

Altruists going on an ego trip: Beliefs and ambiguity attitudes in socially responsible investment

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Preliminary Draft. Please DO NOT Circulate.

Abstract

Trillions of dollars are engaged in socially responsible investments (SRI). However, the true underlying mechanism for SRI is yet unknown. In this paper, we formally investigate investors' belief and ambiguity perception towards the financial performance of an ESG (environmental, social, governance) fund in an incentivized lab experiment. Participants in our experiment were given exactly the same information about a fund with or without the fund's high ESG rating between treatments. We find that knowing the high ESG rating increased participants' return expectations, which is the opposite of what has been found in widely used unincentivized survey studies. Moreover, the high ESG rating made subjects more conservative when updating on negative information and perceive lower ambiguity. This suggests that the unincentivized elicitation of ESG-related beliefs could be systematically biased. Our results contribute to the understanding of why investors hold high ESG investments and to the design of relevant policies.

Keywords: ESG, Socially responsible investment, Belief, Ambiguity, Experiment

JEL Classification: C72, D81

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1 Introduction

Socially Responsible Investments (SRIs) increase exponentially. Specifically, ESG (environmental, social, and governance) factors increasingly attract a tremendous amount of capital and investors' attention. For instance, a third of the 51.4 trillion dollars in total US assets under professional management is using sustainable investing strategies (EUROSIF, 2021). However, it is still unclear why investors choose to invest in high ESG assets. The most-widely discussed explanation in the literature is social preference. But do these investors really want to do good to society? Or do they expect high ESG investments to offer superior performance by some standards? We quantitatively evaluate these alternative explanations based on investor expectations in a controlled lab experiment with monetary incentives. A complete understanding of the underlying mechanism is crucial, for instance, for policy-makers who would like to promote sustainability, for firms who want to attract more investments, and for funds who need to cater to their clients.

The two main drivers of SRI discussed in the literature are social preferences and financial motivations. On the one hand, investors could engage in SRI because of social preferences and/or signalling (e.g. Bauer and Smeets, 2015), that is, their selfless care about the well-being of others, the society, or the nature, and the tendency to improve their social self-image. Therefore, they are willing to forgo financial performance in order to invest in accordance with their social preferences (e.g. Riedl and Smeets, 2017). On the other hand, the financial consideration approach proposes that investors expect superior return or/and risk performance from high ESG investments (e.g. Weber *et al.*, 2010; Friede *et al.*, 2015; Velte, 2017; Hartzmark and Sussman, 2019). However, the financial consideration approach has not been formally evaluated, and some plausible alternative behavioral mechanisms are left unattended.

First, when evaluating the question of whether investors expect high performances from high ESG investments, the majority of studies mainly rely on survey results based on unincentivized Likert scale questions. Usually, investors are asked whether they think a high ESG investment will outperform a low ESG investment or not on a five or seven-point scale (e.g. Lewis and Mackenzie, 2000; Riedl and Smeets, 2017; Nilsson, 2008; Alniacik *et al.*, 2011). However, this can lead to systematic biases due to two main problems (e.g. Gächter and Renner, 2010; Wang, 2011; Brownback and Novotny, 2018). On the one hand, investors could exhibit desirability bias: those

invested in ESG are likely to be more optimistic about ESG performance because that justifies their initial choice and a self-image as skilled investors (e.g. Lindner *et al.*, 2019). On the other hand, they are also likely to understate the performance of ESG in order to emphasize their prosocial preferences, that is they invest in high ESG not because of money (e.g. Bauer *et al.*, 2019). Therefore, the elicited beliefs may not match investors' true beliefs. Meanwhile, the existing belief measures do not allow for belief updating, nor do they compare investors' short versus long run beliefs, whereas these are also possible differences (e.g. Lin *et al.*, 2009). Moreover, ESG risk expectations are not precisely elicited. What makes it more equivocal is that there is no consensus in the literature as to whether high ESG investments have superior profitability to conventional investments. That is, ESG factors may positively, negatively, or insignificantly impact assets' financial performance (e.g. Margolis and Walsh, 2003; Pelozo, 2009; Aguinis and Glavas, 2012; Eccles *et al.*, 2014; Revelli and Viviani, 2015). On the one hand, high ESG investments, like SRI funds, usually cost more in terms of management fees than conventional investments, which means that they are more likely to be expected to be financially costly (e.g. Walley and Whitehead, 1994; Hamilton, 2000). Thus, it is likely that high ESG investments may perform no better than conventional investments (e.g. Fabozzi *et al.*, 2008; Hong and Kacperczyk, 2009; Krüger, 2015). On the other hand, a firm could afford high ESG that costs more if it outperforms its peers (e.g. Wang and Tuttle, 2014). Therefore, high ESG investments, which invest in the superior firms that could afford high ESG, are likely to be more profitable. Moreover, due to studies' various data sets, research periods, and ESG and performance measurement methods, the relationship between ESG and financial performance may vary. To conclude, there is no objectively correct answer to these survey questions, and it is difficult to elicit what people genuinely think. We therefore propose that investors' beliefs on high ESG investments' performance influence investors' investment decisions. Knowing investors' true beliefs and belief updating on high ESG investments' returns offers a comprehensive understanding of investors' motives for holding high ESG investments and their trading behavior of high ESG investments, which has important implications for asset pricing and strategies of investment portfolio composition (e.g. Bennani *et al.*, 2018).

Second, as financial markets are characterized by ambiguity, it is also likely that investors' domain-specific ambiguity attitude on ESG will influence their investment decisions. In the theoretical financial market, future outcomes are not known with

certainty, but there is a set of possible outcomes that may happen with some probabilities. This is often referred to as risk, which is calculable uncertainty when both future outcomes and probabilities are perfectly known (e.g. Bouchaud *et al.*, 2003; Holton, 2004). However, this is not the case in the real financial market. Investors are far from having a clear idea of those probabilities. Just like risk preferences, every person also has an attitude towards ambiguity, mostly varying with degrees of aversion (e.g. Fox and Tversky, 1995; Machina and Siniscalchi, 2014). A person’s attitude towards ambiguity is connected to ESG because ESG, a new, widely adopted concept, could be perceived as a label to reduce the amount of ambiguity prevalent in the market (e.g. Bossaerts *et al.*, 2010; Moliterni, 2018). Investors actively engage in high ESG because it resolves ambiguity, at least along the dimension of sustainability, even though they may not have a clue about how this is related to financial returns.

To address these issues, we conduct a controlled virtual lab experiment, where subjects faced questions related to a randomly selected high ESG fund. We designed methods with monetary incentives to quantitatively elicit subjects’ beliefs towards the fund’s return, domain-specific ambiguity attitude, and social norms on ESG investing. At the beginning of the experiment, subjects in the treatment group were introduced to ESG concepts but not subjects in the control group. Then, all subjects in both groups reviewed a high ESG fund’s historical returns in the first section. Subjects in the treatment group were shown the fund’s ESG information, and subjects in the control group were not told the fund’s ESG information. We use the exchangeability method (e.g. Baillon, 2008; Abdellaoui *et al.*, 2011) to elicit subjects’ beliefs about the fund’s return. This method is source independent, robust to risk attitude, and encompasses nonlinear probability weighting (e.g. Jiao, 2020). Therefore, it avoids the effects of strategic reputation considerations (e.g. Kreps *et al.*, 1982) or social image concerns (e.g. Ellingsen and Johannesson, 2008) and offers a clean, objective, and independent measure of true beliefs. The exchangeability method can effectively solve the problems mentioned above caused by non-incentivized self-report methods. This method elicits a subject’s median belief on the fund’s return by splitting the fund’s return range into two equally likely disjoint sub-ranges revealed through binary choices between binary prospects. We disguise all questions as choices between lotteries to make it harder for respondents to identify the purpose of the study, game the system, or hedge. Meanwhile, we give monetary incentives to every elicitation question to avoid the chaining problem, i.e., to prevent that errors in the first question

may propagate into the following questions, and subjects may strategically explore the relationship between earlier and later questions (e.g. Cerroni *et al.*, 2012). Our method is superior to the unincentivized Likert scale measured beliefs in two aspects: we precisely gauge beliefs, and we incentivize our questions without telling our intentions. The higher a subject’s median belief, the higher the fund’s expected return. In the second section, we adapt Ellsberg urns with monetary incentives to capture subjects’ domain-specific ambiguity attitudes toward the high ESG rating label (e.g. Halevy, 2007). Specifically, We elicited subjects’ willingness to pay (WTP) on the bets of a randomly selected fund’s return from a box of known the mix of positive and negative returns and the other box unknown mix. Next, we computed subjects’ domain-specific ambiguity attitudes using the discrepancy between their WTPs of the two bets. Then, we employ an incentivized survey question about investment strategy to elicit investors’ norm-following propensities.

This paper explores why investors are more likely to hold high ESG investments and investigate investors’ expectations on high ESG investments’ performance and domain-specific ambiguity attitudes toward the high ESG rating label through an incentivized lab experiment and a comprehensive survey without monetary incentives, all of which are orthogonal to social preferences.

We find that subjects have heterogeneous beliefs on SRIs’ returns compared with conventional investments due to various investment horizons and the funds’ past financial performance. On the one hand, in a short-term investment horizon of one year and a long-term investment horizon of three years, subjects expected a higher return on SRI funds: on average, they expected a 2.8% (p-value = 0.02) higher annual return on the SRI funds than on the conventional funds, which was 135% of the conventional fund’s annual return. We also find that subjects expected a 2.2% (p-value = 0.07) higher annual return on the SRI funds than the conventional funds when the fund’s return was negative in the previous period, which was 146% of the conventional fund’s annual return. On the other hand, we find no significant differences between subjects’ return expectations on the SRI and conventional fund when the fund’s return was positive in the previous period. But, for both the SRI and conventional funds, subjects’ long-term expected returns were significantly higher than short-term expected returns, separately 32% (p-value = 0.00) and 55% (p-value = 0.00) higher by annual return. We also used the unincentivized Likert scale to measure subjects’ beliefs on ESG performance compared with non-ESG in the survey section, and We found that

the outcomes contradict the ones elicited by the incentivized exchangeability method. We find that subjects were likely to intentionally understate their expectations of the ESG investments' performance in the survey questions.

Compared with conventional funds, we find that subjects perceived significantly less risk towards SRI funds in both a short-term investment horizon of one year and a long-term investment horizon of three years and when the return was positive in the previous period. We do not find evidence that subjects perceived significantly different risks with the SRI or conventional funds' short-term and long-term investment horizons. Moreover, we find that the high ESG rating label significantly reduced the subjects' perceived amount of ambiguity in the financial market, 80.6% (p-value = 0.01) less than without the ESG rating label. Therefore, it is likely that investors may consider SRI funds to contribute to risk diversification.

Overall, we find evidence that investors are likely to understate the ESG financial performance to emphasize their social preference motives. Thus, financial motives play an essential role in SRI decisions. Meanwhile, as an alternative understanding approach to ESG investing, a high ESG rating label can promote SRI by reducing the amount of perceived ambiguity in the financial market.

Our findings can be explained by several theories. First, there is a positive relation between unincentivized self-reported tendencies and actual dishonesty (e.g. [Zimmerman et al., 2014](#)). To exhibit their prosocial preferences, investors may conceal their financial motives of ESG investing. Second, construal level theory of psychological distance predicts that concrete construals are more likely to be implemented than abstract construals because of its feasibility and attractiveness (e.g. [Liberman et al., 2007](#); [Trope and Liberman, 2010](#)). Investors' total utility consists of financial utility and non-financial utility (e.g. [Anand and Cowton, 1993](#); [Benson and Humphrey, 2008](#); [Beal et al., 2005](#)). They may rank financial performance-related criteria as most feasible to satisfy their lower construal levels (e.g. [Apostolakis et al., 2018](#)). This means that investors may prioritize achieving a certain level of investment returns, which is the lower construal level. After gaining a sure profit, a high ESG rating maximizes investors' non-financial utility, which is a higher construal level after investors ensure their profitability. Third, [Ellsberg \(1961\)](#) distinguishes ambiguity, a subjective variable of uncertainty, from risk by employing Ellsberg urns. A subject may perceive high ambiguity even where there is sufficient information in case she doubts the reliability and relevance of the information, particularly where there is conflicting opinion

and evidence. Mukerji and Tallon (2001) develop a model to show that ambiguity aversion may reduce investors' trading willingness and thus limits investments diversifications. A high ESG label may reduce investors' perceived ambiguity and inspire their buying behavior of ESG to diversify their investments. Our paper provides experimental evidence of employing these theories to interpret investors' motives of investing ESG: financial performance is an important determinant of SRI decisions; A high ESG rating promotes investors' trading behaviour to diversify investment uncertainties because of less perceived ambiguity in the financial market.

Our findings are consistent with some studies on investors' expectations toward SRI. Hartzmark and Sussman (2019) show that sustainability is viewed as positively predicting future performance and negatively relating to risk. In addition, they find evidence that positive affect influences expectations of sustainable fund performance. But they do not find evidence that high-sustainability funds outperform low-sustainability funds. However, to some degree, our results conflict with some studies reporting financial motives play a minor role in the SRI decisions but social preferences are an important determinant. Riedl and Smeets (2017) find that investors expect to earn much or a bit lower returns on SRI funds than on conventional funds. It is worth noticing that all of these mentioned studies elicit investors' expected returns toward ESG by employing an unincentivized Likert scale of self-reporting method.

Investors' social preferences are not the whole picture of the ESG investing motives. Moreover, only relying on the social preference approach may lead to a less comprehensive or even biased understanding of investors' true motives of SRI decisions, as SRI, not like donation, is capital invested and requires both social impact and commercial outcomes (e.g. Agrawal and Hockerts, 2021). Therefore, financial motives and domain-specific ambiguity attitude toward ESG are considerable alternative approaches to interpret investors' SRI behaviour and important determinants of trading strategies and asset pricing. As investors become more familiar with the concept of ESG rating and ESG integration investment standards are formulated, our proposals might have even more explanatory power to ESG integration investment strategies and asset prices.

2 Experiment

2.1 Design

We employed a between- and within- subject design and randomly assigned participants into two groups: the ESG treatment group and the Non-ESG control group.¹ We particularly selected a high ESG fund with five “Globe”, the highest ESG rating from real funds traded on Morningstar.²

Before subjects started to answer the experiment’s questions, we first asked all subjects to watch a 90 seconds introduction video at the very beginning of the experiment. Subjects in the Non-ESG group watched a video regarding big data concepts irrelevant to our experiment. In contrast, subjects in the ESG group watched a video about ESG concepts relevant to the ESG rating of the fund we selected from Morningstar in the experiment. Subjects can only proceed after they have finished watching the video. Then, they were asked to answer questions related to the video they had just watched. For subjects in the Non-ESG group, we asked them a question about the big data concept mentioned in the video; for subjects in the ESG group, we asked them three questions about E, S, and G’s concepts introduced in the video, separately. If subjects failed twice to give the correct answers to the questions, they would not be eligible for the experiment. We dropped participants who couldn’t understand the concepts of ESG or failed to focus on our experiment. Throughout the experiment, subjects in the ESG group were exposed to the ESG rating information of the fund, such as the definition of ESG and its ESG rating and its sustainable investing strategies. In contrast, subjects in the Non-ESG group received no ESG rating information of the fund. All the other experiment setups, as well as the return information of the fund provided to the subjects on the ESG and Non-ESG groups, were identical. No subject knew the selected fund before the experiment.

In the experiment, subjects answered questions in three sections (Figure 1). All the subjects first reviewed the same fund’s past six years’ annual returns, then chose options related to the fund’s future returns in the first section, played a designed bet in the second section, and finally completed a questionnaire about their demographic information, educational backgrounds, financial literacy questions, and an SRI-related

¹The experiment was conducted in a virtual lab on Zoom due to the impact of Covid-19, using oTree specifically developed for the experiment.

²The randomly selected fund is Allianz Global Investors Fund - Allianz Japan Equity A USD.

survey in the third section.

Experiment Design				
Between Subject	Procedure			
	Section 1		Section 2	Section 3
	*Belief Elicitation With incentives	*Belief Updating	*Domain-specific Ambiguity Attitude With incentives	*Survey Without incentives
Non-ESG Group	No ESG Information (Exchangeability Method)	No ESG Information (Strategy Method + Exchangeability Method)	No ESG Information (Adapted Ellsberg Urn)	Belief, Social Preference, and demographic questions
ESG Group	ESG Information (Exchangeability Method)	ESG Information (Strategy Method + Exchangeability Method)	ESG Information (Adapted Ellsberg Urn)	Belief, Social Preference, and demographic questions

Figure 1: *Experiment Design*

Note: This figure describes the experiment design and methods used. There are two treatments and three sections.

2.2 Belief Elicitation

In the first section, we selected nine consecutive years from the fund’s history. These nine consecutive years period was randomly chosen from any part of the fund’s history. We showed subjects the fund’s past six years’ returns. After subjects viewed the fund’s past six years’ returns, we elicited their beliefs on the fund’s return of the following one year (7th year, a short-term investment horizon) and the fund’s average annual return of the following three years (7th, 8th, and 9th year, a long-term investment horizon). We also observed their belief updating, i.e., their reactions to a positive and a negative return of the fund.

Subjects’ beliefs on the fund’s return are their subjective probabilities of its financial performance. We use the adapted exchangeability method (Bailon, 2008) to elicit subjects’ beliefs through binary choices between binary prospects of the fund’s returns. A subject’s belief on the fund’s return composes a state space, S , with a boundary of the expected lowest and highest return, $[S_{lowest}, S_{highest}]$. Her beliefs S_x distribute along with the state space S . Thus, subjects have various belief distributions. A subject’s median belief, S_{median} , splits her belief state space of the fund’s return into two equally likely sub-events, $\text{Prob}([S_{lowest}, S_{median}]) = \text{Prob}([S_{median}, S_{highest}])$, which are indifferent for the subject to bet on the two complementary sub-events because their probabilities are one-half. Thus, we first ask a subject to specify

her expected upper and lower bounds of a fund return in a future period, $[Return_{min}, Return_{max}]$. Then, to elicit her median belief, we ask her to choose through several series of binary sub-events split by middle values $Return_{\frac{1}{2}}$. If she is indifferent between the subranges of return $[Return_{min}, Return_{\frac{1}{2}}]$ and $[Return_{\frac{1}{2}}, Return_{max}]$, the middle value $Return_{\frac{1}{2}}$ is her median belief on the fund’s return. Therefore, to elicit subjects’ median beliefs on the fund’s return, we use a series of two-option lottery choices and ask subjects to choose one of the two until reaching our desired level of precision.

We gave an example to elaborate on how subjects were paid based on their choices in the first section before they started to answer the real questions. They first reviewed the description of the fund. All subjects observed exactly the same fund. They were informed about the fund’s investment information, for instance, its investment philosophy and strategy. We showed a figure of the fund’s annual returns in the past six years using Y1 to Y6 instead of specific years so that subjects had no idea of the exact period. In this way, we excluded the effects of timeframes. Subjects in the Non-ESG group were not told any ESG information of the fund. In contrast, subjects in the ESG group were informed of additional ESG information about the fund compared with the Non-ESG group. For instance, they were told that the selected fund has the highest ESG rating, five “Globe”, in Morningstar, and additional explanations of the ESG factors. Therefore, we could study the impact of the ESG rating information on subjects’ expected returns of the fund.

2.2.1 Eliciting One-Year Median Belief

For the first step, we elicited subjects’ expected highest and lowest annual returns of the fund in the 7th year. We told subjects what the fund’s historical highest (49.4%) and lowest (−42%) annual returns were, respectively, and asked subjects to choose their expected possible highest and lowest returns of the fund of the following year (7th year) separately on a range slider with a boundary of the historically highest and lowest return. To avoid an anchoring effect, we set the selector button on the range slider not to be shown until subjects clicked the range slider to choose their expected return. To prevent subjects from gaming the experiment, i.e., selecting the largest annual return range from −42% to 49.4%, we rewarded subjects who input the narrowest expected return range that includes the fund’s annual return of the prediction year among all subjects’ inputted ranges. In our sample, the average

expected highest annual return is 20.2%, and the average expected lowest annual return is -2.4% . Therefore, subjects' inputted expected annual return ranges are much narrower than the largest, indicating that subjects did not game the experiment.

For the second step, after knowing a subject's expected highest and lowest annual returns, we calculated her middle expected annual return, which was the average of her expected highest and lowest returns. Then, we split her expected annual return range into two complementary sub-ranges, which were $[Return_{min}, Return_{mid}]$ and $[Return_{mid}, Return_{max}]$. Thus, the next question was based on the expected highest and lowest annual returns previously determined in the first step. The subject was offered to bet either on $[Return_{min}, Return_{mid}]$ or on $[Return_{mid}, Return_{max}]$. Her expected annual return of the fund was included in the chosen sub-range. A new middle expected annual return, which further split the chosen sub-range into two complementary sub-ranges, was generated based on the previous step selected sub-range. The subject was offered to bet again on the new generate sub-ranges. The determination of indifferences was then conducted through a bisection process until the desired precision level was reached. We repeated the above procedure twice to obtain subjects' middle expected annual returns on the fund's annual return with a precision of less than 1.43% error (the length of the smallest sub-range based on the average range of expected annual return, $\frac{(20.33\% + 2.62\%)}{2^4}$) compared with subjects' median beliefs. We gave a reward to every bet question. If the chosen option includes the actual annual return of the fund and the question is randomly selected as the reward question, a subject could receive five euros as a reward.

Here is an example. If a subject input 0% as the expected lowest return and 20% as the expected highest return, her middle expected annual return is $10\% (\frac{(20\% + 0\%)}{2})$. Then, we ask her to choose between two lotteries (0%, 10%) and (10%, 20%). The chosen lottery should include her expected annual return of the fund. If she chooses (0%, 10%), her new middle expected annual return is $5\% (\frac{(10\% + 0\%)}{2})$. We ask her to choose again between two lotteries of (0%, 5%) and (5%, 10%), which should include her expected return. If she chooses (5%, 10%), her middle expected annual return is updated to $7.5\% (\frac{(10\% + 5\%)}{2})$. Finally, we ask her to choose between two lotteries of (5%, 7.5%) and (7.5%, 10%). If she chooses (7.5%, 10%), her middle expected annual return becomes $8.75\% (\frac{(10\% + 7.5\%)}{2})$. We take this final middle expected annual return 8.75% as her median belief toward the fund's return, and the

error is less than 1.25% compared with her true median belief.

2.2.2 Two Scenarios of One-Year Median Belief

After obtaining subjects' median beliefs toward the fund's return of the following year, we use the strategy method to observe the differences in subjects' reactions between the ESG and Non-ESG groups to a positive and negative fund return in the previous year to study their belief updating. Subjects were told that they would find two scenarios of the fund's 7th year's annual return, and one of the two is true. One scenario showed that the fund's 7th year's return is 22.22% which is actual, and the other scenario showed that the 7th year's return is -22.22% which is fake. We randomized the sequence of the two scenarios to rule out order effects. Then, we use the same adapted exchangeability method to elicit subjects' updated median beliefs toward the fund's 8th year's return after they observed the two scenarios of the fund's 7th year's return.

2.2.3 Eliciting Three-Year Median Belief

We also elicited subjects' median beliefs toward the fund's annual return in a long-term investment horizon. After reviewing the fund's past six years' annual returns, subjects were asked to predict the following three years' average annual return. To avoid order effects, we randomized the sequence of eliciting subjects' one-year median beliefs and three-year median beliefs.

2.2.4 Eliciting Quartile Beliefs

Based on the obtained median belief, we could further elicit a subject's first quartile belief and third quartile belief by using the same adapted exchangeability method above. Based on the expected lowest annual return and the median belief elicited in the previous steps, a subject was offered to bet either on $[Return_{min}, Return_{\frac{1}{4}}]$ or on $[Return_{\frac{1}{4}}, Return_{median}]$. Like the median belief eliciting procedure, the determination of indifferences was conducted twice through a bisection process to obtain a subject's first quartile belief on the fund's annual return. Similarly, based on the expected highest annual return and the median belief elicited in the previous steps, a subject was offered to bet either on $[Return_{median}, Return_{\frac{3}{4}}]$ or on $[Return_{\frac{3}{4}}, Return_{max}]$.

Then, we obtained a subject’s third quartile belief toward the fund’s annual return. A subject’s belief distribution can be drawn by her quartile beliefs.

2.3 Eliciting Domain-specific Ambiguity Attitude

In section two, we elicited subjects’ domain-specific ambiguity attitudes, which are their perceived ambiguity toward the high ESG rating. Investors may hold various ambiguity attitudes and perceive different degrees of ambiguity toward a high ESG rating label. On the one hand, ESG rating may resolve some ambiguity in the financial market because it reflects assets’ ESG risk from the sustainable perspective. On the other hand, ESG rating may also increase ambiguity in the financial market. For instance, it may increase the difficulty of predicting the market based on various ESG policies, or investors may have difficulties to understand the ESG concept due to it is a relative new concept. In the second section of the experiment, we used two adapted Ellsberg urns tasks to measure subjects’ domain-specific ambiguity attitudes towards the same fund with and without the high ESG rating information. Thus, we can measure the effect of the high ESG rating on subjects’ domain-specific ambiguity attitudes by comparing the ESG and non-ESG groups. We first elicited subjects’ willingness to pay (WTP) for risk and then elicited their WTP for ambiguity. For ambiguity-averse people, they have less WTP for ambiguity; oppositely, for ambiguity-seeking people, they have more WTP for ambiguity. Subjects’ ambiguity attitudes can be measured by the margin of WTP for risk and ambiguity.

In the first step, we elicited subjects’ beliefs toward the market performance. We randomly selected 100 funds associated with the highest ESG rating (5 “Globe”) from Morningstar. Subjects in the ESG group were told that all the designated 100 funds have the highest ESG rating in Morningstar, but subjects in the Non-ESG group were not told about the funds’ ESG rating information. The rest information is exactly the same for subjects in both groups. Then, we elicited subjects’ beliefs on the risk-return performance of the 100 funds by using the exchangeability method applied in the first session. Subjects were asked to choose through binary lotteries, which included their expected numbers of funds generating positive annual returns among the 100 funds. We repeated four rounds to reach the precision error of less than 3% (3 funds). Thus, we knew subjects’ beliefs on the proportion of the funds generating positive and negative returns among all funds.

In the second step, we elicited subjects' WTPs for risk and ambiguity in the market. An adapted Ellsberg urns task was applied to elicit subjects' WTP for the risk. Based on subjects' beliefs on the proportion of the number of positive and negative annual returns of the funds, we told subjects that we specifically selected exactly the same proportion of the number of positive and negative funds they expected. We randomly labeled the funds from 1 to 100, and we used balls labeled from 1 to 100 to represent the funds correspondingly and put them into an urn. The bet was: A subject was endowed 5 euros. A ball in the urn was randomly selected by the computer. If the return of the fund represented by the selected ball was positive, a subject could earn additional 5 euros as her reward; if the return of the fund represented by the selected ball was negative or zero ($\leq 0\%$), a subject would earn nothing. A subject needed to pay a fee for playing the bet using the endowment received. The bet price was randomly generated by the computer, ranging from 0 to 5 euros in 0.5 increments. If her payment for the bet was less than the bet price or 0 euro, the bet would not happen, and she could keep the endowment. If her payment for the bet was equal to or more than the bet price, the bet would happen. The payment amount for the bet was deducted from her endowment. Thus, she needed to choose the highest amount of her willingness to pay for the bet if she wanted to play the bet. On the next page, we told her the bet price and asked her to input the label number of the fund if she was qualified to play the bet. At the end of the experiment, she was told the results of the bet if this task was randomly selected as her final reward. In the third step, the other adapted Ellsberg urns task was employed to elicit subjects' willingness to pay for the ambiguity. At the beginning of the task, we told subjects that we specifically selected 100 funds. However, the proportion of the number of positive and negative annual returns of the funds was unknown. We repeated the above step and asked subjects to play the same bet to elicit their highest WTP for the ambiguity.

To confirm whether subjects in the different treatment groups had significantly different ambiguity attitudes or not at the beginning of the experiment, we obtained their ambiguity attitudes before the first section started. Similarly, we adapted Ellsberg Urns to elicit subjects' WTP for risk and WTP for ambiguity. We showed two scenarios to subjects on the left and right sides separately on the same page for comparison. In scenario one on the left side, we told subjects that an urn was filled with exactly five black and five white chips. In scenario two on the right side, we told subjects that an urn was filled with ten chips that are possibly black or white, but

we do not know their relative proportion. We gave every subject 5 euros for each scenario (the same amount as session two of eliciting perceived ambiguity above) as an endowment and asked them to play a bet. The bet was: a ball in the urn was randomly selected by the computer. Before choosing a ball, we asked subjects to predict the ball's color. If the chosen ball was the same color as the subject predicted, she could earn an additional 5 euros as her reward; if the selected ball was different from the subject predicted, a subject could earn nothing. A subject needed to pay a fee for playing the bet using the endowment received. Therefore, her gain of each scenario was: (the endowment received – the payment for the bet + the additional reward).

2.4 Survey

In the third section, in both the ESG and non-ESG groups, we used the unincentivized Likert scale to elicit subjects' return expectations and risk perceptions regarding ESG equity integrated funds compared to conventional equity funds, their perceptions of the ESG investing social impact, and their trusts on others and donation willingness, and their attitudes toward reciprocity in relationships. Other variables, such as demographic and financial literacy questions, were also asked.

3 Procedure

This experiment was conducted at the Behavioral & Experimental Economics Laboratory (BEELab), School of Business and Economics, Maastricht University. In total 335 subjects of which 59% female and an average age of 22 (199 females and 136 males, aged 19 – 36) participated in the experiment conducted during October and November 2021 over 25 sessions. There were 171 subjects of which 61.4% female in the Non-ESG group and 164 subjects of which 58.5% female in the ESG group. Most of the participants were students of economics and management (283 participants) or the social sciences (20 participants) at the School of Business and Economics, Maastricht University. They were recruited through the Behavioral & Experimental Economics Laboratory (BEELab) at Maastricht University. None of them were aware of the true goal of the experiment. They were only told that the experimenter wanted to collect their choices in a prediction experiment.

At the beginning of the experiment, subjects were introduced to the sections' content and payment method of the experiment. Subjects' earnings consist of two payment parts: a flat show-up fee of €3, and an additional average of €6.25. We randomly selected one question for each subject in the first two sections and rewarded her according to her answer as her additional gain. The experiment took around 45 minutes on average. Full experimental instructions and example screenshots can be found in Supplementary Materials.

4 Results

4.1 Belief

Figure 2 depicts subjects' average median beliefs toward the fund's return in the ESG and Non-ESG treatment groups. In the short-term (one year) and long-term (three years) investment horizons, subjects' median beliefs toward the fund's return are significantly higher in the ESG group than in the Non-ESG group (separately, 2.8% and 1.9% higher; p -value = 0.02 and p -value = 0.08). In both the ESG and Non-ESG groups, compared with their median beliefs toward the fund's long-term (three years) annual return, subjects' median beliefs toward the fund's short-term (one year) return were significantly higher (separately, 3.5% and 4.4% higher; p -value = 0.00 and p -value = 0.00). Interestingly, when we look at subjects' reactions to the scenarios of a positive return of the fund in the previous year, we do not find a significant difference in subjects' median beliefs between the ESG and non-ESG groups (p -value = 0.32). However, we find that subjects' median beliefs are significantly higher in the ESG group than in the Non-ESG group when subjects have observed a negative return of the fund in the previous period (2.2% higher; p -value = 0.07). This indicates that subjects may expect ESG to outperform Non-ESG when there is a downturn in the financial market, implying that subjects are likely to believe that ESG integration funds are more resilient than conventional funds.

We examine the effect of ESG treatment more formally in Table 1 using regressions combined with the survey data by the Likert scale. Specifications from (1) to (4) use subjects' median beliefs towards the fund's return in the scenarios of one year, three years, and positive and negative returns of the fund in the previous year as the dependent variable. The main independent variables are treatments of subjects

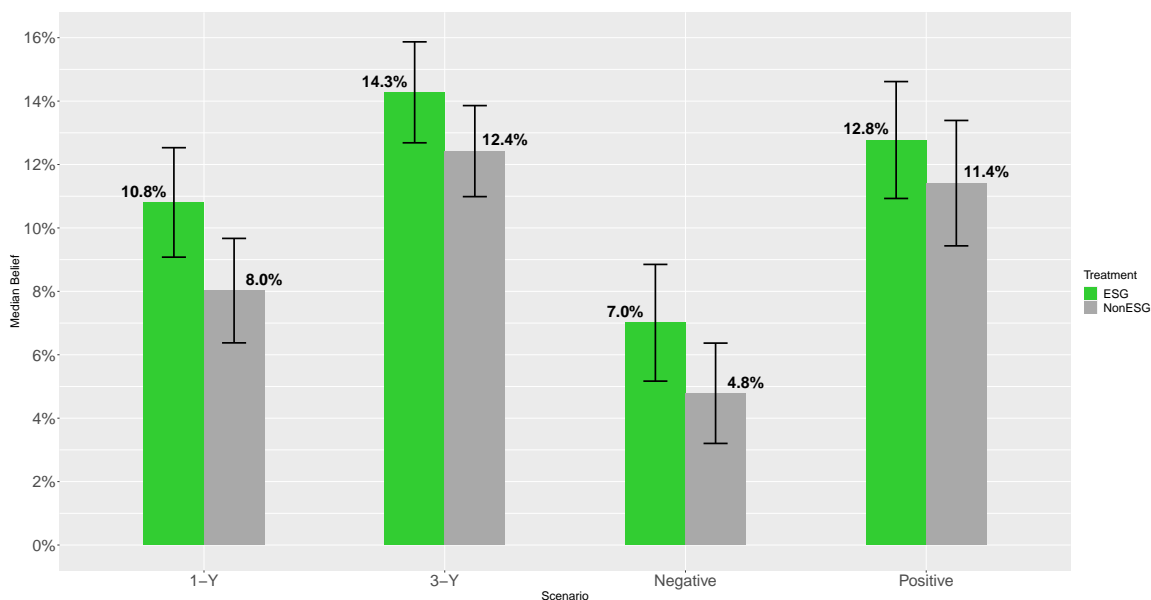


Figure 2: *ESG Vs. Non-ESG Beliefs on the Fund Returns by Scenarios*

Note: This figure plots the comparison of subjects’ median beliefs toward the fund’s returns between the ESG and Non-ESG treatment groups in the four scenarios, respectively (i.e., the one-year and the three-year investment horizons, a positive and a negative return in the previous year).

belonging to the ESG and the Non-ESG groups, subjects’ expected returns on ESG ratings, their perceptions of risk and social impact towards SRI, their donations, their financial knowledge, and their financial literacy. All of the above independent variables were captured by the Likert scale in the unincentivized survey. We control for demographic variables, including gender and education level. Table 1 presents consistent evidence suggesting that subjects believed a higher return of the high ESG fund than the conventional fund. Taken as a whole, the above results emphasize that high ESG information can positively impact subjects’ beliefs toward investment performance.

4.2 Risk Perception

ESG rating reflects assets’ ESG related risk. A higher ESG rating indicates less ESG-related risk. Therefore, investors may perceive less risk on the assets associated with higher ESG ratings and more risk on those associated with lower ESG ratings. A subject’s belief distribution of the fund’s future return can be drawn by the elicited the lowest, first quartile, median, third quartile, and the highest beliefs towards the

Table 1: *Subject Median Belief*

This table shows how the high ESG rating information impacted subjects' beliefs toward the fund return. Non-ESG group is the baseline. Subjects' median beliefs toward the fund's return are significantly higher in the ESG group compared with the Non-ESG group.

	<i>Dependent Variable</i>			
	<i>Belief</i>			
	(1)	(2)	(3)	(4)
	1-Y	Negative	Positive	3-Y
ESG	2.9739** (2.402)	2.3507* (1.849)	1.6250 (1.170)	1.9763* (1.800)
Ambiguity Attitude	0.2311 (0.171)	-1.2015 (-0.868)	0.6927 (0.458)	2.1795* (1.823)
ESG*Ambiguity Attitude	0.4337 (0.428)	-0.6284 (-0.604)	1.8717* (1.647)	0.9515 (1.059)
Return by ESG Rating	0.1216 (0.236)	-0.4260 (-0.806)	-0.7450 (-1.290)	-0.2298 (-0.503)
ESG Impact	-0.3307 (-0.522)	-0.2229 (-0.343)	-0.2258 (-0.318)	0.3133 (0.558)
ESG Risk	0.2982 (0.642)	0.4025 (0.843)	0.7842 (1.504)	-0.0188 (-0.046)
Trust	0.2410 (0.917)	0.3962 (1.469)	-0.3450 (-1.171)	-0.0255 (-0.109)
ESG Good Cause	0.2017 (0.741)	-0.1065 (-0.381)	0.0304 (0.099)	0.3693 (1.530)
ESG Return Belief	-0.0718 (-0.119)	-0.7613 (-1.224)	0.1632 (0.240)	-0.7808 (-1.454)
Positive Reciprocity	-0.2344 (-0.526)	0.2003 (0.438)	-0.0641 (-0.128)	-0.5628 (-1.424)
Negative Reciprocity (Self)	0.2388 (0.802)	0.3523 (1.152)	-0.0439 (-0.132)	0.3663 (1.388)
Negative Reciprocity (Other)	-0.0695 (-0.209)	-0.2042 (-0.597)	-0.2297 (-0.615)	-0.4933* (-1.671)
Gender	-2.1731 (-1.618)	1.5384 (1.115)	-5.5449*** (-3.680)	-0.0656 (-0.055)
Financial Literacy	-0.9522 (-1.032)	-0.8849 (-0.217)	-0.8595 (-0.855)	-2.5853*** (-3.159)
Financial knowledge	1.3370*** (2.713)	-0.3000 (-0.593)	1.7564*** (3.177)	0.1645 (0.377)
Donation	0.0025 (0.838)	0.0012 (0.412)	-0.0017 (-0.515)	-0.0006 (-0.218)
Education	-0.9483 (-1.161)	0.1657 (0.198)	-0.0325 (-0.036)	-0.4674 (-0.646)
Constant	7.0580 (1.461)	4.5441 (0.916)	13.6107** (2.592)	24.4644*** (5.710)
Observations	335	335	335	335
R ²	0.06515	0.03716	0.0761	0.0807
Adjusted R ²	0.01502	-0.01447	0.02656	0.0314
Residual Std. Error	11.04 (df = 317)	11.34 (df = 317)	12.38 (df = 317)	9.788 (df = 317)
F Statistic	1.3 (df = 17; 317)	0.7197 (df = 17; 317)	1.536 (df = 17; 317)	1.637 (df = 17; 317)

Note:

t-statistics are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

fund’s future return. Specifically, a subject’s interquartile belief toward the fund’s future return demonstrates her risk perception of the fund. A subject perceives more risk if the range of her interquartile belief is more extensive.

First, we examine subjects’ expected return ranges of the fund. Figure 3 depicts subjects’ average expected return ranges in the ESG and Non-ESG groups. We find that the ESG group subjects’ average expected return range of the fund is significantly more constrained than the Non-ESG group in the short-run (p-value = 0.00) and long-run (p-value = 0.05), or when the fund’s previous return was positive (p-value = 0.01). However, we find no significant difference in the average expected return ranges between the ESG and Non-ESG groups when the fund’s previous return was negative (p-value = 0.47). Table 2 reports the regression results of the ESG treatment effect on subjects’ expected return ranges by controlling the variables from the Likert scale survey questions.

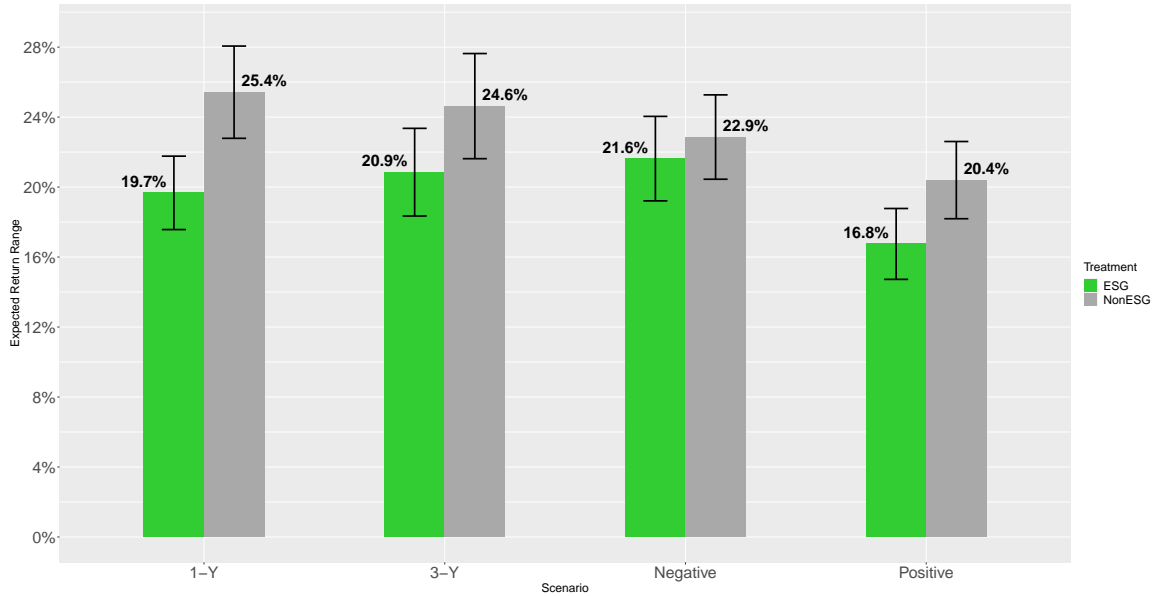


Figure 3: *ESG Vs. Non-ESG Expected Return Ranges by Scenarios*

Note: This figure plots subjects’ average expected return ranges, the distances between the expected lowest returns and the expected highest returns, for the four respective scenarios (i.e., the one-year and three-year investment horizons, and a positive and a negative return over the last year).

Second, we use a subject’s interquartile belief to measure her risk perception toward the fund’s return. Subjects’ interquartile beliefs reflect the volatility of their expected returns. A more extensive interquartile belief indicates a higher expected

Table 2: *Expected Return Range*

This table shows how the high ESG rating information impacted subjects' expected return ranges toward the fund return. Non-ESG group is the baseline. Overall, subjects' expected return ranges toward the fund's return are significantly narrower in the ESG group compared with the Non-ESG group.

	<i>Dependent Variable</i>			
	<i>Return Range</i>			
	(1) 1-Y	(2) Negative	(3) Positive	(4) 3-Y
ESG	-4.9551*** (-2.857)	-0.6982 (-0.394)	-3.0804** (-1.991)	-3.5971* (-1.798)
Ambiguity Attitude	3.6608*** (1.938)	-0.5096 (-0.264)	-0.712 (-0.423)	-0.2499 (-0.115)
ESG*Ambiguity Attitude	0.5433 (0.383)	1.5370 (1.060)	0.4639 (0.367)	2.5253 (1.543)
Return by ESG Rating	-0.7910 (-1.097)	0.3243 (0.440)	0.0142 (0.022)	1.2338 (1.483)
ESG Impact	-0.7316 (-0.825)	0.0511 (0.056)	-0.8256 (-1.043)	0.5287 (0.517)
ESG Risk	-0.9843 (-1.512)	-0.2957 (-0.444)	-1.1472** (-1.976)	-0.7568 (-1.008)
Trust	-0.4193 (-1.140)	-0.7450** (-1.982)	-0.3279 (-0.999)	-0.8619** (-2.031)
ESG Good Cause	0.8087** (2.120)	0.3661 (0.939)	1.0087*** (2.965)	1.4944*** (3.396)
ESG Return Belief	-0.8136 (-0.959)	0.0241 (0.028)	-0.9752 (-1.289)	1.2606 (1.288)
Positive Reciprocity	0.9526 (1.526)	0.8036 (1.259)	0.1562 (0.280)	-0.2582 (-0.358)
Negative Reciprocity (Self)	0.3350 (0.803)	0.5405 (1.268)	0.4591 (1.234)	0.6519 (1.355)
Negative Reciprocity (Other)	-1.1332** (-2.431)	-0.2620 (-0.579)	-0.2497 (-0.630)	-0.2577 (-0.479)
Gender	-0.9883 (-0.525)	-2.9284 (-1.523)	-2.155 (-1.284)	-4.2213** (-1.945)
Financial Literacy	1.5520 (1.201)	0.5095 (0.386)	1.6614 (1.441)	0.1659 (0.111)
Financial knowledge	-0.1205 (-0.175)	0.9525 (1.350)	-0.3495 (-0.568)	0.0672 (0.084)
Donation	0.0075* (1.819)	0.0042 (1.005)	0.0018 (0.495)	-0.00039 (-0.082)
Education	-0.1541 (-0.135)	-1.9064 (-1.631)	-0.2803 (-0.275)	-2.099 (-1.591)
Constant	22.7761*** (3.365)	13.0202* (1.882)	20.1680*** (3.341)	16.8727** (2.161)
Observations	335	335	335	335
R ²	0.1067	0.05148	0.08075	0.09647
Adjusted R ²	0.05883	0.0006133	0.03146	0.04801
Residual Std. Error	15.46 (df = 317)	15.8 (df = 317)	13.79 (df = 317)	17.84 (df = 317)
F Statistic	2.228 (df = 17; 317)	1.012 (df = 17; 317)	1.638 (df = 17; 317)	1.991 (df = 17; 317)

Note:

t-statistics are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

return volatility. Therefore, the more constrained a subject’s interquartile belief, the less she perceives risk. Below we compare subjects’ average interquartile beliefs between the ESG and Non-ESG groups. Figure 4 depicts subjects’ average risk perceptions in the ESG and Non-ESG groups. Table 3 reports the regression results of the ESG treatment effect on subjects’ risk perception by controlling the variables from the Likert scale survey questions. We find that, in the short-run (1 year) and the long-run (3 years) or when the fund’s previous return was positive, subjects in the ESG group perceived significantly less risk than those of the Non-ESG group (separately, p-value = 0.04, p-value = 0.04 and p-value = 0.09); in contrast, subjects between the ESG group and the Non-ESG group have no significant difference in risk perception when the fund’s previous return was negative. We find no evidence that subjects perceived risk significantly differently in the scenarios of when the fund’s return was positive and negative in the previous year.

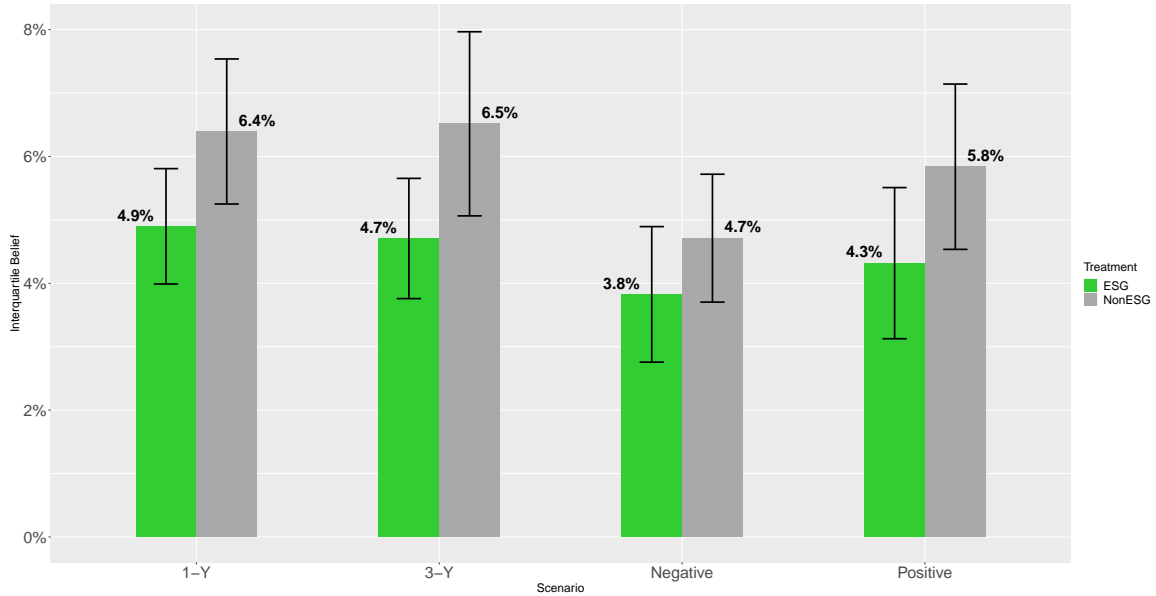


Figure 4: *ESG Vs. Non-ESG Risk Perception By Scenarios*

Note: This figure plots subjects’ average interquartile belief ranges of the fund’s annual returns, comparing the ESG and Non-ESG groups.

Overall, after comparing subjects’ expected return ranges and their interquartile beliefs, we find that the high ESG rating information has a significantly positive effect on mitigating subjects’ risk perceptions.

Table 3: *Risk Perception*

This table shows how the high ESG rating information impacted subjects' risk perception toward the fund performance. Non-ESG group is the baseline. Overall, subjects' risk perception toward the fund's performance is significantly lower in the ESG group compared with the Non-ESG group.

	<i>Dependent Variable</i>			
	<i>Interquartile Return Range</i>			
	(1)	(2)	(3)	(4)
	1-Y	Negative	Positive	3-Y
ESG	-1.3961*	-0.7906	-1.742*	-1.7515**
	(-1.821)	(-1.050)	(-1.918)	(-1.968)
Ambiguity Attitude	-0.0191	0.2872	-0.1324	-2.2388**
	(-0.023)	(0.350)	(-0.134)	(-2.310)
ESG*Ambiguity Attitude	0.3924	0.7520	0.8400	0.6205
	(0.626)	(1.220)	(1.130)	(0.852)
Return by ESG Rating	0.1192	0.2690	-0.5294	0.5681
	(0.374)	(0.859)	(-1.402)	(1.535)
ESG Impact	-0.2843	-0.1714	0.5914	-0.4297
	(-0.725)	(-0.445)	(1.272)	(-0.944)
ESG Risk	0.0394	-0.2385	-0.1341	-0.1700
	(0.137)	(-0.844)	(-0.393)	(-0.509)
Trust	-0.2363	-0.2182	-0.3099	-0.2714
	(-1.453)	(-1.366)	(-1.608)	(-2.031)
ESG Good Cause	-0.0283	0.0201	0.3586*	0.4642**
	(-0.168)	(0.121)	(1.795)	(2.372)
ESG Return Belief	-0.0555	-0.4396	-0.2000	-0.1228
	(-0.148)	(-1.194)	(-0.450)	(-0.282)
Positive Reciprocity	0.0425	-0.5692**	-1.0515***	-0.2457
	(0.154)	(-2.099)	(-3.215)	(-0.767)
Negative Reciprocity (Self)	-0.0659	-0.2663	0.0912	-0.2291
	(-0.358)	(-1.471)	(0.418)	(-1.071)
Negative Reciprocity (Other)	-0.2243	-0.3233	-0.2497	0.4072*
	(-1.089)	(1.089)	(-1.324)	(1.702)
Gender	-0.9883	-0.6926	-0.4163	-0.9394
	(-0.833)	(-1.081)	(-0.422)	(-0.973)
Financial Literacy	-0.2748	-0.4521	-0.1073	-0.0927
	(-0.481)	(-0.805)	(-0.158)	(-0.140)
Financial knowledge	-0.2631	0.2501	0.3079	-0.3066
	(-0.863)	(0.835)	(0.852)	(-0.866)
Donation	0.0003	0.0026	0.0005	0.0008
	(0.146)	(1.455)	(0.217)	(0.368)
Education	-0.2142	0.1224	-0.7266	0.1996
	(-0.424)	(0.246)	(-1.213)	(0.340)
Constant	12.0968***	12.4190***	14.3492***	9.4297***
	(4.044)	(4.226)	(4.048)	(2.715)
Observations	335	335	335	335
R ²	0.05219	0.07679	0.08044	0.09933
Adjusted R ²	0.00136	0.02728	0.03113	0.05103
Residual Std. Error	6.834 (df = 317)	6.714 (df = 317)	8.098 (df = 317)	7.934 (df = 317)
F Statistic	1.027 (df = 17; 317)	1.551 (df = 17; 317)	1.631 (df = 17; 317)	2.057 (df = 17; 317)

Note:

t-statistics are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

4.3 Domain-specific Ambiguity Attitude toward ESG

We use a percentage difference of subjects' WTP for ambiguity compared with their WTP for risk to evaluate subjects' ambiguity attitudes.

$$Ambiguity_Attitude_i = \frac{WTP_{risk_i} - WTP_{ambiguity_i}}{WTP_{risk_i}} \quad (1)$$

A higher percentage of the difference between WTPs for risk and ambiguity indicates that a subject is more ambiguity-averse. The discrepancy of subjects' ambiguity attitudes toward ESG and Non-ESG demonstrates subjects' perceived ambiguity on ESG, which is subjects' domain-specific ambiguity attitude towards ESG. A high discrepancy in subjects' perceived ambiguity between the ESG and Non-ESG groups suggests that the high ESG rating information substantially impacts the subjects' ambiguity attitudes toward the financial market.

At the beginning of the experiment, before the ESG group received any high ESG information, we found no significant difference in subjects' ambiguity attitudes between the ESG and Non-ESG groups (25.8% versus 28.3%, p-value = 0.63). Figure 5 depicts subjects' average ambiguity attitudes in the ESG and Non-ESG groups. Table 4 reports the subjects' ambiguity attitudes by controlling the survey variables.

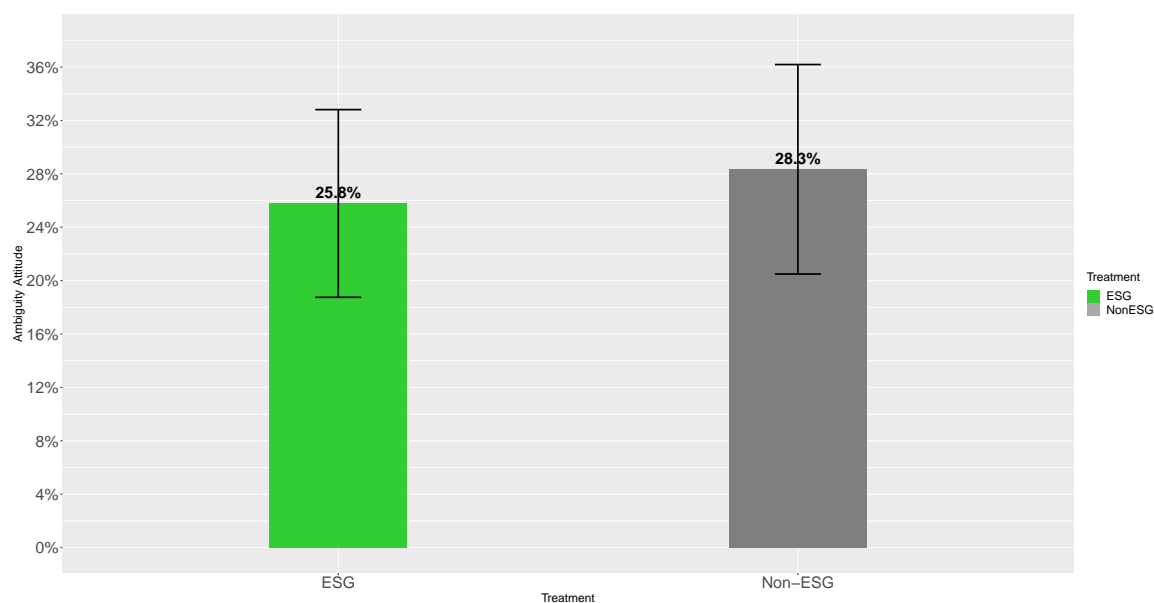


Figure 5: *ESG Vs. Non-ESG Ambiguity Attitude*

Note: This figure plots subjects' average ambiguity attitudes in the ESG and Non-ESG groups.

Table 4: *Ambiguity Attitude*

This table reports subjects' ambiguity attitudes in the ESG and non-ESG groups by controlling the questionnaire question variables. We find that there is no significant difference between subjects' ambiguity attitudes in the ESG and non-ESG groups.

	<i>Dependent Variable</i>
ESG	-0.003 (-0.065)
Return by ESG Rating	-0.0233 (-1.069)
ESG Impact	-0.0390 (-1.459)
ESG Risk	0.0728*** (3.800)
Trust	0.0171 (1.548)
ESG Good Cause	-0.0210* (-1.829)
ESG Return Belief	-0.0096 (-0.377)
Positive Reciprocity	0.0478** (2.557)
Negative Reciprocity (Self)	0.0138 (1.097)
Negative Reciprocity (Other)	0.0071 (0.501)
Gender	-0.0305 (-0.539)
Financial Literacy	0.1034*** (2.676)
Financial knowledge	-0.0455** (-2.198)
Donation	-0.0002 (-1.468)
Education	-0.0270 (-0.785)
Constant	-0.3111 (-1.528)
Observations	335
R ²	0.1269
Adjusted R ²	0.08586
Residual Std. Error	0.4675 (df = 319)
F Statistic	3.091 (df = 15; 319)

Note: Robust standard errors are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

Compared with subjects in the Non-ESG group, subjects in the ESG group have, on average, relatively higher expectations of the number of funds associated with a positive annual return, but not significant (51.2 versus 53.4, p-value = 0.37). How-

ever, we find that subjects' domain-specific ambiguity attitude in the ESG group became significantly lower than that in the Non-ESG group (4.3% versus 22.2%, p-value =0.009). This suggests that the high ESG rating information can resolve the ambiguity in the financial market to some degree. As a result, subjects perceived much less ambiguity towards the funds associated with a high ESG rating. Figure 6 depicts subjects' average domain-specific ambiguity attitudes in the ESG and Non-ESG groups.

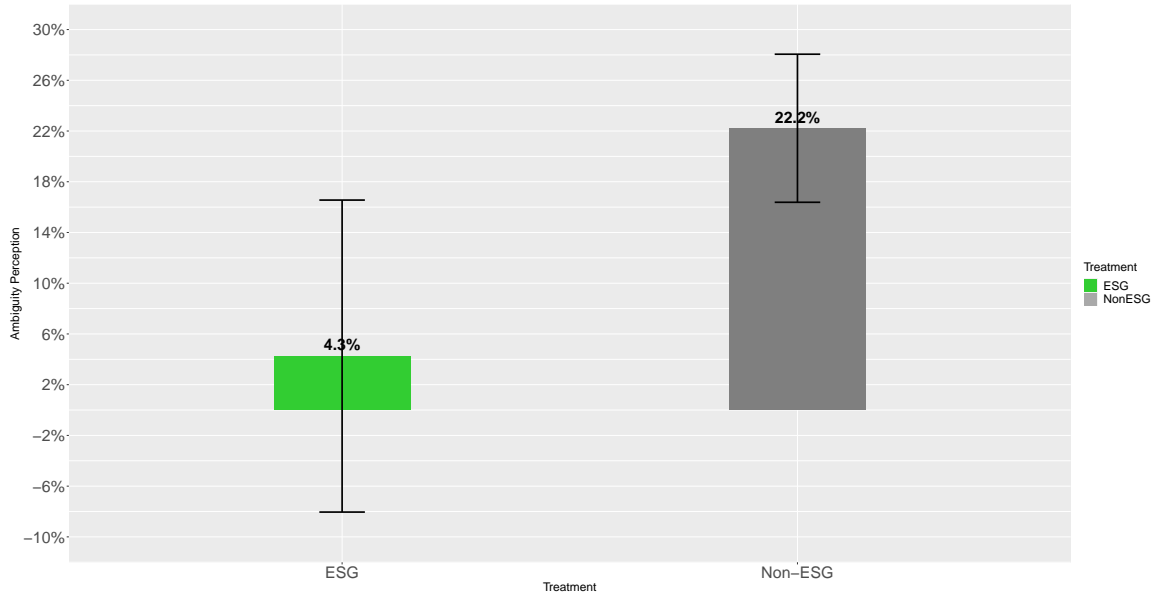


Figure 6: *ESG Vs. Non-ESG Domain-specific Ambiguity Attitude*

Note: This figure plots subjects' average perceived ambiguity in the ESG and Non-ESG groups.

In Table 5, we explore subjects' perceived ambiguity with and without knowing the high ESG information in the market and find that the high ESG rating label can resolve ambiguity to some degree. Specifications from (1) to (3) use subjects' domain-specific ambiguity attitudes as the dependent variable. Our main interested independent variables are treatments of subjects belonging to the ESG and the Non-ESG groups and subjects' ambiguity attitudes. Specification (1) includes only ESG treatment. In specification (2), we include the ambiguity attitude variable. In specification (3), we include the interaction between ambiguity attitude and ESG treatment, which means that the coefficient on the ESG treatment interaction captures how subjects' perceived ambiguity with a given ambiguity attitude compare to those without ESG information with the same ambiguity attitude. The results show that the high

ESG rating information has a highly significant negative effect on the subjects' perceived ambiguity, and oppositely, the subjects' ambiguity attitudes have a significant positive effect on the subjects' perceived ambiguity. Moreover, the insignificant interaction term, with t-statistics of 0.786 on the ESG treatment interaction, suggests similar responses to the subjects' ambiguity attitudes for the ESG and Non-ESG treatment, meaning that the high ESG rating information does not change subjects' ambiguity attitudes. Furthermore, we find that education level significantly increases subjects' domain-specific ambiguity attitudes, indicating that a subject perceived more ambiguity if she had a higher education background.

4.4 ESG Return Expectation in the Unincentivized Survey

In the third section, in both the Non-ESG and the ESG groups, we use the unincentivized Likert scale to elicit subjects' return expectations and risk perceptions regarding ESG equity integrated funds compared to conventional equity funds. To capture subjects' expected returns on the ESG integration fund, we use responses to the statement "When do you think the investment return is highest: The investment return is highest with ESG (Environmental, social and corporate governance) integration, The investment return is equally high with or without ESG integration, The investment return is highest without ESG integration, I do not know." 18.3% of the ESG group subjects and 16.4% of the Non-ESG group subjects chose "I do not know." Only 30.5% of the ESG group subjects and 38.6% of the Non-ESG group subjects expect that the investment return is highest with ESG integration. Around 50% of subjects in both groups do not expect ESG integration investments to generate superior returns compared to conventional investments. Figure 7 depicts subjects' expected returns on the investments integrated with and without ESG.

Interestingly, in the ESG group, the percentage number of subjects who expected the ESG integration investment has superior performance was almost the same as the percentage number of subjects who expected the without ESG integration investment has superior performance, separately 30.5% and 29.3%. The difference in the distributions of return expectation between the ESG group and the Non-ESG group subjects is insignificant (Kolmogorov-Smirnov test, p-value = 0.51). This result is not consistent with the findings in the first section of eliciting subjects' median beliefs toward the fund's return. To further confirm this inconsistency, we focus on

Table 5: *Domain-specific Ambiguity Attitude*

This table shows how the high ESG rating information impacted subjects' domain-specific ambiguity attitudes. Non-ESG group is the baseline. Subjects in the ESG group perceived significantly less ambiguity compared with the subjects in the Non-ESG group.

	<i>Dependent Variable</i>		
	(1) Domain-specific Ambiguity Attitude	(2) Domain-specific Ambiguity Attitude	(3) Domain-specific Ambiguity Attitude
ESG	-0.1657** (-2.396)	-0.1648** (-2.427)	-0.1952** (-2.497)
Ambiguity Attitude		0.2610*** (3.566)	0.2149** (2.292)
ESG*Ambiguity Attitude			0.1124 (0.786)
Return by ESG Rating	-0.0113 (-0.389)	-0.0052 (-0.183)	-0.0074 (-0.259)
ESG Impact	-0.0062 (-0.174)	0.0040 (0.113)	0.0016 (0.047)
ESG Risk	-0.0291 (-1.142)	-0.0481* (-1.879)	-0.0048* (-1.889)
Trust	0.0214 (1.457)	0.0170 (1.170)	0.018 (1.209)
ESG Good Cause	-0.0189 (-1.241)	-0.0135 (-0.894)	-0.0132 (-0.879)
ESG Return Belief	-0.0342 (-1.002)	-0.0316 (-0.945)	-0.0307 (-0.917)
Positive Reciprocity	0.0156 (0.625)	0.0031 (0.125)	0.0017 (0.069)
Negative Reciprocity (Self)	-0.0068 (-0.408)	-0.0104 (-0.634)	-0.0096 (-0.583)
Negative Reciprocity (Other)	-0.0089 (0.474)	-0.0107 (0.582)	-0.0115 (-0.623)
Gender	0.1157 (1.536)	0.1237* (1.671)	0.1244* (1.679)
Financial Literacy	0.0406 (0.789)	0.0136 (0.266)	0.0109 (0.212)
Financial knowledge	-0.0040 (-0.1454)	0.0079 (0.289)	0.0080 (0.292)
Donation	-0.0000 (0.065)	0.0000 (0.358)	0.0000 (0.349)
Education	0.0701* (1.684)	0.0840* (1.870)	0.0854** (1.897)
Constant	0.164 (0.605)	0.2452 (0.918)	0.2950 (1.074)
Observations	335	335	335
R ²	0.06338	0.09939	0.1011
Adjusted R ²	0.01933	0.05407	0.05293
Residual Std. Error	0.6221 (df = 319)	0.611 (df = 318)	0.6114 (df = 317)
F Statistic	1.439 (df = 15; 319)	2.193 (df = 16; 318)	2.098 (df = 17; 317)

Note:

Robust standard errors are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

the subjects who expressed that they think the investment return is higher without ESG in the Likert scale survey question. We make sub-group analyses to investigate how they answered our incentivized belief elicitation questions. If we suppose these subjects answered our incentivized exchangeability method questions consistently as their Likert scale question answers, the subjects' beliefs toward the fund return in the ESG group should be substantially lower than subjects in the Non-ESG group. How-

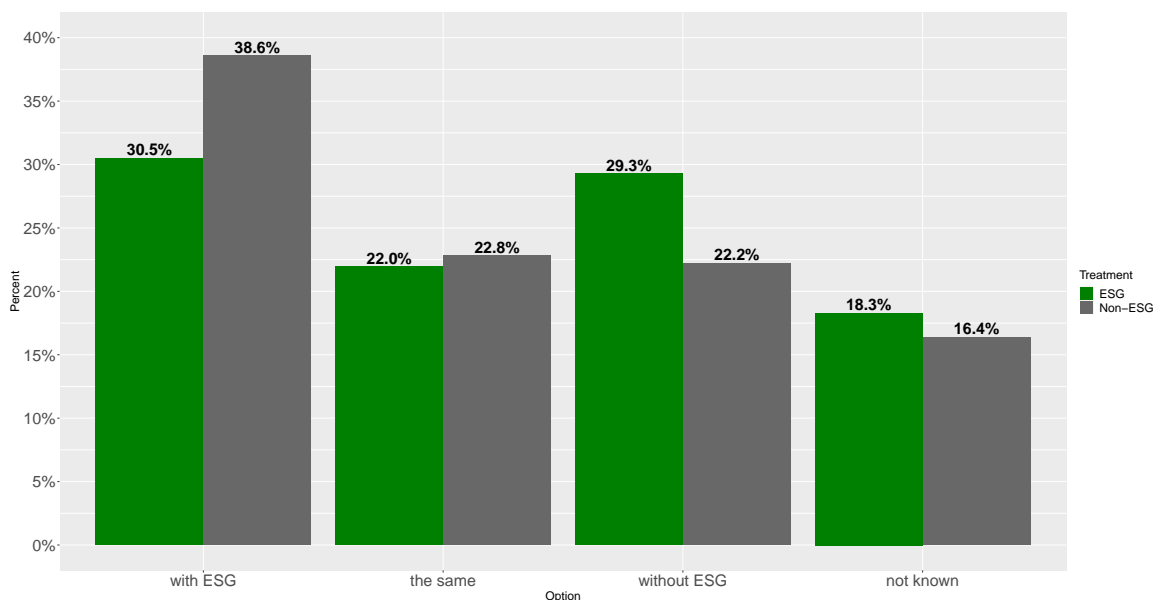


Figure 7: *ESG Vs. Non-ESG ESG Integration Return Expectation Distribution*

Note: This figure depicts the distributions of subjects' expected returns on the investment with and without ESG integration separately for subjects in the ESG and the Non-ESG groups.

ever, on the contrary, we find that the sub-ESG group subjects' beliefs on the fund return are significantly higher than the sub-non ESG group subjects. Figure 8 depicts subjects' average median beliefs in the sub-ESG and the sub-Non ESG groups. Table 6 reports the regression results of the ESG treatment effect on the subjects' expected return in the sub-group, in which the subjects think return is higher without ESG in the Likert scale survey question, by controlling the variables from the Likert scale survey questions.

Thus, we confirmed a systematic bias of subjects' return expectations evaluated by the unincentivized Likert scale. It suggests that the unincentivized self-report methods may conduct biased results. Subjects understated their expectations of the ESG investments' performance measured by the unincentivized Likert scale. Therefore, only relying on investors' social preferences to explain investors' SRI behaviour may be incomplete or even problematic. To promote their prosocial images, socially responsible investors are likely to understate the financial performance of ESG investments in the unincentivized Likert scale survey.

Furthermore, we address whether the subjects who think ESG has a positive influence on society expected a lower return toward ESG compared with non-ESG or

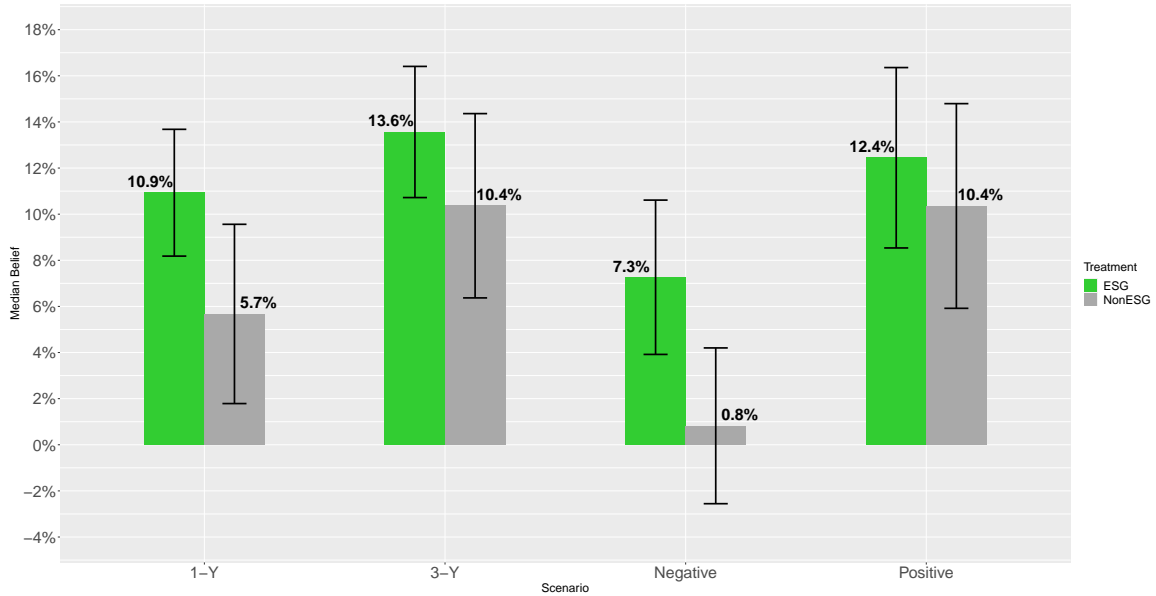


Figure 8: *ESG Vs. Non-ESG Return Expectation Sub-group Analysis*

Note: This figure depicts the sub-group analysis result: subjects, who expressed that they think the investment return is higher without ESG in the Likert scale survey question, contradict their beliefs toward the fund return.

not. We select the subjects of both the ESG and Non-ESG groups who expressed that they strongly agree the ESG integration funds have a positive influence on society in the Likert scale survey question, and then compare their beliefs toward the fund return. We find that the selected ESG group subjects' beliefs are significantly higher than the selected Non-ESG group subjects. Figure 9 depicts the selected subjects' average median beliefs. Therefore, it is likely that subjects expected both a positive social impact and a higher return of ESG. Table 7 reports the regression results of the ESG treatment effect on the subjects' expected return in the sub-group, in which the subjects think ESG has a positive impact in the Likert scale survey question, by controlling the variables from the Likert scale survey questions.

Table 6: *Sub-group Belief Analysis - ESG Return*

This table shows how the high ESG rating information impacted subjects' expected return of the fund in the sub-group, in which the subjects answered that funds' returns are higher without ESG integration in the Likert scale survey question. Non-ESG group is the baseline. Subjects answered our incentivized exchangeability method questions conversely as their Likert scale question answers.

	<i>Dependent Variable</i>			
	<i>Belief in Sub-group</i>			
	(1)	(2)	(3)	(4)
	1-Y	Negative	Positive	3-Y
ESG	6.6321** (2.520)	4.9855** (1.966)	1.7366 (0.564)	2.9798 (1.121)
Ambiguity Attitude	2.4289 (0.893)	-4.7350* (-1.808)	2.8170 (0.885)	1.3678 (0.498)
ESG*Ambiguity Attitude	0.2168 (0.137)	-0.1656 (-0.108)	0.5032 (0.271)	0.1965 (0.123)
Return by ESG Rating	0.9992 (0.900)	-0.9118 (-0.852)	-0.7649 (-0.588)	-0.3716 (-0.331)
ESG Impact	-1.7571 (-1.186)	4.6983*** (3.291)	-1.0379 (-0.598)	-0.6875 (-0.459)
ESG Risk	0.0044 (0.005)	1.4670* (1.711)	1.3553 (1.301)	-0.3800 (-0.423)
Trust	0.2568 (0.453)	0.2986 (0.546)	-1.1919* (-1.795)	0.1158 (0.202)
ESG Good Cause	-0.3063 (-0.561)	-0.0029 (-0.006)	-0.7996 (-1.251)	0.5661 (1.027)
Positive Reciprocity	1.2649 (1.376)	-0.5333 (-0.602)	1.2767 (1.186)	0.6686 (0.720)
Negative Reciprocity (Self)	-0.1451 (-0.237)	1.0336* (1.755)	-1.1595 (-1.620)	0.6264 (1.014)
Negative Reciprocity (Other)	0.0466 (0.069)	-0.5709 (-0.883)	0.3060 (0.389)	-0.5790 (-0.854)
Gender	-1.1275 (-0.408)	-1.3529 (-0.509)	-3.1660 (-0.979)	1.6530 (0.593)
Financial Literacy	1.8864 (0.579)	-2.0127 (-0.642)	1.4116 (0.370)	-1.4416 (-0.438)
Financial knowledge	1.0583 (0.994)	-1.8239* (-1.777)	2.7583** (2.212)	-2.0007* (-1.859)
Donation	-0.0039 (-0.779)	-0.0059 (-1.202)	-0.0046 (-0.772)	-0.0087* (-1.697)
Education	0.4914 (0.307)	-1.5977 (-1.035)	0.7161 (0.382)	-3.4917** (-2.157)
Constant	-8.3650 (-0.686)	-8.0126 (-0.682)	0.9670 (0.068)	25.1445** (2.042)
Observations	86	86	86	86
R ²	0.1742	0.3068	0.2651	0.1753
Adjusted R ²	-0.01724	0.146	0.09464	-0.01593
Residual Std. Error	10.92 (df = 69)	10.53 (df = 69)	12.79 (df = 69)	11.04 (df = 69)
F Statistic	0.91 (df = 16; 69)	1.909 (df = 16; 69)	1.555 (df = 16; 69)	0.9167 (df = 16; 69)

Note:

t-statistics are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

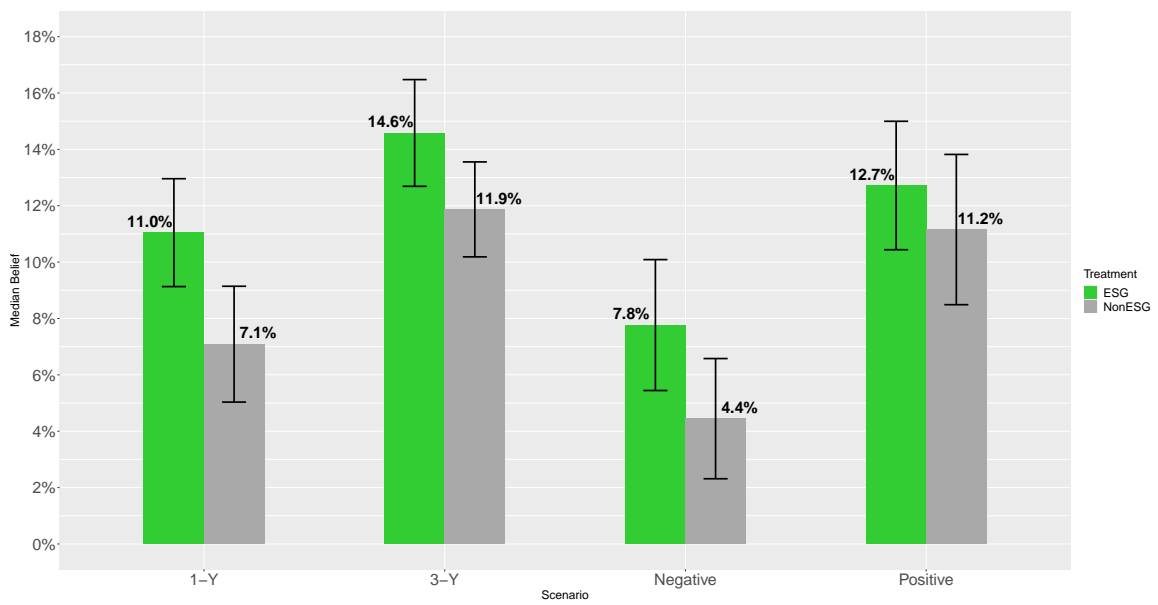


Figure 9: *ESG Vs. Non-ESG Soical Impact and Belief Sub-group Analysis*

Note: This figure depicts the sub-group analysis result: subjects who strongly agree with the ESG integration funds positively influence society in the Likert scale survey question expected a higher return toward the fund.

Table 7: *Sub-group Belief Analysis - ESG Impact*

This table shows how the high ESG rating information impacted subjects' expected return of the fund in the sub-group, in which the subjects answered that ESG integration funds have a positive impact by their Likert scale survey questions. Non-ESG group is the baseline. On the one hand, Subjects expected a positive impact of ESG integration funds. On the other hand, subjects believe ESG integration funds outperform non-ESG funds.

	<i>Dependent Variable</i>			
	<i>Belief in Sub-group</i>			
	(1)	(2)	(3)	(4)
	1-Y	Negative	Positive	3-Y
ESG	4.543*** (3.175)	3.3795** (2.024)	1.9585 (1.099)	2.814** (2.145)
Ambiguity Attitude	-2.3432 (-1.541)	-1.9584 (-1.104)	-0.8704 (-0.460)	1.1343 (0.814)
ESG*Ambiguity Attitude	0.2620 (0.250)	-0.5245 (-0.430)	2.4276* (1.863)	0.7569 (0.789)
Return by ESG Rating	1.0103 (1.521)	-0.7437 (-0.960)	-0.5830 (-0.705)	0.5178 (0.850)
ESG Impact	-0.3891 (-0.258)	-0.7827 (-0.444)	-1.4826 (-0.789)	1.5136 (1.094)
ESG Risk	0.3025 (0.556)	0.2550 (0.402)	1.0202 (1.506)	-0.1387 (-0.278)
Trust	0.3096 (1.037)	0.5729* (1.644)	-0.3257 (-0.876)	-0.1650 (-0.603)
ESG Good Cause	-0.4646 (-1.388)	-0.2402 (-0.615)	0.0431 (0.103)	0.5555* (1.810)
ESG Return Belief	0.6159 (0.808)	-0.3203 (-0.360)	0.3591 (0.378)	-0.1081 (-0.155)
Positive Reciprocity	1.0882* (1.719)	-0.0697 (-0.094)	0.7423 (0.941)	0.1276 (0.220)
Negative Reciprocity (Self)	0.1766 (0.522)	0.3969 (1.005)	-0.1623 (-0.385)	0.4697 (1.514)
Negative Reciprocity (Other)	-0.2421 (-0.669)	-0.2577 (-0.043)	0.3060 (-0.572)	-0.8033** (-2.422)
Gender	-3.7597** (-2.383)	1.5850 (0.861)	-6.4164*** (-3.265)	-0.3063 (-0.212)
Financial Literacy	-1.1534 (-1.052)	1.2687 (0.992)	-0.7850 (-0.575)	-2.0790** (-2.069)
Financial knowledge	1.2931** (2.256)	-0.9296 (-1.390)	2.0148*** (2.822)	0.1064 (0.202)
Donation	-0.0008 (-0.222)	0.0031 (0.784)	-0.0040 (-0.946)	-0.0053* (-1.681)
Education	-0.0360 (-0.040)	-0.462 (-0.439)	0.5015 (0.445)	-0.2152 (-0.260)
Constant	-1.9014 (-0.165)	7.3858 (0.549)	12.6149 (0.878)	7.4286 (0.702)
Observations	218	218	218	218
R ²	0.13	0.06205	0.09784	0.107
Adjusted R ²	0.05608	-0.01768	0.02115	0.03108
Residual Std. Error	10.29 (df = 200)	12.01 (df = 200)	12.82 (df = 200)	9.439 (df = 200)
F Statistic	1.758 (df = 17; 200)	0.7783 (df = 17; 200)	1.276 (df = 17; 200)	1.409 (df = 17; 200)

Note:

t-statistics are reported in parentheses. *p<0.1; **p<0.05; ***p<0.01

5 Discussion

Subjects in our lab experiment expected that the ESG integration investments generate higher returns than conventional investments. Specifically, they expected that the ESG integration investments outperform conventional investments after observing a negative return information in the financial market. From the financial perspective, this indicates that investors may do not just invest in high ESG to do good to society according to their social preferences, but also expect a higher financial return of ESG investing with less uncertainty. Furthermore, the difference between investors' beliefs toward ESG and Non-ESG funds' financial performances may influence asset prices, i.e., ESG rating is a determinant of investors' investment decisions. Because investors expect a better financial performance toward ESG funds than Non-ESG funds, they may incline to sell out more Non-ESG funds and buy in more ESG funds in their portfolios, which pushes up ESG fund prices and pulls down Non-ESG fund prices. In particular, investors may overestimate high ESG assets' financial performances during the economy's downturn, such as financial crises or pandemics. As the ESG investing amount is growing exponentially, the impact of ESG rating may influence asset prices more significantly. Therefore, investors' updating beliefs toward high ESG rating funds after observing a downturn of funds' financial performances can also be a driver of SRI funds showing more resilience and better resisting financial crisis than conventional funds (e.g. Nakai *et al.*, 2016; Erragragui *et al.*, 2018).

We also used the unincentivized Likert scale in the self-report survey to capture investors' expectations of ESG performance. Interestingly, we find the opposite of what we found by using the incentivized exchangeability method. Investors are likely to understate their expectations of the financial performance of SRI when it comes to the unincentivized self-report. This indicates that to justify their investment decisions or create a positive social image via social signaling, investors may intentionally understate their expectations of the performance of the high ESG assets, which may introduce systematically biased inferences when analyzing these misreported beliefs. Therefore, only relying on investors' social preferences as their primary motives, neglecting their financial motives, could be incomplete and insufficient to explain their SRI behaviour. It is recommendable to further distinguish SRI investors into two categories: social preference driven investors, who aim to derive more non-financial utility through ESG integration, and performance driven investors, who aim to derive

more financial utility through ESG integration.

Furthermore, a high ESG rating can reduce investors' perceived ambiguity in the financial market. Therefore, as one of the motives of actively engaging in SRI, investors have a higher WTP for the high ESG rating funds, which promote their trading behavior of engaging in the ESG investing because they perceive less uncertainty. This will further boom the high ESG rating assets' prices. Therefore, firms have more incentives to improve their ESG-related evaluation.

Subjects in our sample are mainly bachelor or master students. 84.4% of subjects' professionals are Accounting, Business, Commerce, Economics, Marketing or Finance, which are highly related to the financial industry. Meanwhile, over 90% of subjects gave correct answers to the questions related to finance, suggesting that they have sufficient financial literacy. Therefore, our sample is familiar with the financial market concepts and has adequate financial knowledge for this experiment, and thus our results could be generalized.

The findings in this paper also have important implications for practitioners. For example, funds can incorporate our tools into their client profiling to obtain a reliable measure of their clients' beliefs and domain-specific ambiguity attitudes. This can help them achieve precision marketing. That is, they can not only design products that cater to the specific demand of different segments of investors with heterogeneous beliefs and domain-specific ambiguity attitudes but also apply different marketing strategies to attract the appropriate clients. For instance, during a financial market downturn, funds can emphasize the SRI funds' risk-return performance because investors have higher expectations of the SRI funds' returns. Funds can also emphasize the SRI funds' social impacts because investors may expect both a positive social impact and a higher return of ESG.

Understanding investors' true reasons for investing in ESG also has important policy implications. For example, governments can profile ESG investors through better understanding their motives and promote SRI by adopting preferential taxing policies if investors believe SRI has an advantage in return. In addition, standardizing ESG rating and ESG investing procedure, introducing disclosure requirements, and setting up scrutiny of investment "green-washing" is imminent because ESG factors are essential determinators of investment decision-making for socially responsible investors.

Future research could conduct a field experiment by employing our novel and

portable methods validated in this paper. It would also be interesting to investigate how investors react to the separated ESG factors and their WTP for ESG factors and different ESG approaches, for instance, engagement and divestment.

6 Conclusion

In this paper, we investigate possible alternative approaches of why individual investors actively engage in ESG investing. Primary literature employs investors' intrinsic social preferences and social signaling to explain their SRI decision. However, important alternative approaches to explaining investors' SRI behavior are neglected. Therefore, we propose investors' beliefs and domain-specific ambiguity attitudes towards ESG as alternative explanations. We conducted an incentivized lab experiment and found supportive evidence for the above proposal. First, investors may understate their expectations of the ESG assets' performance. Particularly, they expect that ESG investments outperform Non-ESG investments. Second, a high ESG rating can reduce investors' uncertainty perceptions in the financial market, including risk perceptions and ambiguity perceptions, thus encouraging investors to invest more in ESG investments. Third, investors expect a positive social impact as well as a higher return toward ESG.

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