probabilities can be approximated by simulation methods. The inclusion of these simulated probabilities leads to the simulated maximum likelihood (SML) estimation (e.g. Revelt and Train, 1998, Train, 2009). The corresponding simulated loglikelihood function is:

$$\ln L^{sim} = \sum_{i=1}^{N} \ln\left[\frac{1}{R}\sum_{r=1}^{R} P_i\left(\beta_i^r\right)\right]$$

Here β_i^r is the simulated r^{th} random draw from the underlying normal distribution and R is the number of replications, i.e. draws. For our MLM estimation we used the Stata command "mixlogit2", which was written by Hole (2007) and used R = 1000 Halton draws.[7]

This approach leads to an estimation of the mean and standard deviation of the random parameters as well as to the estimation of one fixed financial performance variable parameter (i.e. yearly nominal interest rate) for the first SC experiment and of three fixed financial performance variables parameter (i.e. value of the subscription fee, net return in the last year, average yearly net return in the last five years) for the second SC experiment. On this basis, we commonly estimated the mean WTP by dividing the estimated mean of the random parameters by the estimated parameters of the financial performance variables. In spite of the problems of considering past returns in the second SC experiment as discussed above, we will nevertheless report these estimates, especially for the analysis of different relevance of short-term and long-term past returns. This leads to six mean WTP estimates when the two aggregated dummy variables for sustainability criteria and a transparency logo and to 12 mean WTP estimates when the corresponding four disaggregated dummy variables are included. In the case of the first SC experiment, six mean WTP estimates are considered when the two aggregated dummy variables and eight mean WTP estimates when the corresponding four disaggregated dummy variables are included.

3.1.2. Basic estimation results

Table 5 reports the parameter estimates (including robust z-statistics) and the mean WTP estimates for the choice among four equity funds in the second SC experiment. The upper part of the table reveals that all standard deviations of the random parameters are strongly significantly different from zero, which indicates high unobserved heterogeneity among the respondents. Furthermore, the value of the subscription fee has the expected significantly negative effect, whereas the net return in the last year as well as the average yearly net return in the last five years have significant positive effects on the choice among different equity funds. The latter result thus implies that past returns matter for this investment decision. Moreover, sustainability criteria and a transparency logo are also highly relevant since all aggregated and disaggregated variables have significantly positive effects. This implies that both types of transparency logos (issued by an NGO and the state) and especially sustainability criteria with

[7] Also all other estimations and statistical analyses for this paper were conducted with Stata.

and without certificate matter for the choice among different equity funds. However, the values of some parameter estimates differ, which leads to different WTP estimates.

The lower part of Table 5 reveals very similar mean WTP estimates for the aggregated variables for sustainability criteria and a transparency logo. The estimated mean WTP higher subscription fees are more than 4.2 percentage points for both attributes. Similarly, the mean WTP estimates in terms of the net return in the last year is more than 4.3 percentage points, whereas the values are smaller (about 2.5 percentage points) in terms of the average yearly net return in the last five years. This suggests a higher relevance of past returns over several years compared with short-term past returns, but also compared with subscription fees. The differences are confirmed for each disaggregated variable for sustainability criteria and transparency logos. However, the main results refer to the differences between the two types of transparency logos and especially between the two types of consideration of sustainability criteria. While the mean WTP estimates for a transparency logo issued by the state are higher than for a transparency logo issued by an NGO, the differences are rather moderate. In contrast, the estimates for the consideration of sustainability criteria with certificate are much higher than without certificate so that the differences vary between about 1.3 percentage points in terms of the average yearly net return in the last five years and more than 2.2 percentage points in terms of the other two financial performance variables. This suggests not only a high WTP for sustainability criteria, but an additional considerable WTP for a certification.

As discussed above, however, we focus on the choice among four three-year fixed-interest investment products in the first SC experiment. Table 6 reports the corresponding parameter estimates (including robust z-statistics) and the mean WTP estimates. The upper part of the table again reveals that almost all standard deviations of the random parameters (with one exception for the consideration of sustainability criteria without certificate) are strongly significantly different from zero, which indicates high unobserved heterogeneity among the respondents. In line with the results in Table 5, the yearly nominal interest rate as the single financial performance variable and all aggregated and disaggregated variables of sustainability criteria and transparency logos have significantly positive effects on the choice among different fixed-interest investment products. In addition, the estimation results for the provider imply a significantly lower stated preference for big banks compared to direct banks and especially compared to sustainability banks, municipal savings banks, and co-operative banks. However, the parameter estimates surprisingly imply a weak stated preference for sustainability banks compared with municipal savings and co-operative banks.

This result is even more obvious in the lower part of Table 6, which reports a lower estimate of the mean willingness to sacrifice interest rates for sustainability banks than for municipal savings and co-operative banks. However, the main estimation results refer to the consideration of sustainability criteria. The estimated mean willingness to sacrifice yearly nominal interest rates for the aggregated variable is 0.21 percentage points. Furthermore, in line with the results in Table 5, the mean WTP estimate of 0.25 percentage points for the consideration of sustainability criteria with certificate is much higher than the value of 0.11 percentage points for the case without certificate, which again suggests an additional considerable WTP for a certification of sustainability criteria in investment products. Finally, the mean WTP estimates for transparency logos are also in line with the results in Table 5, i.e. the differences between the (higher) mean WTP estimate for a transparency logo issued by the state and the (lower) value for a transparency logo issued by an NGO are rather moderate. Furthermore, the mean WTP estimates for the aggregated variables of sustainability criteria and a transparency logo are again very similar, although the value of 0.26 percentage points for a transparency logo is even a bit higher.

In sum, the estimation results in Table 5 and Table 6 suggest a high WTP for sustainable investments. However, it can naturally be argued that the WTP are overestimated due to the hypothetical character of the SC experiments. In fact, the mean WTP estimates for sustainable equity funds seem to be rather high. However, as already discussed above in detail, the consideration of past returns as basis for WTP estimates should be treated with caution. Nevertheless, the estimated WTP higher subscription fees for sustainable equity funds is also large. This result is especially based on the relatively small estimate for the parameter of this financial performance variable. Therefore, another explanation for the high WTP estimates is that the subscription fee is of extremely minor relevance for the purchase of an equity fund, at least compared with past returns. In contrast, the moderate WTP estimates for sustainable fixed-interest investment products seem to be much more realistic. In general, hypothetical biases especially arise if participants respond strategically or give socially desirable answers. However, SRI (and CSR in general, e.g. http://anticsr.com) do not enjoy an exceptionally good reputation in the population, for example, due to announcements about violation of ethical standards or environmental pollution by firms that had good sustainability ratings and thus were components of sustainable equity funds or indexes like the Dow Jones Sustainability Indexes (e.g. BP with respect to the Deepwater Horizon oil spill or recently Volkswagen with respect to the emissions scandal). Therefore, we do not expect a strong hypothetical bias for our WTP estimates.

3.1.3. Robustness checks

In order to examine the reliability of our estimation results and especially WTP estimates and thus possible hypothetical biases, we nevertheless conducted a series of robustness checks on the basis of three subsamples for the choice among the fixed-interest investment products in the first SC experiment. Our first robustness check is based on an understanding question, i.e. each respondent was asked subsequent to both SC experiments whether they generally found the choice sets and the description of the choice situations understandable. Therefore, the corresponding subsample excludes respondents with any misunderstandings. A second robustness check is based on another ex post technique to mitigate hypothetical biases, namely the use of certainty scales (e.g. Fifer et al., 2014), i.e. each respondent was asked subsequent to each choice set for the degree of certainty that the chosen investment product would be purchased in a real investment situation. Thus, the corresponding subsample excludes respondents who stated after a choice set that they are very unsure, rather unsure, or neither sure nor unsure, or if they did not answer to this question.[8] Finally, the third robustness check combines the two approaches, i.e. the corresponding subsample only includes respondents who stated both after the SC experiments that the description of the choice situations was understandable and separately for each choice set to be rather or very sure that they would purchase the investment product in reality.

Table 7 and Table 8 report the corresponding estimation results. While the parameter estimates and mean WTP estimates in Table 7 are based on MLM specifications with the two aggregated variables for sustainability criteria and a transparency logo, the results in Table 8 are based on the inclusion of the corresponding four disaggregated variables. The tables reveal that the first robustness check is based on N = 837 respondents (and thus 837 × 6 = 5022 observations), which implies that 164 participants had problems in the understanding of the choice sets and the description of the choice situations. The second robustness check is based on N = 629 respondents who stated at least after one choice set that they are rather or very sure that they would purchase the investment product in reality (the number of 2486 observations is therefore smaller than 629 × 6). This implies that a relatively high number of 372 participants never stated to be rather or very sure across the six choice sets. In contrast, a clearly smaller number of 182 respondents stated to be rather or very sure in all six choice sets. Finally, the third robustness check is based on overall N = 544 respondents and 2136 observations for the highest response and choice certainty.

[8] The participants had to choose among the five ordered response categories “very unsure”, “rather unsure”, “neither sure nor unsure”, “rather sure”, and “very sure” including the possibility to refuse the answer.

In sum, the estimation results in Table 7 and Table 8 are qualitatively extremely similar to the estimation results in Table 5, i.e. the tables report high estimates for the mean willingness to sacrifice yearly nominal interest rates for the consideration of sustainability criteria and especially for the consideration of sustainability criteria with certificate. Surprisingly, the corresponding WTP estimates are even higher on the basis of the second and third subsamples compared with the basic estimation results. These results suggest that hypothetical biases should not play an important role. Our result of a high WTP for sustainable investments is even further strengthened in additional robustness checks. We have, for example, analyzed several alternative numbers *R* of Halton draws for the SML estimation in the MLM and the inclusion of alternative-specific constants. Furthermore, we have analyzed MLM specifications that only include data of the first choice set for each respondent in order to exclude possible biased choices due to fatigue. However, the estimation results for the consideration of sustainability criteria on the basis of these additional robustness checks[9] do not qualitatively differ from the previous estimation results and thus confirm the considerable WTP for sustainable investments.

3.1.4. Analysis of different investor groups

While our robustness checks do not suggest any problems with hypothetical biases, no SC study can naturally completely exclude them. In contrast, comparisons between WTP estimates such as for the consideration of sustainability criteria without and with certificate are not influenced by possible minor overestimations of WTP. We now compare the estimated WTP for sustainable investments between different populations and thus investor groups. This analysis again refers to the choice among the fixed-interest investment products in the first SC experiment. On the basis of the full sample of $N = 1001$ respondents, several pairs of subsamples that refer to individual characteristics are considered. We mainly examine variations in social values and norms, i.e. warm glow feelings, expectations in the social environment, the membership in an environmental organization, and the affinity to left-wing parties, as discussed in section 2.2. In addition, we consider socio-demographic variables and thus differences between females and males, older and younger respondents, higher and lower education groups, respondents who live together or are married and their counterparts, and participants from Western and Eastern Germany. For each of these subsamples, SML estimations in MLM with aggregated and disaggregated variables for the consideration of sustainability criteria and

[9] The estimation results are not reported due to brevity, but are available upon request.

transparency logos were conducted. On this basis, the mean WTP estimates for sustainability criteria were estimated.

Table 9 reports the corresponding estimation results. It reveals extremely similar WTP estimates for the different pairs of socio-demographic groups, i.e. gender, age, education, marital status, and regional provenance are obviously hardly correlated with the WTP for SRI. In contrast, the differences in the mean WTP estimates between investor groups with different social values and norms are much higher. Respondents with high feelings of warm glow from SRI, strong considerations of norms by the social environment with respect to SRI, a strong environmental awareness, and an affinity to left-wing parties have a much higher estimated mean willingness to sacrifice yearly nominal interest rates for the consideration of sustainability criteria than their counterparts, respectively. These estimation results do not only hold for the aggregated, but also for the disaggregated variables. Therefore, it can be concluded that social values and norms strongly matter for the WTP for sustainable investments in the expected direction, which is in line with previous empirical studies as discussed in section 2.2.

However, these estimation results are only based on comparisons between two different investor groups, respectively, and thus indicate univariate correlations, which could be influenced by correlations with other variables. Therefore, we now examine investor groups with different WTP for SRI on the basis of a much more sophisticated LCLM approach. This analysis again refers only to the choice among four three-year fixed-interest investment products in the first SC experiment. Furthermore, only model specifications with aggregated variables for sustainability criteria and a transparency logo are considered.

3.2. Latent class logit model analysis

3.2.1. Econometric approach

In contrast to MLM, which include taste heterogeneity by continuous parameter variations, LCLM assume discrete mixing distribution (e.g. Greene and Hensher, 2003, Train, 2009), whereby the heterogeneity in the parameters can be explained by individual characteristics. While LCLM are thus slightly less flexible than MLM, they have the main advantage that no specific assumptions about the distributions of the parameters are necessary. In particular, if a specific investor group has a general higher WTP for sustainable investments, for example, due to a lower sensitivity to interest rates, the underlying heterogeneity is better reflected as discrete rather than continuous (e.g. Adamowicz et al., 2011). LCLM assume that respondents

are implicitly sorted into a set of Q classes and that the error terms ε_{ijm} are still independently and standard (type I) extreme value distributed. If respondent i belongs to class q ($q = 1,\ldots,Q$), the probability that i chooses category j in choice set m is:

$$P_{ijmq}\left(\beta_q\right) = \frac{e^{\beta_q' x_{ijm}}}{\sum_{j'=1}^{4} e^{\beta_q' x_{ij'm}}}$$

Now $\beta_q = (\beta_{q1},\ldots,\beta_{q7})$' is a class-specific vector of parameters for class q. If $P_{imq}(\beta_q)$ symbolizes the conditional probability that a specific alternative j is chosen by participant i in class q in choice set m, the joint conditional probability of the observed sequence of choices across all $M = 6$ choice sets is:

$$P_{iq}(\beta_q) = \prod_{m=1}^{6} P_{imq}(\beta_q)$$

However, the class membership is unknown. The respondents are probabilistically assigned to the Q different classes by a class membership model. It is assumed that the membership to a class q depends on the vector $z_i = (z_{i1},\ldots,z_{i,10})$' which generally includes individual characteristics, i.e. in our case the four variables for social values and norms and the five socio-demographic variables as discussed above as well as a constant. The corresponding unknown parameter vector is $\theta_q = (\theta_{q1},\ldots,\theta_{q,10})$'. By additionally assuming that the error terms in the class membership model are independently and standard (type 1) extreme value distributed, the probability that respondent i belongs to class q is:

$$H_{iq} = \frac{e^{\theta_q' z_i}}{\sum_{q'=1}^{Q} e^{\theta_{q'}' z_i}}$$

With respect to formal model identification, θ_Q is normalized to the zero vector. The unconditional probability of the observed sequence of choices across all $M = 6$ choice sets is:

$$P_i = \sum_{q=1}^{Q} H_{iq} P_{iq}(\beta_q)$$

Finally, the log-likelihood function is:

$$\ln L = \sum_{i=1}^{N} \ln P_i = \sum_{i=1}^{N} \ln \left[\sum_{q=1}^{Q} \frac{e^{\theta_q' z_i}}{\sum_{q'=1}^{Q} e^{\theta_{q'}' z_i}} \left(\prod_{m=1}^{6} P_{imq}(\beta_q) \right) \right]$$

The maximization of this log-likelihood function thus refers to the Q structural parameter vectors $\beta_1,\ldots, \beta_Q$ and the Q-1 latent class parameter vectors $\theta_1,\ldots, \theta_{Q-1}$. However, this optimization problem is numerically not trivial compared to other common maximum likelihood estimations (e.g. Greene and Hensher, 2003). In line with Train (2009), we used the Expectation-Maximization (EM) algorithm to guarantee numerical stability and convergence of the log-likelihood function to a local maximum even for a higher number of classes. The corresponding algorithm for the EM maximum likelihood estimation has recently been included in a Stata module, written by Pacifico and Yoo (2013). In our econometric analysis, we compare the estimation results in LCLM with $Q = 2$ and $Q = 3$ classes.[10]

3.2.2. Estimation results

Table 10 and Table 11 report the corresponding estimation results in the two LCLM. The upper part of Table 10 reveals strong differences in the estimated preferences between the two investor classes. The main difference refers to the estimated parameters for the yearly nominal interest rate, which is more than six times higher in the second class compared with the first class. This implies a much higher sensitivity to this financial performance variable in the second class and also suggests the superiority of the use of LCLM compared with MLM, as discussed above. On the basis of the higher parameter estimate for the consideration of sustainability criteria, this leads to a much higher mean WTP estimate of 0.53 percentage points in the first class that is nearly ten times as high as in the second class. Similarly, the mean WTP estimates for a transparency logo as well as for municipal savings banks, co-operative banks, direct banks, and sustainability banks compared with big banks are much higher in the first class. The estimation results for the second class reveal insignificant differences in the stated preferences for municipal savings banks and direct banks and even a significantly lower stated preference for sustainability banks, which also points to a strong heterogeneity between the two classes and thus investor groups.

The lower part of Table 10 shows that nearly two thirds of the respondents are members of the first class. However, it especially reveals the composition of the two classes. The estimation results for the socio-demographic variables imply that older respondents, lower education groups, and particularly females and participants from Eastern Germany tend to be members

[10] This choice is based on an content-related motivation of the class memberships as discussed below and thus not solely on statistical information criteria such as the Bayesian information criterion (BIC) or the consistent Akaike information criterion (CAIC).

of the first class with a higher WTP for SRI, which was not completely obvious from the results in Table 9 on the basis of the corresponding restricted univariate analysis. However, the main result in the lower part of the table refers to the relevance of social values and norms. Respondents with high feelings of warm glow from SRI, a strong environmental awareness, an affinity to left-wing parties, and (less robust) strong considerations of norms by the social environment with respect to SRI have a significantly higher probability to be members of the first class. In line with the results in Table 9, this implies that investor groups with these specific social values and norms have a much higher mean willingness to sacrifice interest rates for other providers (including sustainability banks) than big banks, a transparency logo, and especially for sustainable fixed-interest investment products than their counterparts.

The estimation results in Table 11 on the basis of an LCLM with three classes reveal high similarities of the third class with the second class in the LCLM with two classes. In both cases, slightly more than one third of the respondents are members of the classes. In particular, both classes are characterized by a large estimated sensitivity to the interest rate, low mean WTP estimates for the consideration of sustainability criteria and a transparency logo, low differences in the estimated stated preferences for several providers, and a significantly lower stated preference for sustainability banks. This class can thus be termed as "financial performance investor group". As a consequence, the previous first class in the LCLM with two classes is widely divided in the first two classes in the LCLM with three classes. The first class in this LCLM is largely in line with the first class in the previous LCLM with high mean WTP estimates for a transparency logo and several providers and especially with very high mean WTP estimates for the consideration of sustainability criteria and also (in contrast to the first class in the previous LCLM) for sustainability banks. This class with more than 40% of the respondents can thus be termed as "sustainability investor group". In contrast, the second class with 25% of the respondents can be termed as "transparency investor group" due to the high mean WTP estimates for a transparency logo and also for municipal savings and co-operative banks, which are considered as much more transparent and reliable in Germany due to the public and co-operative ownership. While the mean WTP estimate for SRI in this class is lower than in the first class, it is still much higher than in the third class, even when the members have a weakly significantly lower stated preference for sustainability banks.

According to the estimation results in the lower part of Table 11, respondents from Eastern Germany and especially participants with high feelings of warm glow from SRI, a strong environmental awareness, and an affinity to left-wing parties tend to be members of the "sus-

tainability investor group" with a high estimated mean willingness to sacrifice interest rates for SRI. In line with the only weakly significant effect of "expectation social environment" on the membership in the first class in the previous LCLM, this variable has no significant effect on the membership in the "sustainability investor group". Instead, it has a significantly positive effect on the membership in the "transparency investor group" with strong estimated preferences for transparency and reliability criteria. The estimation results also imply that respondents from Eastern Germany and females and especially respondents with a strong environmental awareness and lower education groups tend to be members of the "transparency investor group".

In sum, our estimation results suggest that feelings of warm glow lead to a higher WTP of SRI, which is in line with, for example, the results of Bauer and Smeets (2015). Our estimation results also imply that environmental awareness (in line with empirical studies of pro-environmental behavior, e.g. Kotchen and Moore, 2008) and an affinity with left-wing parties (e.g. in line with Hong and Kostovetsky, 2012, Hood et al., 2014, Schwirplies and Ziegler, 2016) have strong positive effects on this WTP. While strong considerations of norms by the social environment with respect to SRI obviously have lower effects, it seems that investors with such norms still have higher WTP for SRI than their counterparts.

4. Conclusion

This paper empirically examines the willingness of private financial decision makers in Germany to pay for SRI. Traditional finance theory suggests a WTP of zero since SRI would only be considered if they are at least as attractive as other investments in terms of risk and returns. However, several empirical studies reveal non-financial motives for SRI and thus indirectly a positive WTP for sustainable investments. Our study contributes to this literature by directly analyzing the WTP for SRI. The main novelty of our empirical analysis is the use of data from SC experiments with a representative sample as it is common for the estimation of WTP in other economic sub-disciplines like transportation economics. Methodologically, our econometric analysis is based on flexible discrete choice models, namely MLM and LCLM. Our estimation results reveal the high relevance of unobserved heterogeneity between different investor groups. Especially our LCLM analysis enables us to identify specific investor groups with higher and lower WTP, which would not be possible if restricted discrete choice models like the conditional logit model were used.

Our MLM analysis implies strong stated preferences for sustainable equity funds and three-year fixed-interest investment products. The corresponding estimated mean willingness to sacrifice yearly nominal interest rates for sustainable fixed-interest investment products is considerable and amounts to 0.21 percentage points among a variation between 1.30% and 2.10% in the underlying SC experiment. These results are very stable across several robustness checks that also include different techniques to mitigate possible hypothetical biases. Furthermore, our MLM analysis reveals that the estimated mean WTP for certified sustainable fixed-interest investment products is more than twice as high as for the uncertified counterparts and that the estimated mean WTP for a transparency logo is slightly higher than for the consideration of sustainability criteria. In addition, our estimation results on the basis of LCLM imply a mean willingness to sacrifice interest rates for fixed-interest investment products that is nearly ten times as high for investor groups with specific social values and norms, i.e. for investors with strong considerations of norms by the social environment with respect to SRI (those respondents especially belong to an investor group with significantly higher preferences for transparency and reliability criteria) and particularly with high feelings of warm glow from SRI, a strong environmental awareness, and an affinity to left-wing parties, compared with their counterparts.

This relevance of social values and norms is in line with previous SRI studies (e.g. Bauer and Smeets, 2015, Riedl and Smeets, 2016), but also with other empirical environmental economics studies that generally consider pro-environmental behavior or climate protection activities (e.g. Kotchen and Moore, 2008, Schwirplies and Ziegler, 2016). Indeed, a positive effect of an affinity to left-wing parties seems to contradict the estimation results in Gutsche et al. (2016), who report rather negative effects of a left-wing orientation on SRI. However, they do not consider fixed-interest investment products in SC experiments, but the share of SRI among all investments, which are currently mainly combined with risky investments. The results of Gutsche et al. (2016) can therefore be explained by the general aversion of an affinity to left-wing parties to risky investments and the participation in stock markets (e.g. Kaustia and Torstila, 2011), i.e. left-wing oriented financial decision makers are rather more skeptical toward general equity investments than toward sustainable investments. Thus, the difference is that their analysis does not disentangle the sustainable and the risky dimensions of current SRI. In contrast, our empirical analysis on the basis of the SC experiments is able to identify the relevance of the consideration of sustainability criteria and especially focuses on riskless fixed-interest investment products.

This sophisticated picture of left-wing investors as well as our general identification of investor groups with a higher WTP for sustainable investments have important implications for the development of specific SRI products and marketing and advertisement activities by banks and other providers of financial investments in order to attract new SRI customers. It would certainly be very interesting to analyze sustainable fixed-interest investment products, which are currently only a small segment in the SRI universe, in more detail in future empirical studies. Methodologically, it would be particularly interesting to analyze the WTP for sustainable fixed-interest investment products, but also sustainable equity funds, on the basis of field experimental approaches. A first (natural) field experiment can be found in Døskeland and Pedersen (2016). However, they only consider the effect of wealth or morality framings on SRI so that field experimental analyses of the WTP for sustainable investments and the relevance of social values and norms are left for further research in the future.

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Tables

Table 1: Attributes and attribute levels in the SC experiments

First SC experiment on three-year fixed-interest investment products	
Attributes	Attribute levels
Provider	Big bank, municipal savings bank, co-operative bank, direct bank, sustainability bank
Yearly nominal interest rate	1.30%, 1.50%, 1.70%, 1.90%, 2.10%
Sustainability criteria	No consideration, consideration without sustainability certificate, consideration with sustainability certificate
Transparency logo	No transparency logo, transparency logo issued by an NGO, transparency logo issued by the state
Second SC experiment on equity funds	
Attributes	Attribute levels
Value of the subscription fee	3.00%, 4.00%, 5.00%
Net return in the last year	4.00%, 5.00%, 6.00%, 7.00%, 8.00%
Average yearly net return in the last five years	3.00%, 5.00%, 6.00%, 7.00%, 9.00%
Sustainability criteria	No consideration, consideration without sustainability certificate, consideration with sustainability certificate
Transparency logo	No transparency logo, transparency logo issued by an NGO, transparency logo issued by the state

Table 2: Exemplary choice set for the first SC experiment on three-year fixed-interest investment products

Please indicate which of the following four investment products you would most likely purchase.				
Attribute	Three-year fixed-interest investment product A	Three-year fixed-interest investment product B	Three-year fixed-interest investment product C	Three-year fixed-interest investment product D
Provider	Direct bank	Direct bank	Big bank	Municipal savings bank
Yearly nominal interest rate	1.30%	1.70%	1.50%	1.30%
Sustainability criteria	No consideration	Consideration with certificate	Consideration without certificate	No consideration
Transparency logo	No transparency logo	Transparency logo issued by an NGO	Transparency logo issued by the state	No transparency logo
	□	□	□	□

Table 3: Exemplary choice set for the second SC experiment on equity funds

Please indicate which of the following four equity funds appears so attractive for you that you would most likely purchase it.				
Attribute	Equity fund A	Equity fund B	Equity fund C	Equity fund D
Value of the subscription fee	3.00 %	5.00 %	5.00 %	4.00 %
Net return in the last year	4.00 %	8.00 %	7.00 %	5.00 %
Average yearly net returns in the last five years	3.00 %	7.00 %	5.00 %	9.00 %
Sustainability criteria	Consideration without certificate	No consideration	Consideration with certificate	No consideration
Transparency logo	Transparency logo issued by the state	No transparency logo	Transparency logo issued by an NGO	Transparency logo issued by an NGO
	□	□	□	□

Table 4: Descriptive statistics of individual characteristics

Social values and norms		
Variables	Number of observations	Mean
Warm glow	936	0.46
Expectation social environment	955	0.10
Membership environmental organization	942	0.10
Affinity left-wing parties	778	0.49
Socio-demographic variables		
Variables	Number of observations	Mean
Female	1001	0.49
Age	1001	43.91
Older respondent	1001	0.53
High education	997	0.62
Living together or married	995	0.67
Western Germany	1001	0.82

Table 5: SML estimation results in MLM for the choice among four equity funds

Explanatory variables	Parameter estimates (robust z-statistics)			
	Mean	Standard deviation	Mean	Standard deviation
Value of the subscription fee	-0.20*** (-8.25)	--	-0.21*** (-8.28)	--
Net return in the last year	0.20*** (14.40)	--	0.21*** (14.70)	--
Average yearly net return in the last five years	0.34*** (23.35)	--	0.36*** (23.30)	--
Consideration of sustainability criteria	0.85*** (16.38)	1.00*** (18.29)	--	--
Consideration of sustainability criteria without certificate	--	--	0.52*** (11.42)	-0.39*** (-4.07)
Consideration of sustainability criteria with certificate	--	--	0.99*** (16.13)	1.09*** (15.84)
Transparency logo	0.84*** (15.01)	0.96*** (15.57)	--	--
Transparency logo issued by an NGO	--	--	0.62*** (11.77)	0.62*** (8.58)
Transparency logo issued by the state	--	--	0.82*** (13.94)	0.85*** (11.96)

	Mean WTP estimates					
	Value of the subscription fee	Net return in the last year	Average yearly net return in the last five years	Value of the subscription fee	Net return in the last year	Average yearly net return in the last five years
Consideration of sustainability criteria	4.27	-4.36	-2.52	--	--	--
Consideration of sustainability criteria without certificate	--	--	--	2.45	-2.51	-1.45
Consideration of sustainability criteria with certificate	--	--	--	4.67	-4.78	-2.76
Transparency logo	4.22	-4.31	-2.49	--	--	--
Transparency logo issued by an NGO	--	--	--	2.93	-3.00	-1.73
Transparency logo issued by the state	--	--	--	3.88	-3.97	-2.29

Note: For the SML estimation 1000 Halton draws were used. The basis of the estimation results in this table are data from the second SC experiment with N = 801 respondents, M = 8 choice sets, and thus 6408 observations. The upper part of the table reports for each explanatory variable the parameter estimates and the corresponding robust z-statistics in parentheses. * (**, ***) means that the appropriate parameter is different from zero at the 10% (5%, 1%) significance level, respectively. The lower part of the table reports the mean WTP estimates for each combination of non-financial and financial performance variables. The values are calculated by dividing the estimated mean of the random parameters of the non-financial performance variables by the estimated parameters of the financial performance variables. While the left side of the table refers to the model specification that includes the two aggregated dummy variables for sustainability criteria and transparency logo, the right side refers to the model specification that includes the corresponding disaggregated dummy variables, respectively.

Table 6: SML estimation results in MLM for the choice among four three-year fixed-interest investment products

Explanatory variables	Parameter estimates (robust z-statistics)			
	Mean	Standard deviation	Mean	Standard deviation
Yearly nominal interest rate	3.97*** (26.17)	--	4.12*** (25.85)	--
Consideration of sustainability criteria	0.83*** (14.19)	1.07*** (14.46)	--	--
Consideration of sustainability criteria without certificate	--	--	0.46*** (8.25)	-0.04 (-0.13)
Consideration of sustainability criteria with certificate	--	--	1.02*** (14.36)	1.24*** (14.61)
Transparency logo	1.03*** (16.54)	1.05*** (12.88)	--	--
Transparency logo issued by an NGO	--	--	0.77*** (13.42)	-0.33* (-1.84)
Transparency logo issued by the state	--	--	0.97*** (14.61)	0.84*** (10.59)
Municipal savings bank	0.49*** (6.55)	1.29*** (12.06)	0.46*** (6.02)	1.35*** (12.40)
Co-operative bank	0.50*** (7.05)	1.07*** (10.30)	0.50*** (6.84)	1.13*** (10.61)
Direct bank	0.11* (1.79)	0.51** (3.35)	0.11* (1.73)	0.46** (2.17)
Sustainability bank	0.22*** (2.82)	1.14*** (10.95)	0.20** (2.50)	1.33*** (12.50)
	Mean WTP estimates (on the basis of the yearly nominal interest rate)			
Consideration of sustainability criteria	-0.21		--	
Consideration of sustainability criteria without certificate	--		-0.11	
Consideration of sustainability criteria with certificate	--		-0.25	
Transparency logo	-0.26		--	
Transparency logo issued by an NGO	--		-0.19	
Transparency logo issued by the state	--		-0.24	
Municipal savings bank	-0.12		-0.11	
Co-operative bank	-0.13		-0.12	
Direct bank	-0.03		-0.03	
Sustainability bank	-0.05		-0.05	

Note: For the SML estimation 1000 Halton draws were used. The basis of the estimation results in this table are data from the first SC experiment with N = 1001 respondents, M = 6 choice sets, and thus 6006 observations. The upper part of the table reports for each explanatory variable the parameter estimates and the corresponding robust z-statistics in parentheses. * (**, ***) means that the appropriate parameter is different from zero at the 10% (5%, 1%) significance level, respectively. The lower part of the table reports the mean WTP estimates for each non-financial variable. The values are calculated by dividing the estimated mean of the random parameters of the non-financial variables by the estimated parameter of the yearly nominal interest rate. While the left side of the table refers to the model specification that includes the two aggregated dummy variables for sustainability criteria and transparency logo, the right side refers to the model specification that includes the corresponding disaggregated dummy variables, respectively.

Table 7: SML estimation results in MLM for the choice among four three-year fixed-interest investment products, robustness checks with aggregated variables for sustainability criteria and a transparency logo

Explanatory variables	Parameter estimates (robust z-statistics)					
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Yearly nominal interest rate	4.21*** (24.37)	--	4.52*** (17.03)	--	4.55*** (15.43)	--
Consideration of sustainability criteria	0.85*** (12.99)	1.07*** (12.91)	1.20*** (11.00)	1.32*** (9.20)	1.19*** (9.95)	1.33*** (8.60)
Transparency logo	1.04*** (15.10)	1.00*** (10.70)	1.25*** (11.54)	0.97*** (6.38)	1.22*** (10.61)	0.88*** (5.50)
Municipal savings bank	0.50*** (6.15)	1.27*** (10.94)	0.48*** (3.46)	1.72*** (9.38)	0.59*** (4.00)	1.72*** (9.16)
Co-operative bank	0.49*** (6.21)	1.03*** (8.33)	0.38*** (2.94)	1.50*** (7.39)	0.39*** (2.75)	1.43*** (7.00)
Direct bank	0.10 (1.54)	0.36 (1.50)	0.00 (0.00)	0.52* (0.31)	0.09 (0.73)	0.37 (0.78)
Sustainability bank	0.29*** (3.58)	1.23*** (9.99)	0.38*** (3.12)	0.98*** (4.87)	0.50*** (3.93)	0.89*** (4.45)
N (number of observations)	837 (5022)		629 (2486)		544 (2136)	
	Mean WTP estimates (on the basis of the yearly nominal interest rate)					
Consideration of sustainability criteria	-0.20		-0.27		-0.26	
Transparency logo	-0.25		-0.28		-0.27	
Municipal savings bank	-0.12		-0.11		-0.13	
Co-operative bank	-0.12		-0.08		-0.09	
Direct bank	n.s.		n.s.		n.s.	
Sustainability bank	-0.07		-0.08		-0.11	

Note: For all SML estimations 1000 Halton draws were used. The basis of the estimation results in this table are data from the first SC experiment with $M = 6$ choice sets and different numbers of respondents and thus observations. The upper part of the table reports for each explanatory variable the parameter estimates and the corresponding robust z-statistics in parentheses. * (**, ***) means that the appropriate parameter is different from zero at the 10% (5%, 1%) significance level, respectively. The lower part of the table reports the mean WTP estimates for each non-financial variable (n.s. means that the underlying mean of the random parameter is not significantly different from zero). The values are calculated by dividing the estimated mean of the random parameters of the non-financial variables by the estimated parameter of the yearly nominal interest rate. All model specifications include the two aggregated dummy variables for sustainability criteria and transparency logo. The left part of the table refers to estimation results that only include respondents who stated after the experiments that the choice sets and the description of the choice situations were understandable. The middle part of the table refers to estimation results that only include participants who stated separately for each choice set to be rather or very sure that they would purchase the investment product in reality (possible response categories were "very unsure", "rather unsure", "neither sure nor unsure", "rather sure", and "very sure"). The right part of the table refers to estimation results that only include respondents who stated both after the experiments that the choice sets and the description of the choice situations were understandable and separately for each choice set to be rather or very sure that they would purchase the investment product in reality.

Table 8: SML estimation results in MLM for the choice among four three-year fixed-interest investment products, robustness checks with disaggregated variables for sustainability criteria and transparency logos

Explanatory variables	Parameter estimates (robust z-statistics)					
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Yearly nominal interest rate	4.42*** (23.55)	--	4.83*** (15.91)	--	4.82*** (13.02)	--
Consideration of sustainability criteria without certificate	0.47*** (7.61)	-0.10 (-0.33)	0.64*** (6.38)	-0.19 (-0.32)	0.59*** (5.52)	-0.19 (-0.11)
Consideration of sustainability criteria with certificate	1.06*** (13.28)	1.24*** (13.34)	1.48*** (10.99)	1.51*** (9.74)	1.45*** (9.32)	1.53*** (8.04)
Transparency logo issued by an NGO	0.80*** (12.61)	-0.38** (-2.56)	1.00*** (10.41)	-0.033 (-0.07)	1.00*** (9.20)	0.01 (0.18)
Transparency logo issued by the state	1.02*** (13.82)	0.82*** (9.11)	1.26*** (11.42)	0.82*** (5.28)	1.24*** (9.97)	0.70*** (3.47)
Municipal savings bank	0.48*** (5.77)	1.33*** (11.16)	0.48*** (3.30)	1.82*** (9.49)	0.63*** (3.92)	1.74*** (8.70)
Co-operative bank	0.48*** (5.93)	1.09*** (8.76)	0.43*** (3.13)	1.57*** (7.31)	0.44*** (2.91)	1.50*** (5.97)
Direct bank	0.09 (1.35)	0.41** (1.96)	-0.05 (-0.37)	0.61** (2.16)	0.14 (0.30)	0.54 (1.34)
Sustainability bank	0.30*** (3.39)	1.31*** (11.16)	0.44*** (3.20)	1.30*** (6.73)	0.57*** (4.03)	1.22*** (5.22)
N (number of observations)	837 (5022)		629 (2486)		544 (2136)	
	Mean WTP estimates (on the basis of the yearly nominal interest rate)					
Consideration of sustainability criteria without certificate	-0.11		-0.13		-0.12	
Consideration of sustainability criteria with certificate	-0.24		-0.31		-0.30	
Transparency logo issued by an NGO	-0.18		-0.21		-0.21	
Transparency logo issued by the state	-0.23		-0.26		-0.26	
Municipal savings bank	-0.11		-0.10		-0.13	
Co-operative bank	-0.11		-0.09		-0.09	
Direct bank	n.s.		n.s.		n.s.	
Sustainability bank	-0.07		-0.09		-0.12	

Note: For all SML estimations 1000 Halton draws were used. The basis of the estimation results in this table are data from the first SC experiment with $M = 6$ choice sets and different numbers of respondents and thus observations. The upper part of the table reports for each explanatory variable the parameter estimates and the corresponding robust z-statistics in parentheses. * (**, ***) means that the appropriate parameter is different from zero at the 10% (5%, 1%) significance level, respectively. The lower part of the table reports the mean WTP estimates for each non-financial variable (n.s. means that the underlying mean of the random parameter is not significantly different from zero). The values are calculated by dividing the estimated mean of the random parameters of the non-financial variables by the estimated parameter of the yearly nominal interest rate. All model specifications include the disaggregated dummy variables for sustainability criteria and transparency logos. The left part of the table refers to estimation results that only include respondents who stated after the experiments that the choice sets and the description of the choice situations were understandable. The middle part of the table refers to estimation results that only include participants who stated separately for each choice set to be rather or very sure that they would purchase the investment product in reality (possible response categories were "very unsure", "rather unsure", "neither sure nor unsure", "rather sure", and "very sure"). The right part of the table refers to estimation results that only include respondents who stated both after the experiments that the choice sets and the description of the choice situations were understandable and separately for each choice set to be rather or very sure that they would purchase the investment product in reality.

Table 9: Mean WTP estimates for sustainability criteria in the choice among four three-year fixed-interest investment products in different investor groups

	Consideration of sustainability criteria	Consideration of sustainability criteria without certificate	Consideration of sustainability criteria with certificate
All N = 1001 respondents	-0.21	-0.11	-0.25
Warm glow =1 (428 respondents)	-0.34	-0.17	-0.40
Warm glow = 0 (508 respondents)	-0.13	-0.08	-0.16
Expectation social environment =1 (92 respondents)	-0.38	-0.23	-0.44
Expectation social environment = 0 (863 respondents)	-0.20	-0.10	-0.24
Membership environmental organization =1 (95 respondents)	-0.40	-0.18	-0.47
Membership environmental organization = 0 (847 respondents)	-0.20	-0.11	-0.23
Affinity left-wing parties = 1 (380 respondents)	-0.34	-0.20	-0.38
Affinity left-wing parties = 0 (398 respondents)	-0.16	-0.08	-0.21
Female = 1 (488 respondents)	-0.23	-0.12	-0.27
Female = 0 (513 respondents)	-0.20	-0.11	-0.23
Older respondent = 1 (527 respondents)	-0.21	-0.10	-0.23
Older respondent = 0 (474 respondents)	-0.22	-0.12	-0.26
High education = 1 (607 respondents)	-0.21	-0.11	-0.25
High education = 0 (390 respondents)	-0.22	-0.13	-0.25
Living together or married = 1 (662 respondents)	-0.21	-0.10	-0.25
Living together or married = 0 (333 respondents)	-0.21	-0.13	-0.25
Western Germany = 1 (825 respondents)	-0.21	-0.11	-0.25
Western Germany = 0 (176 respondents)	-0.25	-0.13	-0.26

Note: The mean WTP estimates on the basis of the yearly nominal interest rate in this table refer to different pairs of sub-samples and thus investor groups, which are considered on the basis of the nine dummy variables of individual characteristics. The basis of the estimation results are data from the first SC experiment with different numbers of respondents and M = 6 choice sets, respectively. For the underlying SML estimation in MLM 1000 Halton draws were used. The first column of the table refers to the model specification that includes the two aggregated dummy variables for sustainability criteria and transparency logo and thus only reports one mean WTP estimate for each sub-sample. The other two columns refer to the model specification that includes the corresponding disaggregated dummy variables and thus report for each sub-sample two mean WTP estimates for certified and uncertified sustainability criteria, respectively.

Table 10: EM maximum likelihood estimation results in a LCLM with $Q = 2$ classes for the choice among four three-year fixed-interest investment products

Variables	Class 1		Class 2	
	Parameter estimates (robust z-statistics)	Mean WTP estimates	Parameter estimates (robust z-statistics)	Mean WTP estimates
Yearly nominal interest rate	1.71*** (15.40)	--	10.76*** (14.69)	--
Consideration of sustainability criteria	0.90*** (16.37)	-0.53	0.67*** (4.81)	-0.06
Transparency logo	0.87*** (15.67)	-0.51	0.94*** (7.07)	-0.09
Municipal savings bank	0.68*** (8.58)	-0.40	0.15 (0.84)	n.s.
Co-operative bank	0.67*** (8.34)	-0.39	0.33* (1.85)	-0.03
Direct bank	0.27*** (3.32)	-0.16	-0.20 (-1.08)	n.s.
Sustainability bank	0.49*** (5.99)	-0.29	-0.53** (-2.52)	0.05
	Parameter estimates (robust z-statistics)			
Warm glow	1.05*** (4.75)		--	
Expectation social environment	0.74* (1.71)		--	
Membership environmental organization	1.32*** (2.88)		--	
Affinity left-wing parties	0.60*** (3.01)		--	
Female	0.41** (1.99)		--	
Age	0.01* (1.83)		--	
High education	-0.41* (-1.95)		--	
Living together or married	-0.04 (-0.18)		--	
Western Germany	-0.72*** (-2.64)		--	
Constant	-0.19 (-0.37)		--	
Class share	0.647		0.353	

Note: The basis of the estimation results in this table are data from the first SC experiment with $N = 1001$ respondents, $M = 6$ choice sets, and thus 6006 observations. The upper part of the table reports for both classes and each explanatory variable the parameter estimates and the corresponding robust z-statistics in parentheses. It additionally reports the mean WTP estimates for each non-financial variable (n.s. means that the underlying parameter is not significantly different from zero). The values are calculated by dividing the estimated parameters of the non-financial variables by the estimated parameter of the yearly nominal interest rate. The lower part of the table reports the parameter estimates and the corresponding robust z-statistics in parentheses for the individual characteristics that explain the class membership. The parameters for the second class are normalized to zero so that only parameters for the first class are estimated. * (**, ***) means that the appropriate parameter is different from zero at the 10% (5%, 1%) significance level, respectively.

Table 11: EM maximum likelihood estimation results in a LCLM with $Q = 3$ classes for the choice among four three-year fixed-interest investment products

Variables	Class 1 ("sustainability investor group")		Class 2 ("transparency investor group")		Class 3 ("financial performance investor group")	
	Parameter estimates (robust z-statistics)	Mean WTP estimates	Parameter estimates (robust z-statistics)	Mean WTP estimates	Parameter estimates (robust z-statistics)	Mean WTP estimates
Yearly nominal interest rate	2.88*** (14.43)	--	0.82*** (4.41)	--	11.23*** (13.19)	--
Consideration of sustainability criteria	1.64*** (13.76)	-0.57	0.20** (2.00)	-0.24	0.64*** (4.32)	-0.06
Transparency logo	1.40*** (13.88)	-0.49	0.41*** (3.69)	-0.50	1.01*** (6.78)	-0.09
Municipal savings bank	0.56*** (4.04)	-0.19	0.79*** (5.84)	-0.96	0.20 (1.02)	n.s.
Co-operative bank	0.62*** (4.51)	-0.22	0.76*** (5.75)	-0.93	0.26 (1.39)	n.s.
Direct bank	0.51*** (3.66)	-0.18	0.00 (0.03)	n.s.	-0.22 (-1.13)	n.s.
Sustainability bank	0.93*** (6.56)	-0.32	-0.31* (-1.75)	0.38	-0.61*** (-2.78)	0.05
	Parameter estimates (robust z-statistics)					
Warm glow	1.72*** (6.58)		0.18 (0.64)		--	
Expectation social environment	0.45 (0.90)		1.27*** (2.59)		--	
Membership environmental organization	1.47*** (2.85)		1.31** (2.49)		--	
Affinity left-wing parties	0.99*** (3.98)		0.18 (0.73)		--	
Female	0.49 (1.53)		0.41* (1.68)		--	
Age	0.02 (1.60)		0.01 (1.38)		--	
High education	-0.16 (-0.60)		-0.69*** (-2.76)		--	
Living together or married	0.09 (0.33)		-0.12 (-0.45)		--	
Western Germany	-0.72** (-2.28)		-0.55* (-1.74		--	
Constant	-1.46** (-2.18)		-0.52 (-0.67)		--	
Class share	0.413		0.250		0.336	

Note: The basis of the estimation results in this table are data from the first SC experiment with $N = 1001$ respondents, $M = 6$ choice sets, and thus 6006 observations. The upper part of the table reports for all three classes and each explanatory variable the parameter estimates and the corresponding robust z-statistics in parentheses. It additionally reports the mean WTP estimates for each non-financial variable (n.s. means that the underlying parameter is not significantly different from zero). The values are calculated by dividing the estimated parameters of the non-financial variables by the estimated parameter of the yearly nominal interest rate. The lower part of the table reports the parameter estimates and the corresponding robust z-statistics in parentheses for the individual characteristics that explain the class membership. The parameters for the third class are normalized to zero so that only parameters for the first and second classes are estimated. * (**, ***) means that the appropriate parameter is different from zero at the 10% (5%, 1%) significance level, respectively.

Figures

Figure 1: Original screenshot of an exemplary choice set for the first SC experiment on three-year fixed-interest investment products