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SAFE Working Paper No. 412 | December 2023

Leibniz Institute for Financial Research SAFE
Sustainable Architecture for Finance in Europe

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Electronic copy available at: <https://ssrn.com/abstract=4673139>

Conform to the norm.

Peer information and sustainable investments

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This version: December 2023

Abstract

We conduct a field experiment with clients of a German universal bank to explore the impact of peer information on sustainable retail investments. Our results show that information about peers' inclination towards sustainable investing raises the amount allocated to stock funds labeled sustainable, when communicated during a buying decision. This effect is primarily driven by participants initially underestimating peers' propensity to invest sustainably. Further, treated individuals indicate an increased interest in additional information on sustainable investments, primarily on risk and return expectations. However, when analyzing account-level portfolio holding data over time, we detect no spillover effects of peer information on later sustainable investment decisions.

JEL Classification: D14, G11, C93

Keywords: Household Finance, Sustainable Finance, Experimental Finance, Financial Advice.

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We gratefully acknowledge research support from the Leibniz Institute for Financial Research SAFE. Furthermore, we thank (in alphabetical order) Rob Bauer, John Beshears, Katrin Gödker, Julian Kölbel, Christine Laudénbach, Paul Smeets, Lea Voigt, and Michael Weber for helpful comments and suggestions. The study was pre-registered at the AEA RCT registry under the ID AEARCTR-0010353 and granted ethics approval at the Joint Ethics Committee of the Faculty of Economics and Business Administration of Goethe University Frankfurt and the Gutenberg School of Management & Economics of the Faculty of Law, Management and Economics of Johannes Gutenberg University Mainz.

1 Introduction

People care about what their peers do or think and adjust their behavior accordingly. Building on this, previous research has shown the efficacy of communicating beliefs and behavior of peers as a cost-effective policy tool to alter individual behavior with the aim of reaching policy goals. For example, [Allcott \(2011\)](#) shows that informing households in the US¹ about their energy consumption, relative to peers, causes an increase in overall energy conservation levels in the short-term.²

It is intriguing to transfer these results to design behavioral interventions in other domains. For instance, the European Commission has set out to redirect investments towards sustainable growth.³ Informing retail investors about their peers' propensity to invest sustainably could be a cost-effective tool to bring about the behavior change required to reach this policy goal. Yet, it is unclear whether evidence regarding the efficacy of peer information in inducing behavior change can be transferred to an investment context. Peer effects have been shown to be ineffective in altering financial decision-making in domains such as retirement saving or life insurance purchase ([Lieber & Skimmyhorn, 2018](#)). Peer information can even have counterproductive effects in a financial decision-making context, by decreasing savings rates of pension plan participants ([Beshears, Choi, Laibson, Madrian, & Milkman, 2015](#)). It may hence well be the case that peer information interventions are not fit to alter behavior in an investment context.

To examine the effect of peer information on sustainable investment behavior, we collaborate with a universal bank in Germany and administer a field experiment with a sample of retail investors. We invite current clients of the bank via e-mail to participate in an online experiment, in which they allocate an experimental budget of EUR 10,000 between globally investing equity funds that vary in the extent to which they promote sustainability.⁴ While all participants receive a basic explanation of sustainable

¹This study has been replicated outside of the US, even though lower treatment effects were reported, casting doubt on the cost-effectiveness ([Andor, Gerster, Peters, & Schmidt, 2020](#)).

²This effect tapers off in the long-term, unless the information treatment is repeated ([Allcott & Rogers, 2014](#)).

³<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0097&from=EN>

⁴In experimental studies, real decisions differ from hypothetical ones ([List & Gallet, 2001](#)). If participants expect their fund allocation to have an impact on society, it is important to realize their selection, making

investments, a subset of participants is additionally exposed to peer information.

Related studies have identified different reasons why peer information interventions change individual behavior. We incorporate these reasons in the design of our peer information interventions, manipulating the content of the provided peer information. We aim to identify the one that most significantly influences sustainable investment behavior. First, investors may assume that others have formed beliefs based on relevant private information and may update their own beliefs based on this information (Ellison & Fudenberg, 1993). To capture behavior consistent with this mechanism, we communicate peers' beliefs about the future return of sustainable investments (return treatment) or beliefs about the sustainable impact of sustainable investments (impact treatment) to subgroups of participants. Second, investors may derive utility from behaving in line with a social norm or dis-utility from not acting in line with social norms, for example because they fear social sanctions (Akerlof & Kranton, 2000; Benjamin, Choi, & Strickland, 2010). To capture behavior consistent with this mechanism, we communicate peers' intentions to invest in sustainable products in the future (social treatment) to a third subgroup of participants. Third, investors may be discouraged by social comparisons (Beshears et al., 2015) or may try to "outsmart" their peers with oppositional investment allocations. Behavior consistent with this mechanism would be a reduction in the amount allocated to sustainable funds in response to peer information.

Our results show that peer information influences investor behavior at the aggregate level. Controlling for a wide range of demographics, preferences, and beliefs, we find that compared to the control group, retail investors in the impact, social, and return treatment groups invest an additional EUR 429, EUR 293, and EUR 267 of their EUR 10,000 experimental budget with a concern for sustainability, respectively. We therefore provide evidence that just-in-time peer information increases the willingness to purchase sustainable funds among retail investors in a statistically and economically significant

their choice consequential. Specifically, we invest EUR 10,000 for one randomly selected participant based on their allocation choice. This investment lasts for six months, and any positive return is paid out to the participant. If there is a negative return, the participant receives nothing, ensuring they can only benefit financially from participation. As shown by Charness, Gneezy, and Halladay (2016), realizing the incentive of only one randomly selected participants does not bias behavior in experiments, compared to a setting in which the incentives of all participants are realized.

way. However, the effect size is statistically the same for all three treatment groups. The fact that investors react to all three types of peer information indicates that a combination of multiple mechanisms drives behavior in our context.

We rule out attention to sustainability as an alternative mechanism of the increased allocation to the sustainable fund in the treatment groups. All participants, including those in the control group, are provided with an explanation of the concept of sustainable investing, and are asked about their general experience, knowledge, and beliefs regarding sustainable investments. Therefore, all participants receive information on sustainable investing, indicating that it is the peer information component that drives the differences in allocations that we observe.

To further verify that it is a change in beliefs about peers that drives additional investments in sustainable funds, rather than attention to sustainability or experimenter demand effects (see [Zizzo \(2010\)](#)), we consider heterogeneity between investors. Specifically, we test whether prior beliefs about peers affect participants' response to the treatments. Before providing the peer information, we ask participants to predict peers' propensity to invest sustainably, peers' beliefs about the return of sustainable investments, and peers' beliefs about the impact of sustainable investments. We find that participants in the impact treatment group allocate more to the sustainable fund compared to the control group, regardless of their prior belief. However, the social treatment successfully increases sustainable investments only among retail investors who estimated peers' propensity to invest sustainably to be lower than stated in the provided peer information. Similarly, the return treatment only increases sustainable investments among those whose prior belief regarding peers' expectations about the return of sustainable investments was lower than the provided information. In general, our results indicate that investors are more responsive to peer information if it differs from their prior about the beliefs and behavior of peers. These results are in line with those of [Andre, Boneva, Chopra, and Falk \(2021\)](#), who show that peer information interventions only encourage pro-environmental donations, when the provided information differs from the prior belief of the receiver. Further these results are in line with the findings from the meta analysis conducted by

(Bursztyn & Yang, 2022). The authors show the efficacy of experimental interventions in re-calibrating individuals' misconceptions about peers, which brings about behavior change in the short-term.

We consider further implications of the provided peer information by assessing participants' motivation to seek more information on the subject of sustainable investing. As insufficient investment knowledge has been identified as a factor limiting sustainable investments (Filippini, Leippold, & Wekhof, 2021; Anderson & Robinson, 2022), the increased knowledge resulting from the information search may in turn lead to more investments in sustainable funds. We therefore give investors the opportunity to ask for more information on sustainable investments (beyond the information provided in the experiment) at the end of the study. Our results show that participants across treatment groups are significantly more likely to request additional information about sustainable investments compared to the control group. Specifically, a majority of participants expresses interest in information regarding the risk and return of sustainable investments.

Over the months following the experiment, we observe participants' portfolio holdings in their accounts of the collaborating bank. Specifically, we observe changes in the sustainability of fund holdings between October 2022 (prior to the launch of the experiment), and January 2023. We employ the *Morningstar* globe rating as a definition of the sustainability of investors' fund holdings. Investors with preferences for sustainability have been shown to invest a larger share into those funds that have five globes (Hartzmark & Sussman, 2019). Therefore, we define a fund as sustainable if it has five *Morningstar* globes. We find that participants in the peer information treatment groups do not significantly increase the sustainability of their fund holdings, relative to participants in the control group. This indicates that the peer information interventions do not spill over to later buying decisions.

Our results contribute to the literature on retail sustainable investments. A growing stream of literature identifies non-pecuniary factors as drivers of sustainable investments, where retail investors derive utility from investing in line with their social preferences (Białkowski & Starks, 2016; Riedl & Smeets, 2017; Humphrey, Kogan, Sagi, & Starks,

2020; Bauer, Ruof, & Smeets, 2021; Heeb, Kölbel, Paetzold, & Zeisberger, 2023). Investors are willing to pay more for sustainable investments by accepting higher fees (Riedl & Smeets, 2017; Anderson & Robinson, 2022; Laudi, Smeets, & Weitzel, 2022) or by accepting lower expected returns (Barber, Morse, & Yasuda, 2021; Pástor, Stambaugh, & Taylor, 2022). In addition, previous studies have exposed an indication for a social norm that affects allocations to sustainable investment products (Hong & Kacperczyk, 2009). We add to this by showing that communicating implied social norms for sustainable investments to retail investors during a buying decision increases allocations towards sustainable investment products.

Our findings also contribute to the literature on the efficacy of providing peer information to alter behavior. People derive negative utility from acting against social norms (Levitt & List, 2007). As a result, researchers have explored to what extent peer information can be used to alter financial behavior such as retirement saving (Lieber & Skimmyhorn, 2018; Duffo & Saez, 2002, 2003; Beshears et al., 2015; Bauer, Eberhardt, & Smeets, 2022) as well as non-financial behavior such as energy conservation (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007; Allcott, 2011; Costa & Kahn, 2013), offsetting the CO₂ emissions of a flight (Bernard, Tzamourani, & Weber, 2022), the provision of useful reviews to retailers (Burtch, Hong, Bapna, & Griskevicius, 2018), and political voting (Gerber & Rogers, 2009). We show that disclosing related others' tendencies to invest sustainably as well as peers' beliefs about the impact and return of sustainable investments during an investment decision increase retail investors' likelihood to invest more sustainably themselves. However, this information does not seem to spill over to behavior outside of this decision environment.

More generally, we contribute to the recent discussion on spillover effects of behavioral interventions that are aimed at enhancing sustainable behavior. Individual-level behavioral interventions as a policy tool to solve pressing policy problems like climate change have recently come under scrutiny, considering the marginal sustainable impact of the evoked behavior change.⁵ In contrast, the impact of behavioral interventions may

⁵See for example the discussion by Chater and Loewenstein (2023), who even imply negative spillover effects, where individual-level behavioral interventions draw attention away from necessary system-level

be larger than previously estimated in the presence of behavioral spillovers to other decision environments. Previous evidence on the presence of such spillover effects is mixed. While some studies report positive spillover effects (Ferraro, Miranda, & Price, 2011; Henn, Otto, & Kaiser, 2020), other studies do not or even report negative spillover effects that are evoked by moral licensing (Tiefenbeck, Staake, Roth, & Sachs, 2013; Maki et al., 2019). Our results contribute to this debate by indicating no spillover effects of sustainability-related behavioral interventions in the domain of investment decisions.

2 Experimental design

2.1 Invitation to our experiment

We cooperate with a German universal bank that offers a large variety of retail products and services. We invite current clients of the bank via e-mail to participate in an online experiment. The invitation e-mail includes a direct link to the experiment. To be invited to the study, participants must (i) be clients at the bank, (ii) be older than 18 years, and (iii) have given permission to be contacted via email. Before being administered in the fall of 2022, the study was pre-registered⁶ and granted ethics approval at the ethics committee of one of the authors' universities. Upon completion of the experiment, subjects received a participation fee.

2.2 Experimental setup

We provide the experimental instructions in German. The study starts with some general questions about participants' prior knowledge about investing, investment preferences, and investment behavior. We then provide all participants with an explanation of the concept of sustainable investing and elicit participants' experience, knowledge, and beliefs regarding sustainable investments.

We then randomly allocate participants to one of three treatment groups or a control

interventions.

⁶At the AEA RCT registry under the ID AEARCTR-0010353.

group. The treatment groups are provided with a graphic containing one of the following sentences:

- **Impact treatment:** “About 70 % of Germans say that sustainable investments can have an impact.”
- **Social treatment:** “About 70 % of Germans say that they intend to invest in sustainable investments in the future.”
- **Return treatment:** “About 70 % of Germans say that sustainable investments yield the same or higher returns.”

That is, while all participants receive information on sustainable investments, all participants, except those in the control group are additionally exposed to peer information with varying content. The peer information is provided in a single sentence, which has been shown to be sufficient to alter individual financial behavior ([Bott, Cappelen, Sørensen, & Tungodden, 2020](#)). Further, the information that is provided is based on openly available results from surveys conducted by [Allianz Global Investors \(2019\)](#), [Forsa \(2015\)](#), and [LBBW Research \(2021\)](#) and we provide participants with links to these sources if they wish to verify the information. The wording and appearance of the peer information messages is consistent, allowing us to isolate the effect of the content of the provided information, similar to [Andre et al. \(2021\)](#).

2.3 Fund allocation lottery

Participants allocate an experimental investment budget of EUR 10,000 between two funds. We select both funds such that they differ solely in whether or not they screen companies by sustainability ratings. Both funds invest globally in high-dividend-yield stocks, belong to the same risk class, and are managed by the same firm. However, while the conventional fund considers all companies world-wide, the sustainable fund only invests in companies that have an above-average environmental, social, and governance (ESG) score. Further, certain industries that do not meet the sustainability criteria,

such as arms manufacturers or tobacco companies, are excluded. To avoid the effects of framing and participants conducting online searches for more information of the funds, we do not provide the real names of the funds during the allocation decision, but give them generic names (Fund 1 and Fund 2). We provide the real names of the funds to participants who indicated interest after the allocation decision.

In experimental studies, participants' behavior has been shown to differ when making real versus hypothetical decisions (List & Gallet, 2001). Since having a positive impact is an important decision criterion to sustainable investors, we make the investment decision consequential. Specifically, we invest the amount of EUR 10,000 for one randomly selected participant after the closure of the experiment according to his/her allocation choice in the lottery question for a six-month period. As shown by Charness et al. (2016), realizing the incentive of only one randomly selected participants does not bias behavior in experiments, compared to a setting in which the incentives of all participants are realized. We pay out any positive return on investment at the end of the holding period net of the principal endowment and any transaction costs or fund management fees accrued over the holding period. In case of a negative return, the payout to the randomly selected participant is zero such that participants only have the chance to financially gain from their participation.

3 Sample and methodology

3.1 Sample

We reach out to approximately 200,000 customers of the collaborating German universal bank to participate in our experiment. We invite both clients who already invest in the stock market and those who have expressed interest in investing in the stock market to the bank. 5,198 start the experiment and 3,586 (69.0%) complete it.

We exclude 375 participants who fail to answer both comprehension questions correctly.⁷ Further, we exclude 66 respondents from our sample that belong to either the

⁷See Table C1 for the description and wording of the comprehension questions.

fastest or slowest 1% of respondents to complete the experiment. Finally, we exclude 148 respondents who take less than 25 seconds on the fund allocation question. Our final sample comprises 3,089 complete responses.

Table C2 reflects the summary statistics of the final sample after the aforementioned exclusions. On average, participants allocate more than half of the EUR 10,000 principal endowment to the sustainable fund in the corresponding allocation decision question. The average participant is 49 years old. 63% of the participants are male and 55% are married. 47% of the participants hold a college degree, 33% have children, 19% are retired, and 2% are unemployed. The mean household size amounts to roughly 2.4 people.

3.2 Empirical strategy

To test whether our treatments affect retail investors' allocation decisions, we estimate a set of three OLS regression models in the following form:

$$\textit{Allocation to sustainable fund}_i = \alpha + \beta_i * \textit{Treatment Group}_i + \gamma_{i,j} * \chi_{i,j} + \epsilon_i, \quad (1)$$

where *Allocation to sustainable fund*_{*i*} represents the EUR value which participant *i* allocates to the sustainable fund. *Treatment Group*_{*i*} represents one of three dummy variables which is equal to one if respondent *i* is in the (i) impact, (ii) social, or (iii) return treatment group and zero for a member of the control group.

$\chi_{i,j}$ represents a vector of control variables. First, we include a comprehensive set of the participants' preferences that have been shown to be related to individual (sustainable) investment decisions. In particular, we include measures for the participants', investment horizon, risk attitude (Dohmen, Falk, Huffman, & Sunde, 2010), general trust (Guiso, Sapienza, & Zingales, 2008), patience (Becker, Deckers, Dohmen, Falk, & Kosse, 2012), altruism (Falk et al., 2018; Falk, Becker, Dohmen, Huffman, & Sunde, 2023), self-control (Falk et al., 2018, 2023), and a dummy that indicates whether an individual engages in charitable behavior. Further, we include a set of investment motives, i.e., what participants look for when conducting investment decisions. Here, we include measures

on how important high returns, diversification, dividends, low risk, low fees, and sustainability are for the participants' investment decisions. Finally, we add a comprehensive set of demographic variables, i.e., the participants' age, age-squared, gender, marital status, household size, parental status, education level, and employment status. For variable definitions, please refer to Table C1.

4 Results

4.1 General knowledge and beliefs about sustainable investments

In a first descriptive analysis, we examine the level of participants' knowledge about sustainable investments. Figure 1 shows the respondents' answers to two survey questions. The first question elicits whether respondents know the term 'ESG'. 53.5% of the respondents are not familiar with it while 17.4% have heard it but do not know its meaning and only 21.4% state that they know what it means. The second question elicits how participants rate their own knowledge of sustainable investments on a scale ranging from 1 (Not at all) to 7 (Very much). While 78% of respondents rate their familiarity at 3 or lower, only 10.0% rate their familiarity at 5 or higher.

Figure 2 presents respondents' prior beliefs about their peers' attitudes towards sustainable investments. On average, members of the impact treatment group estimate that about 55.7% of their peers believe that sustainable investments can have an impact. Similarly, members of the social treatment group underestimate the share of their peers' willingness to invest sustainably at 55.4%. Members of the return treatment group underestimate their peers' assessment of sustainable investment returns even more intensely. On average, participants believe that only 49.3% of their peers believe that sustainable investments yield the same or higher returns. Hence, participants in all three treatment groups on average initially underestimate their peers' inclinations towards sustainable investments, where the difference to the true value of 70% is statistically significant at the 0.1% level in all cases.

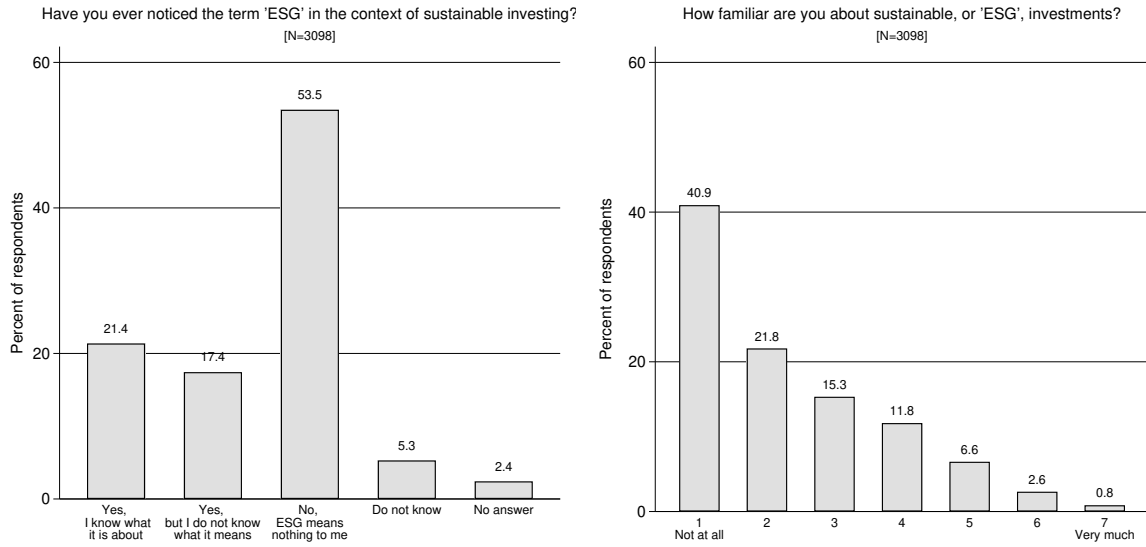


Figure 1: Respondents' ESG knowledge

Notes: This figure shows the results of two survey questions which elicit respondents' knowledge of the term ESG in the context of sustainable investing, as well as familiarity with sustainable investments.

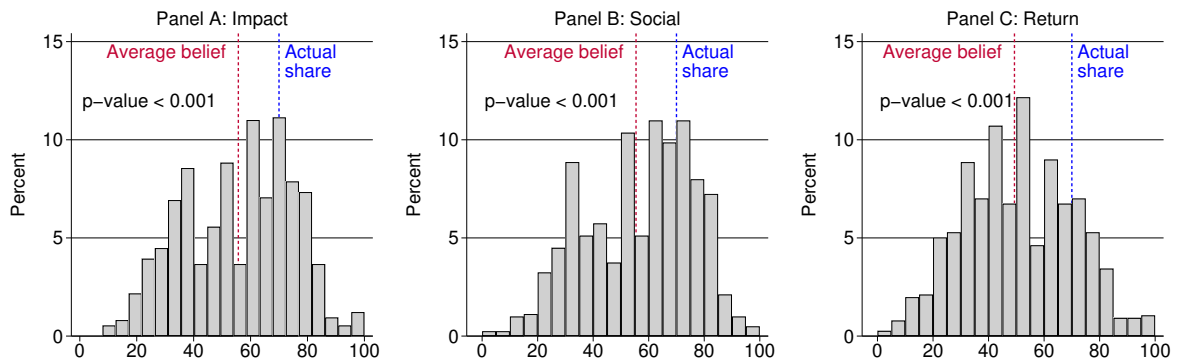


Figure 2: Respondents' priors in sustainable investments

Notes: The red dotted lines in this figure show the results of our survey questions assessing the respondents' priors with respect to the impact, social and return treatment dimensions. Panel A shows the average response of those in the impact treatment group to the question "What percentage of respondents do you think indicated that sustainable investments make an important contribution, e.g., to environmental and climate protection?". Panel B shows the average response of those in the social treatment group to the question "What percentage of respondents do you think indicated that they would like to invest in sustainable investments in the future?". Panel C shows the average response of those in the return treatment group to the question "What do you estimate, what percentage of respondents indicated that you would get the same or higher returns with sustainable investments?". All information treatments indicate a share of 70% in all three cases, which is indicated by the blue dotted line.

4.2 Peer information increase sustainable investments

We now investigate whether the treatments have the predicted effect on investor behavior. Overall, investors in our sample allocate EUR 5,816 of their EUR 10,000 experimental budget to the sustainable fund (see Table C2). We run a series of two-sided t-tests where we compare the allocations to the sustainable fund across the three treatment groups with the corresponding allocations in the control group. Figure 3 presents the results and shows that on average all three treated groups allocate more of the EUR 10,000 principal endowment to the sustainable fund than the control group. The observation of higher allocations compared with the control group is most pronounced for the impact treatment group followed by the social treatment group and the return treatment group. To check the statistical significance of the deltas vis-à-vis the control group, we conduct a series of two-tailed t-tests. The results are documented in Table 1. Participants in the “impact”, “social”, and “return” treatment groups invest significantly higher amounts in the sustainable fund compared to the control group, whereby the differences are statistically significant at the 1% level for the impact treatment group and at the 5% level for the latter two.

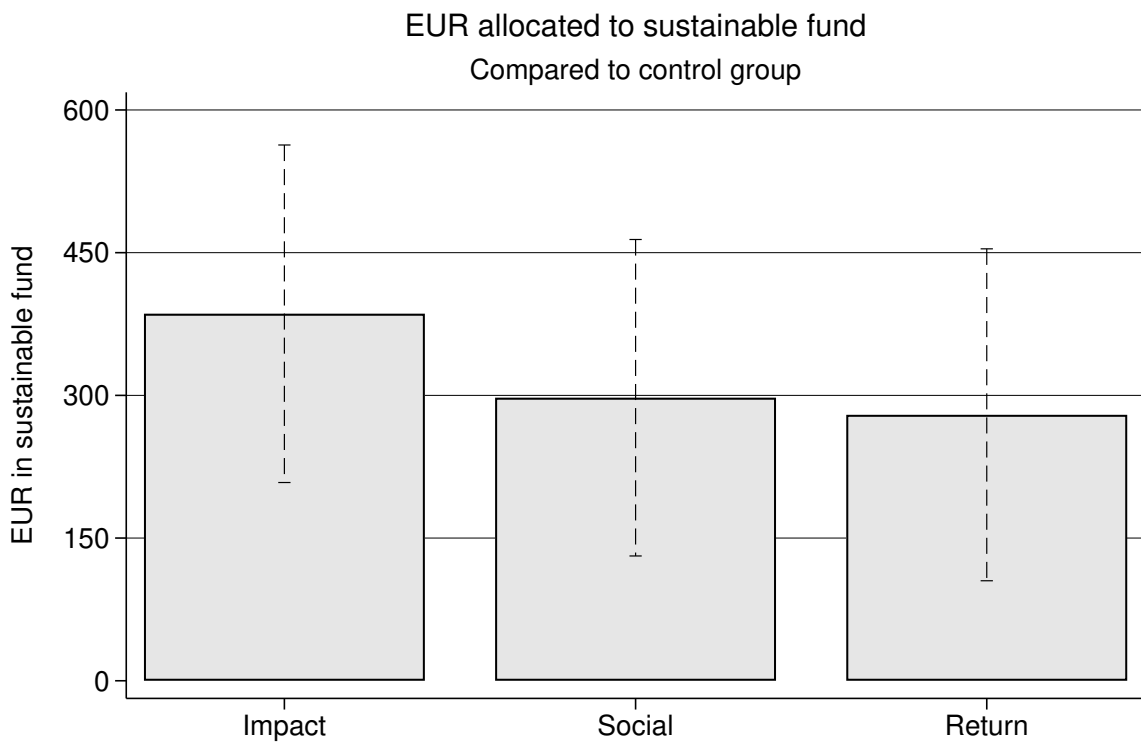


Figure 3: Allocation to the sustainable fund, by treatment

Notes: This figure shows the EUR amount allocated to the sustainable fund, relative to the control group for all three treatment groups (“impact”, “social” or “return”). The whiskers represent 95% confidence intervals.

Table 1: Allocation to the sustainable fund, by treatment

Allocation to the sustainable fund in EUR	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Treatment Mean	SD	Control Mean	SD	Diff	t-Stat	p
Treatment: Impact	5,964.67	2,451.46	5,578.88	2,604.59	385.79	2.99	0.00***
Treatment: Social	5,876.40	2,398.11	5,578.88	2,604.59	297.52	2.38	0.02**
Treatment: Return	5,858.47	2,443.50	5,578.88	2,604.59	279.58	2.18	0.03**

*Notes: This table shows the average EUR amount allocated to the sustainable fund out of the principal endowment of EUR 10,000, by treatment group. Columns 1 and 2 show the mean and standard deviation of the allocation to the sustainable fund in EUR, by treatment. Columns 3 and 4 show the mean and standard deviation of the control group's allocation to the sustainable fund in EUR. Column 5 reports the allocation to the sustainable fund in EUR, relative to the control group, by treatment. Columns 6 and 7 show the outcome of a t-test that reports whether the EUR differences shown in column 5 are significantly different from 0. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.*

To test whether our results hold in a multivariate setup, we run a series of linear regressions where we employ the EUR amount allocated to the sustainable fund as the dependent variable as described in section 3.2. Table 2 presents the results of these regressions and confirms the univariate results. The positive coefficients imply that all three treated groups of participants invest a larger proportion of the EUR 10,000 principal endowment in the sustainable fund than members of the control group. Members of the impact treatment group invest EUR 429 more in the sustainable fund than members of the control group, members of the social treatment group EUR 293 and members of the return treatment group EUR 267. Altogether, the results show that peer information increases allocations to sustainable investments.

Table 2: Just-in-time peer information increase sustainable investments

	(1)	(2)	(3)
Dependent variable:	Allocation to the sustainable fund in EUR		
Treatment: Impact	429.187*** (116.721)		
Treatment: Social		293.257*** (112.366)	
Treatment: Return			267.045** (118.617)
Preferences	Yes	Yes	Yes
Investment motives	Yes	Yes	Yes
Demographics	Yes	Yes	Yes
α	2,441.652*** (803.385)	3,051.300*** (757.741)	2,608.077*** (803.038)
Observations	1,471	1,531	1,485
R ²	0.243	0.253	0.223

*Notes: This table shows the outcome of three iterations of regression specification 1. The EUR amount (out of the principal endowment of EUR 10,000) allocated to the sustainable fund constitutes the dependent variables. Dummy variables that are equal to 1 if a participant is in the “impact”, “social”, or “return” treatment group and 0 if a participant is in the control group represent our main explanatory variables. We add control variables on preferences, investment motives and participant demographics. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Robust standard errors are given in parentheses.*

4.3 The efficacy of peer information depends on investors' priors

Peer information interventions have been shown to encourage pro-environmental behavior only when the provided information differs from the prior of the receiver (Andre et al., 2021). In our case, if participants' beliefs about related others are in line with the information provided as part of the intervention, the information treatment is unlikely to change individual behavior. When participants have overestimated the propensity of related others to invest sustainably, the treatment may even work in the opposite direction, as investors decrease the share invested sustainably to conform to a social norm (boomerang effect, see Cleve and Wicklund (1980)).

To test whether the treatment works differently for participants with different prior beliefs, we elicit participants' expectations about the presented peer information before showing the treatments. That is, we inform participants that we will show them the outcome of a survey with over 1,000 participants, who are from all over Germany and thus reflect the views and attitudes of Germans well. We then ask those in the impact treatment group: "What percentage of respondents do you think indicated that sustainable investments make an important contribution, e.g., to environmental and climate protection?". We ask those in the social treatment group: "What percentage of respondents do you think indicated that they would like to invest in sustainable investments in the future?". We ask those in the return treatment group: "What percentage of respondents do you think indicated that you would get the same or higher returns with sustainable investments?". In all cases, the response was given on a scale from 0 to 100 in one-unit steps.

We categorize participants into those who underestimated the presented information (response < 70) and those who correctly estimated or overestimated the presented information (response >= 70). We then re-run regression specification 1 separately for these two categories.

The results are shown in Table 3. Those in the impact treatment group allocate more to the sustainable fund, relative to the control group, irrespective of their prior. For par-

ticipants in the other treatment groups, the treatment only affects those participants who underestimated the presented information. The most pronounced coefficient difference by prior group can be observed for the return treatment group. For investors with a low prior belief regarding peers' return expectations on sustainable investments, the provided information increases the allocated amount to the sustainable fund by EUR 314. For investors who already had a high prior belief about peers' return expectations on sustainable funds, the peer information treatment does not change the allocation. Similarly, for those with a low prior belief, the social treatment significantly increases the amount allocated to the sustainable fund by EUR 283, while the treatment does not influence the allocation of those with a high prior belief.

4.4 Peer information increase investor demand for information on sustainable investments

So far, we have established that peer information has an effect on investor behavior in the short-term. That is, when peer information is shown right before an allocation decision, retail investors allocate a larger share to a sustainable fund, compared to an otherwise similar conventional fund.

We now consider further implications of peer information on individual investor behavior. Individuals' investment behavior may be affected in the long-term, if the treatments cause an increased motivation to acquire more information on the topic of sustainable investing. While it is difficult to observe what information participants actually look at, we ask participants at the end of the experiment whether they are interested in being provided with additional information about sustainable investments. Participants can submit their interest in receiving additional information on (1) attitudes of Germans towards sustainable investments (social information), (2) expected return and risk of sustainable information (return information), (3) how to structure investments in a way that causes firms to act more sustainably (impact information), or (4) none of the above.

Table 3: The efficacy of just-in-time peer information depends on investors' priors

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
	Allocation to the sustainable fund in EUR					
	Prior < 70			Prior >= 70		
Treatment: Impact	392.754*** (126.799)			507.633*** (182.935)		
Treatment: Social		282.679** (124.522)			259.502 (165.887)	
Treatment: Return			313.684** (125.214)			59.874 (220.010)
Preferences	Yes	Yes	Yes	Yes	Yes	Yes
Investment motives	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes	Yes
α	2,474.867*** (839.898)	2,992.256*** (803.968)	2,271.431*** (830.363)	2,004.533** (1,013.875)	2,332.009** (983.010)	2,475.878** (1,039.290)
Observations	1,255	1,303	1,352	983	995	900
R ²	0.256	0.259	0.223	0.263	0.276	0.283

*Notes: This table shows the outcome of six OLS regressions. We split participants in the treatment groups into sub-samples, according to their stated prior beliefs about the presented peer information (See Table C1 for the wording of prior elicitations). We categorize participants into those who underestimated the presented information (response < 70) and those who correctly estimated or overestimated the presented information (response >= 70). Columns 1, 2, and 3 include participants of the former category in the impact, social, and return treatments, respectively, as well as participants in the control group. Columns 4, 5, and 6 include participants of the latter category in the impact, social, and return treatments, respectively, as well as participants in the control group. The EUR amount (out of the principal endowment of EUR 10,000) allocated to the sustainable fund constitutes the dependent variable. Dummy variables that are equal to 1 if a participant is in the “impact”, “social”, or “return” treatment group and 0 if a participant is in the control group represent our main explanatory variables. We add control variables on preferences, investment motives and participant demographics (See Table C1 for more information on the control variables). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Robust standard errors are given in parentheses.*

Table 4 shows the outcome of three OLS regressions with a binary dependent variable that is equal to 1 if participants indicate being interested further information about sustainable investments and 0 otherwise. Participants in all three treatment groups are significantly more likely to ask for additional information, compared to the control group. We additionally consider what type of information investors are most interested in. The largest share of participants (43.9%) asks for additional information on the risk and return of sustainable investments, followed by additional information on how to have an impact with sustainable investments (20.2%) and additional information on what peers think about sustainable investments (11.2%).

Table 4: Peer information increase investor demand for information on sustainable investments

Dependent variable:	(1)	(2)	(3)
	Information demanded		
Treatment: Impact	0.075*** (0.022)		
Treatment: Social		0.068*** (0.021)	
Treatment: Return			0.048** (0.022)
Preferences	Yes	Yes	Yes
Investment motives	Yes	Yes	Yes
Demographics	Yes	Yes	Yes
α	0.428*** (0.151)	0.274** (0.140)	0.393** (0.153)
Observations	1,453	1,510	1,470
R ²	0.113	0.125	0.119

*Notes: This table shows the outcome of three OLS regressions. The dependent variable is binary and is equal to 1 if participants indicated being interested further information about sustainable investments and 0 otherwise (See Table C1 for the exact wording of the elicitation). Dummy variables that are equal to 1 if a participant is in the “impact”, “social”, or “return” treatment group and 0 if a participant is in the control group represent our main explanatory variables. We add control variables on preferences, investment motives and participant demographics (See Table C1 for more information on the control variables). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Robust standard errors are given in parentheses.*

4.5 Peer information do not spill over to later investment decisions

To get a better sense of the long-term effects of the peer information treatments, we observe participants' portfolio holdings over time. Specifically, we explore, whether the proportion of sustainable funds over conventional funds in participants' portfolios changes between October 2022 (prior to the launch of the experiment) and January 2023.

To define the sustainability of investors' fund holdings, we use the globe rating of the platform *Morningstar*. Sustainably-minded investors have been shown to invest a larger share into those funds that have five globes ([Hartzmark & Sussman, 2019](#)). Therefore, we define a fund as "sustainable", if it has five globes according to the *Morningstar* sustainability rating and as "conventional" otherwise.

Table 5 shows the outcome of two sets of OLS regressions with the changes in the proportion of sustainable funds as dependent variables. All coefficients of the treatment dummies are not significantly different from 0. Therefore, while just-in-time peer information affects sustainable investment behavior, it does not spill over to trading behavior outside of the decision environment.

Table 5: Peer information do not spill over to later investment decisions

Dependent variable:	(1)	(2)	(3)
	Change in sustainability of fund holdings		
Treatment: Impact	-0.003 (0.002)		
Treatment: Social		-0.003 (0.002)	
Treatment: Return			0.000 (0.003)
Preferences	Yes	Yes	Yes
Investment motives	Yes	Yes	Yes
Demographics	Yes	Yes	Yes
α	-0.007 (0.015)	-0.007 (0.015)	0.016 (0.022)
Observations	1,471	1,531	1,485
R ²	0.010	0.009	0.009

*Notes: This table shows the outcome of three OLS regressions. We define a fund as "sustainable", if it has five globes according to the Morningstar sustainability rating and as "conventional" otherwise. The dependent variable in all columns is the change in the proportion of sustainable funds in participants' portfolios between October 2022 and January 2023. Dummy variables that are equal to 1 if a participant is in the "impact", "social", or "return" treatment group and 0 if a participant is in the control group represent our main explanatory variables. We add control variables on preferences, investment motives and participant demographics (See Table C1 for more information on the control variables). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Robust standard errors are given in parentheses.*

5 Conclusion

Using a field study, we provide evidence that just-in-time peer information elevates investments in funds labeled as sustainable. This is the case when providing investors with information about (a) peers' propensity to invest sustainably (social treatment), (b) peers' beliefs regarding the impact (impact treatment) and (c) peers' beliefs regarding the expected return (return treatment) of sustainable investments. In general, our results indicate that investors are more responsive to peer information if it differs from their prior about the beliefs and behavior of peers.

We further consider spillover effects of provided peer information on participants' attitudes and behavior regarding sustainable investments outside of the experimental context. Participants that were exposed to peer information are significantly more likely to request additional information about sustainable investments compared to the control group, especially information regarding the risk and return of sustainable investments. However, participants' do not increase the sustainability scores of their portfolios in the months following the experiment, indicating no spillover effects of the provided peer information.

Results from field experiments are often used to inform public policy ([Levitt & List, 2009](#); [Gneezy & Imas, 2017](#)). Correspondingly, our results inform considerations of the potential merit of providing peer information as a policy tool to move towards the policy goal of increasing sustainable investments. While our results suggest that such behavioral interventions can elevate sustainable investments when they are delivered just-in-time, they show no spillover effects on later investment decisions. Furthermore, the fact that the investors' response to peer information varies depending on prior beliefs suggests the merit of a customer-specific approach.

Further, our results open interesting avenues for future research. While the behavioral interventions that we designed affect investor behavior at the point of decision, they do not have a long-term impact on investor behavior. This is in line with previous research on peer information interventions, which suggests little success for the long-term (see, e.g. [Bauer et al. \(2022\)](#) or the discussion by [Chater and Loewenstein \(2023\)](#)). Future studies

may explore whether continuous repetition of the treatment may extend the duration of the treatment effect, which has proven to evoke long-term behavior change ([Allcott & Rogers, 2014](#)).

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A Appendix

Table C1: List of variables

Variable name	Description
Allocation to the sustainable fund in EUR	The EUR amount invested in the ESG fund by survey participants when given the choice to allocate EUR 10,000 in (a) a sustainable fund or (b) an alternative conventional fund. Corresponding instructions and survey question (translated from German): "Please read the following information carefully. From all participants, we will choose one at random. If you are selected, your decision in the next question will be a real decision. That is, EUR 10,000 will be invested for six months according to your selection. At the end of the six months, the investment will be sold and you will receive the profit from the sale (including accrued dividends). You will not be charged any taxes or fees. An example: If you are drawn and the value of your investment increases by 5% in the six months, you will receive EUR 500 from us. If the price stays the same or falls below EUR 10,000, you receive EUR 0. You can divide the EUR 10,000 between two funds. We have selected the funds so that they differ only in their sustainability orientation. Both funds invest globally in equities, primarily in highly capitalized stocks that are expected to have a higher dividend yield than the market average. <ul style="list-style-type: none"> • Fund 1 considers all companies worldwide. • Fund 2 only considers sustainable companies. This means that Fund 2 excludes stocks of firms with very low ESG scores. Further, certain industries that do not meet the sustainability criteria, such as arms manufacturers or tobacco companies, are excluded. Please choose how you want to divide the EUR 10,000 between the two funds."
Change in the sustainability of participants' portfolios: 5 globe funds	The change in the proportion of sustainable funds in participants' portfolios between October 2022 and January 2023. A fund is defined as "sustainable", if it has five globes according to the <i>Morningstar</i> sustainability rating and as "conventional" otherwise.
Change in the sustainability of participants' portfolios: Article 8 & 9 funds	The change in the proportion of sustainable funds in participants' portfolios between October 2022 and January 2023. A fund is defined as "sustainable", if it can be categorized as article 8 or article 9 fund according to the Sustainable Finance Disclosures Regulation (SFDR) and as "conventional" otherwise.
Comprehension question 1 (d)	Dummy variable that equals one if a respondent answered attention question 1 correctly and 0 otherwise. Corresponding survey question (translated from German): "Who was interviewed in the survey described above? Please select only one of the following answers: <ul style="list-style-type: none"> <input type="checkbox"/> Participants from Germany [correct] <input type="checkbox"/> Participants from all over Europe <input type="checkbox"/> Participants from all over the world"
Comprehension question 2 (d)	Dummy variable that equals one if a respondent answered attention question 2 correctly and 0 otherwise. Corresponding survey question (translated from German): Participants of the just mentioned survey were asked. . . <ul style="list-style-type: none"> <input type="checkbox"/> ...how they assess the impact of sustainable investments, for example on the environment (impact treatment group), whether they want to invest in sustainable investments in the future (social treatment group), about their expectations concerning the return of sustainable investments (return treatment group). [correct] <input type="checkbox"/> ... how they assess the impact of risky assets, for example on the environment (impact treatment group), whether they want to invest in risky assets in the future (social treatment group), about their expectations concerning the return of risky assets (return treatment group). <input type="checkbox"/> ... how they assess the impact of short-term investments, for example on the environment (impact treatment group), whether they want to invest in short-term investments in the future (social treatment group), about their expectations concerning the return of short-term investments (return treatment group)."
Demographic: Age	Participants' self-reported age.
Demographic: Children (d)	Dummy variable that equals one if children live in the participant's household, zero otherwise.
Demographic: College degree (d)	Dummy variable that equals one if the respondent has a college degree, zero otherwise.
Demographic: Household Size	Number of people living in the participant's household.
Demographic: Male (d)	Dummy variable that equals one if the respondent is male, zero otherwise.
Demographic: Married (d)	Dummy variable that equals one if the respondent is married, zero otherwise.
Demographic: Retired (d)	Dummy variable that equals one if the respondent is in retirement, zero otherwise.
Demographic: Self-employed (d)	Dummy variable that equals one if the respondent is self-employed, zero otherwise.
Demographic: Unemployed (d)	Dummy variable that equals one if the respondent is unemployed, zero otherwise.
Information demanded (d)	Dummy variable that equals one if the respondent reported being interested in further information about sustainable investments. Corresponding survey question (translated from German): "We plan to create and distribute tailored information sheets on the various topics related to sustainable investing. Which of the following topics would you be interested in? Please select only one of the following answers:" <ul style="list-style-type: none"> <input type="checkbox"/> How can I use my investments to influence companies to behave more sustainably? [Impact information] <input type="checkbox"/> What do Germans think about sustainable investments [Social information] <input type="checkbox"/> What is the risk / return of sustainable investments [Return information] <input type="checkbox"/> None of the three topics [No information]

Variable name	Description
Investment motive: High return	An ordinal variable that is drawn from the response to the question (translated from German): “How important are the following aspects to you when making investment decisions? – High return”. The response was given on a scale from 1 (Not at all important) to 7 (Very important).
Investment motive: Diversification	An ordinal variable that is drawn from the response to the question (translated from German): “How important are the following aspects to you when making investment decisions? – Diversification”. The response was given on a scale from 1 (Not at all important) to 7 (Very important).
Investment motive: Dividends	An ordinal variable that is drawn from the response to the question (translated from German): “How important are the following aspects to you when making investment decisions? – Dividends”. The response was given on a scale from 1 (Not at all important) to 7 (Very important).
Investment motive: Low risk	An ordinal variable that is drawn from the response to the question (translated from German): “How important are the following aspects to you when making investment decisions? – Low risk”. The response was given on a scale from 1 (Not at all important) to 7 (Very important).
Investment motive: Low fees	An ordinal variable that is drawn from the response to the question (translated from German): “How important are the following aspects to you when making investment decisions? – Low fees”. The response was given on a scale from 1 (Not at all important) to 7 (Very important).
Investment motive: Sustainability	An ordinal variable that is drawn from the response to the question (translated from German): “How important are the following aspects to you when making investment decisions? – sustainability”. The response was given on a scale from 0 (Not at all important) to 7 (Very important).
Preference: Investment horizon	An ordinal variable that is drawn from the response to the question (translated from German): “When you make investment decisions, for example, when investing in stocks or funds: How would you describe your investment horizon?” The response was given on a scale from 1 (Very short-term) to 7 (Very long-term).
Preference: Risk attitude	An ordinal variable that is drawn from the response to the question (translated from German): “How would you rate your willingness to take risks in financial matters” The response was given on a scale from 1 (Not at all willing to take risks) to 7 (Very willing to take risks).
Preference: Trust	An ordinal variable that is drawn from the response to the question (translated from German): “Generally speaking, would you say that most people can be trusted or that you have to be very careful in dealing with people?” The response was given on a scale from 1 (People cannot be trusted) to 7 (People can be trusted).
Preference: Patience	An ordinal variable that is drawn from the response to the question (translated from German): “Are you generally an impatient person, or someone who always shows great patience?” The response was given on a scale from 1 (Very impatient) to 7 (Very patient).
Preference: Altruism	An ordinal variable that is drawn from the response to the question (translated from German): “How willing are you to give to good causes without expecting anything in return?” The response was given on a scale from 1 (Not at all willing) to 7 (Very willing).
Preference: Self-control	An ordinal variable that is drawn from the response to the question (translated from German): “How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?” The response was given on a scale from 1 (Not at all willing) to 7 (Very willing).
Preference: Charity (d)	A dummy variable that is drawn from the response to the question (translated from German): “Do you donate to charity on a regular basis?” It equals one if a participant responded “yes”, else zero.
Prior: Impact	The response given to the following question (translated from German): “In a large-scale study, over 1,000 people were surveyed on the subject of sustainable financial investments. The aim of the survey was to understand what Germans think about sustainable financial investments. The respondents come from all over Germany and thus reflect the views and attitudes of Germans well. Among other things, participants were asked how they assess the positive impact of sustainable investments, for example on the environment. What percentage of respondents do you think indicated that sustainable investments make an important contribution, e.g., to environmental and climate protection?” The response was given on a scale from 0 to 100 in one-unit steps.
Prior: Social	The response given to the following question (translated from German): “In a large-scale study, over 1,000 people were surveyed on the subject of sustainable financial investments. The aim of the survey was to understand what Germans think about sustainable financial investments. The respondents come from all over Germany and thus reflect the views and attitudes of Germans well. Among other things, participants were asked whether they would like to invest in sustainable investments in the future. What percentage of respondents do you think indicated that they would like to invest in sustainable investments in the future?” The response was given on a scale from 0 to 100 in one-unit steps.
Prior: Return	The response given to the following question (translated from German): “In a large-scale study, over 1,000 people were surveyed on the subject of sustainable financial investments. The aim of the survey was to understand what Germans think about sustainable financial investments. The respondents come from all over Germany and thus reflect the views and attitudes of Germans well. Among other things, participants were asked how they assess the return opportunities of sustainable investments. What percentage of respondents do you think indicated that you would get the same or higher returns with sustainable investments?” The response was given on a scale from 0 to 100 in one-unit steps.
Treatment: Impact	Dummy variable that equals one for the respondent in the “impact” treatment group. It equals zero for the respondents in the control group. Members of the “impact” treatment group are provided with the “impact” information treatment (see Section 2.2) before conducting the allocation decision.
Treatment: Social	Dummy variable that equals one for the respondent in the “social” treatment group. It equals zero for the respondents in the control group. Members of the “social” treatment group are provided with the “social” information treatment (see Section 2.2) before conducting the allocation decision.
Treatment: Return	Dummy variable that equals one for the respondent in the “return” treatment group. It equals zero for the respondents in the control group. Members of the “return” treatment group are provided with the “return” information treatment (see Section 2.2) before conducting the allocation decision.

Table C2: Descriptive summary statistics on final participant sample after exclusions

Variable	mean	sd	min	p50	max	N
Age	48.76	15.62	18	49	82	3,098
Allocation to the Sustainable Fund in EUR	5,816	2,48	0	6	10	3,098
Children (d)	0.327	0.469	0	0	1	3,098
College Degree (d)	0.468	0.499	0	0	1	3,098
Household Size	2.358	1.122	1	2	5	3,098
Investment Motive: High Returns	5.356	1.396	1	5	7	3,098
Investment Motive: Diversification	4.521	1.539	1	4	7	3,098
Investment Motive: Dividend	4.682	1.507	1	5	7	3,098
Investment Motive: Low Risk	5.530	1.391	1	6	7	3,098
Investment Motive: Low Fees	5.427	1.526	1	6	7	3,098
Investment Motive: Sustainability	4.397	1.920	1	5	7	3,098
Male (d)	0.629	0.483	0	1	1	3,098
Married (d)	0.546	0.498	0	1	1	2,953
Preference: Investment Horizon	4.931	1.548	1	5	7	3,098
Preference: Risk Attitude	3.547	1.500	1	4	7	3,098
Preference: Trust	2.997	1.561	1	3	7	3,098
Preference: Patience	4.454	1.587	1	5	7	3,098
Preference: Altruism	4.792	1.407	1	5	7	3,098
Preference: Self-control	5.037	1.382	1	5	7	3,098
Preference: Charity (d)	0.501	0.500	0	1	1	3,098
Prior: Impact	55.70	19.21	8	60	100	736
Prior: Social	55.43	19.46	0	60	100	801
Prior: Return	49.32	19.62	0	50	100	756
Retired (d)	0.189	0.392	0	0	1	3,098
Self-employed (d)	0.0468	0.211	0	0	1	3,098
Unemployed (d)	0.0210	0.143	0	0	1	3,098

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