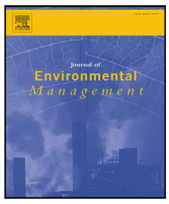
Journal of Environmental Management 391 (2025) 126323

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman



Short communication

From shock to strategy: Adversity experiences and Environmental, Social, and Governance investment

Xiao Jia [a], Yuki Yamamoto [b], Ken'ichi Matsumoto [c,*]

[a] Research Promotion Section, Toyo University, 5-28-20 Hakusan, Bunkyo-ku, Tokyo, 112-8606, Japan
[b] Faculty of Economics, Kansai University, 3-3-35 Yamate-cho, Suita-shi, Osaka, 564-8680, Japan
[c] Faculty of Economics, Toyo University, 5-28-20 Hakusan, Bunkyo-ku, Tokyo, 112-8606, Japan

ARTICLE INFO

Keywords:
ESG investment
ESG factors
personal experiences
Retail investors

ABSTRACT

This study investigates the association between individuals' personal experiences and their decisions regarding Environmental, Social, and Governance (ESG) investments. We surveyed 10,000 representative respondents living in 47 prefectures of Japan using quota sampling and analyzed both the extensive and intensive margins of ESG investment decisions, as well as investors' willingness to forgo financial returns. Using data retrieved from an online survey conducted in December 2024, we show via regression analyses that personal experiences linked to ESG component – especially those related to environmental (E) issues – are significantly associated with an increased likelihood of ESG investment. Notably, only E-related experiences are responsible for a higher portfolio share of ESG products and a greater willingness to sacrifice financial returns. We also reveal heterogeneity across investor groups.

1. Introduction

Japan's sustainable investment landscape has grown remarkably over the last decade (Global Sustainable Investment Alliance, 2023), characterized by increasing interest from retail investors in environmental, social, and governance (ESG) investments (Nomura Holdings, Inc., 2022). Understanding the motives for retail investors to engage in ESG investment is crucial for channeling capital towards sustainable development goals. Yet, empirical evidence remains limited regarding the drivers and barriers of ESG investment in Japan's expanding market.

This study investigates key determinants of ESG investment behavior among individual investors in Japan, with a particular emphasis on the role of personal experiences—a factor that profoundly shapes financial decision-making (Malmendier, 2021). As Malmendier (2021) argues, individuals do not make financial decisions in a vacuum; rather, their lifetime experiences fundamentally shape risk preferences and belief formation, thereby influencing their financial decision-making. Individuals' financial decisions often follow a basic learning process: they repeat behaviors that previously coincided with pleasure and avoid those that coincided with pain (Barber and Odean, 2013). This perspective provides the theoretical foundation for our investigation into how ESG-related adversity experiences are associated with investment behavior in Japan. Several studies provide empirical insights. For instance, Strahilevitz et al. (2011) found that investors are more likely to repurchase stocks that they previously sold at a profit than those they sold at a loss. Similarly, Huang (2019) showed that individuals tend to invest in the sector in which they previously achieved returns above the market average. Malmendier and Nagel (2011) demonstrated that investors who experienced low stock returns throughout their lives were less willing to participate in the stock market. While these studies primarily focus on financial experiences–aligning with the governance (G) dimension of the ESG framework, our research broadens the scope by incorporating environmental (E) and social (S) dimensions as well. Accordingly, our study addresses the following research questions (RQs):

RQ1. Are ESG-related personal experiences associated with ESG investment engagement?

RQ2. Do personal experiences influence ESG portfolio allocation decisions?

RQ3. Are ESG-related personal experiences related to a willingness to trade off financial returns for ESG values?[1]

We situate our study within the growing literature on the determinants of individuals' decisions on sustainable investment. Numerous studies have examined the factors related to the sustainable investing behavior of retail investors, covering elements such as demographic

* Corresponding author.
E-mail addresses: jia@toyo.jp (X. Jia), yamayuki@kansai-u.ac.jp (Y. Yamamoto), matsumoto1005@toyo.jp (K. Matsumoto).

[1] Since ESG funds often yield lower financial returns than conventional alternatives.

https://doi.org/10.1016/j.jenvman.2025.126323
Received 15 April 2025; Received in revised form 14 June 2025; Accepted 21 June 2025
Available online 6 July 2025

and sociodemographic characteristics (Gutsche et al., 2021), financial knowledge (Porzio et al., 2023), social values (Anderson and Robinson, 2022; Bauer et al., 2021), and external shocks, such as media exposure (Li et al., 2024) and natural disasters (Bianchi et al., 2022; Chiah et al., 2025). Malmendier (2021) emphasized that personal history plays a powerful role in shaping individuals' financial decision-making; however, this lens has not been widely applied to ESG investing. Moreover, investors' preferences are far from uniform. Recent studies highlight that individuals place varying emphasis on the three subpillars of ESG (Assaf et al., 2024; D'Hondt et al., 2022). However, few studies have examined whether personal experiences tied specifically to E-, S-, or G-related adversity influence portfolio decisions in a differentiated manner. Our study fills these gaps.

Furthermore, our study adds to the literature on portfolio allocation in the sustainable investment realm (Marshall et al., 2021; Misev and Balles, 2024). We also distinguish between ESG-motivated investors and profit-driven investors, since the shares of sustainable assets can differ considerably depending on investment motives (Siemroth and Hornuf, 2023). Our work provides new insights into how ESG retail investors incorporate their ESG-related experiences at the intensive margin. Regarding the return trade-offs, average retail investors are aware of the lower returns of sustainable assets compared to conventional assets (Giglio et al., 2025). Despite the lower returns, investors are willing to engage in sustainable investment because they believe it can bring about ethical outcomes (Bauer et al., 2021). Responsible investors are willing to trade financial performance for ethical outcomes (Barber et al., 2021; Bauer et al., 2021), whereas the opposite case could also be true (Larcker and Watts, 2020). Our study adds to this strand of literature by examining the tolerance for lower returns on ESG assets among retail investors in Japan.

We estimate empirical models to analyze the adversity–investment connection and document several findings. First, in the extensive margin analysis, we find a strong positive link among all three types of adversity and a higher propensity for holding ESG assets. Average investors are most responsive to E-related experiences; however, the relationship is moderated by financial and climate change literacy. Second, at the intensive margin, investors who experienced E-related adversity allocate more to ESG assets, while those who suffered S- or G-related issues hold the same amount as those who did not. Third, the E-related adversity is indicative of an increase in the willingness to forgo financial returns, while S- or G-related adversities are not. Fourth, ESG-motivated investors respond to environmental adversities by holding a greater share of ESG assets, while their return-motivated counterparts are willing to trade wealth for ESG components in response to such events.

The remainder of the paper is organized as follows. Section 2 introduces the study design and the empirical model. In Section 3, we report the results, which are discussed in Section 4. Section 5 concludes the paper. Finally, the Appendix provides the results for the robustness test.

2. Data and empirical model

We collected data through an online survey conducted between December 4 and December 9, 2024, with the cooperation of Rakuten Insight. Quota sampling was applied on three criteria: prefecture of residence, age, and gender, to ensure that the sample was representative of the demographic composition of Japan.[2] Respondents who did not hold any financial products at the time of the survey were excluded. Ultimately, we identified 10,000 representative individuals who were current investors. The questionnaire comprised five sections. In Section I, respondents' sociodemographic characteristics, such as education, marital status, occupation, housing, and the 2023 income were collected. In Section II, we captured the extent of altruism, following Falk et al. (2023). We then referred to the National Character Survey to capture individuals' time preferences and the extent to which they view others as trustworthy. Financial literacy was addressed in Section III, which was measured by a three-question test that assessed respondents' ability to make investment decisions. We assigned 1 point to each correct answer. Questions on ESG investments were listed in Section IV. We first asked respondents if they were already aware of ESG investment before participating in this survey. We then asked the ESG-aware respondents if they currently held any ESG assets.[3] We identified 4879 ESG-aware respondents and 323 current ESG investors. We then asked the current ESG investors about their motives for ESG investment, the share of ESG assets in their portfolios, and their tolerance for lower financial returns. Regarding non-ESG investors, who *currently* held zero ESG assets by definition, we distinguished the former ESG investors who had already quit ESG investing and those who had never invested in ESG. Tests for climate change literacy and questions about ESG-related adversities appeared in Section V in case the respondents answered the previous questions in an ESG-approving manner. In this section, we inquired about investors' adversity experiences that were related to environmental issues, such as presenting to the emergency room for heatstroke, evacuating due to floods, or suffering from pollution-induced diseases; social issues, such as violation of human rights; and governance issues, such as unpaid work or being treated unfairly because of gender. The statistics and descriptions of the variables are summarized in Table 1.

We estimated the model below to examine the relationship between adversity experiences and investment decisions:

$$Y_i = \alpha_0 + \alpha_1 Adversity_i^j + \alpha_2 Concern_i^j + \alpha_3 Literacy_i + \alpha_4 Preference_i + \alpha_5 Demographic_i + \epsilon_i$$

where Y_i is the ownership of ESG assets, the share of ESG portfolios, or the willingness to forgo financial returns. $Adversity_i^j$, the key explanatory variable, equals 1 if respondent i has ever experienced adversities of type $j \in \{E, S, G\}$, 0 if not. $Concern_i^j$ is investor i's concern in component j. $Literacy_i$ stands for financial literacy and knowledge of climate change. $Preference_i$ is the vector of altruism, trust, and time preferences. $Demographic_i$ indicates the demographic and sociodemographic characteristics. ϵ_i is the error term.

3. Empirical analysis

3.1. Extensive margin: Ownership of ESG assets

We employed a binary logistic model for the extensive margin analysis and report the average marginal change of dependent variables to each explanatory variable, which is denoted as $\frac{1}{N}\sum_{i=1}^{N}\frac{\partial E[y_i|x_i,w_i]}{\partial x}\alpha_k$. That is, we report the marginal change at every observed value of x and average across those estimates. The results from the estimation of the current ESG ownership are demonstrated in Fig. 1. Fig. 1(a) indicates that a change from a zero to a positive experience of E-related adversity is associated with an increase of 6.2 percentage points in the probability of investing in ESG. Experiencing S-related or G-related adversities are associated with an increase of 5.3 and 2.9 percentage points in the likelihood of ESG participation, respectively.[4] Investors who are altruistic, trusting, or concerned about environmental and governance issues are more likely to hold ESG assets, which parallels the findings from previous studies (Riedl and Smeets, 2017; Brodback et al., 2019; Porzio et al., 2023).

[2] Except for several age–gender–prefecture cohorts.

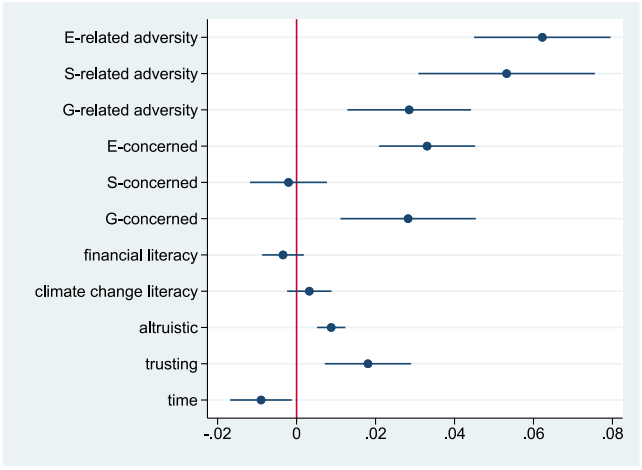
[3] However, it is possible that investors held ESG assets without realizing it. We excluded these investors or accounted for them as non-investors in the analysis.

[4] Coefficients are reported in Table A.2.

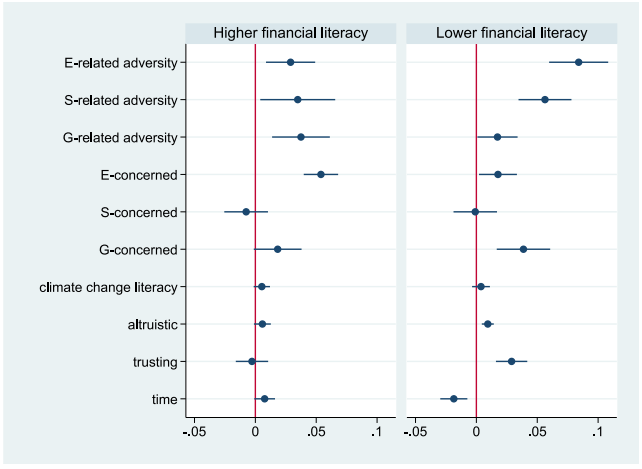
Table 1
Descriptive statistics.

Variable	Description	Obs.	Mean	St. Dev.	Min	Max
Demographic and sociodemographic attributes						
gender	1 if female; 0 if male	10,000	0.502	0.500	0	1
age	age as of 2024	10,000	50.340	14.762	20	81
married	1 if married, 0 if not	10,000	0.618	0.486	0	1
education	education level	9,995	4.144	1.331	1	6
income	income in 2023	10,000	4.727	3.138	1	21
missing income	1 if no answer to income	10,000	0.121	0.326	0	1
occupation	1 if full-time employee; 0 otherwise	10,000	0.794	0.404	0	1
housing	1 if own property; 0 otherwise	10,000	0.689	0.463	0	1
years of investment	years since the first financial product	10,000	3.362	0.883	1	4
talk about investment	frequency of talking about investment	10,000	2.415	0.851	1	4
Preference						
altruistic	a 2-question test for altruism	10,000	1.117	1.089	0	5
trust	a 4-point question of trusting, larger numbers stand for a stronger trust to others	10,000	2.362	0.678	1	4
time	a 4-point question of time preference, larger numbers stand for impatience	10,000	2.213	0.759	1	4
Literacy						
financial literacy	a 3-question test for financial knowledge	10,000	1.733	1.031	0	3
climate change literacy	a 3-question test for knowledge of climate change	10,000	1.854	0.981	0	3
ESG investment						
aware of ESG before the survey	1 if knew about ESG before the survey; 0 if not	10,000	0.488	0.500	0	1
currently hold ESG assets	1 if yes; 0 if no	4,879	0.066	0.249	0	1
motivated by ESG	1 if motivated by E/S/G factors; 0 if motivated by higher expected returns, lower expected risks, portfolio diversity, or suggestions from financial advisors	323	0.715	0.452	0	1
used to hold ESG assets	1 if yes; 0 if no	4,556	0.048	0.213	0	1
share of ESG assets	20 scales, with a step of 5%	323	5.536	4.156	1	20
returns willing to forgo	7 scales, with a step of 0.5 percentage point	323	3.115	1.513	1	7
continue ESG	1 if keep holding ESG assets in the future; 0 if not	323	0.895	0.307	0	1
ESG-related adversities and concerns						
E-related adversity	1 if experienced environmental adversities; 0 if not	10,000	0.112	0.315	0	1
S-related adversities	1 if experienced social adversities; 0 if not	10,000	0.071	0.257	0	1
G-related adversities	1 if experienced governance adversities; 0 if not	10,000	0.175	0.380	0	1
concerned about E	1 if concerned about environmental issues; 0 if not	10,000	0.547	0.498	0	1
concerned about S	1 if concerned about social issues; 0 if not	10,000	0.590	0.492	0	1
concerned about G	1 if concerned about governance issues; 0 if not	10,000	0.141	0.348	0	1

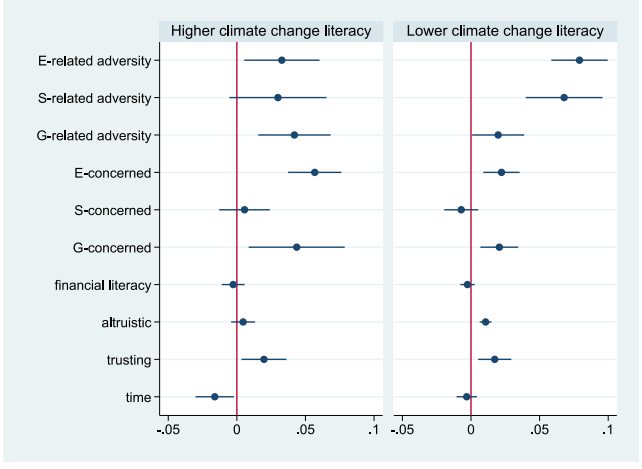
We further investigated the connection using subsamples defined by literacy. To be specific, we denoted respondents who obtained 3 points in financial (climate change) questions as the higher-literacy group in finance (climate change), while those who obtained 0–2 points were designated as the lower-literacy group. As demonstrated by Fig. 1(b), the lower-literacy group is more sensitive to environmental or social issues, while its higher-literacy peer responds more aggressively to governance factors. Estimated coefficients are reported in Columns 4–5 of Table A.1. This echoes the previous finding by D'Hondt et al. (2022) who posited that financially literate individuals show less interest in the E or S subpillars but embrace the G component. Since the former ESG investors could be systematically different from the never-investors, we



(a) Full sample

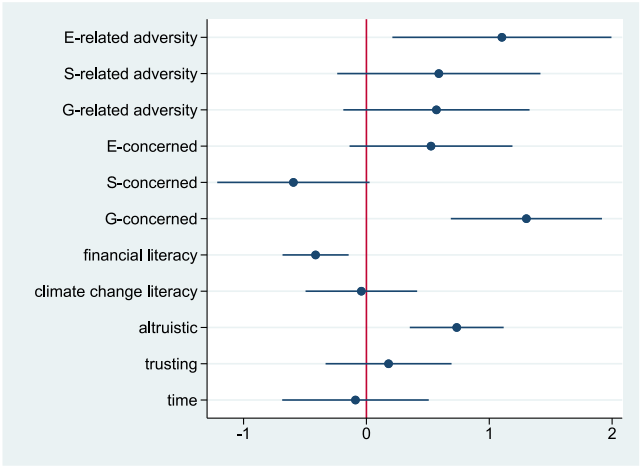


(b) Subsamples by financial literacy

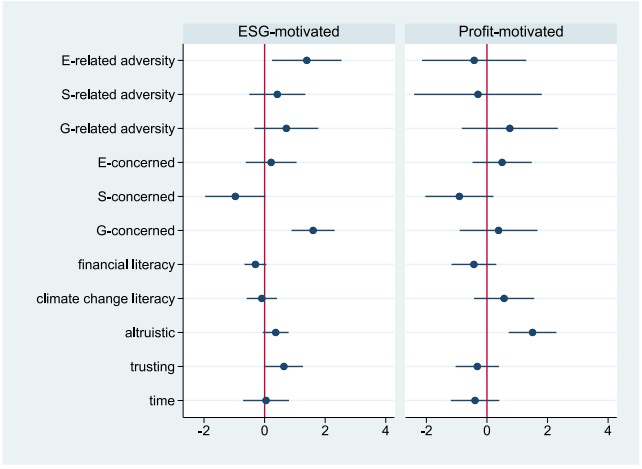


(c) Subsamples by climate change literacy

Fig. 1. Relationship between adversity experiences and the ownership of ESG products. Point estimates and 90% CI are indicated by dots and horizontal lines, respectively.



(a) Full sample



(b) Subsamples by motivation

Fig. 2. Relationship between adversity experiences and the share of ESG products. Point estimates and 90% CI are indicated by dots and horizontal lines, respectively.

excluded the former from our sample or treated them as (former) ESG participants. The results are largely unchanged, as reported in Table A.2 and A.3, except that financially literate individuals are less likely to have ever incorporated ESG factors into their portfolios, which is in line with Rossi et al. (2019). The results remain consistent, as we considered the investors who had never heard of ESG before the survey to be non-ESG investors, as demonstrated in Table A.4.

3.2. Intensive margin: ESG portfolio allocations

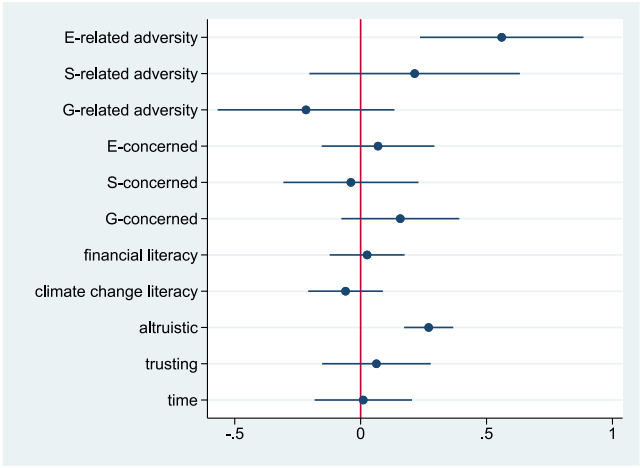
Results from the intensive margin analysis estimated using ordinal least squares (OLS) are visualized in Fig. 2(a) and reported in Table A.5. The experience of E-related adversity translates to a one-unit increase in ESG shares, which is a maximum of 5 percentage points in investors' portfolio allocation to ESG funds. Similar to the extensive margin analysis, environmental adversities are more salient than social or governance issues, and portfolios owned by the financially literate are less exposed to ESG factors.

The positive relationship, however, is mainly driven by ESG-motivated investors,[5] as shown in Fig. 2(b) and reported in Columns 5–6 of Table A.5. Our findings support Giglio et al. (2025), who documented a higher share of ESG assets among investors driven by ethical motives. Other types of adversities are not evident.

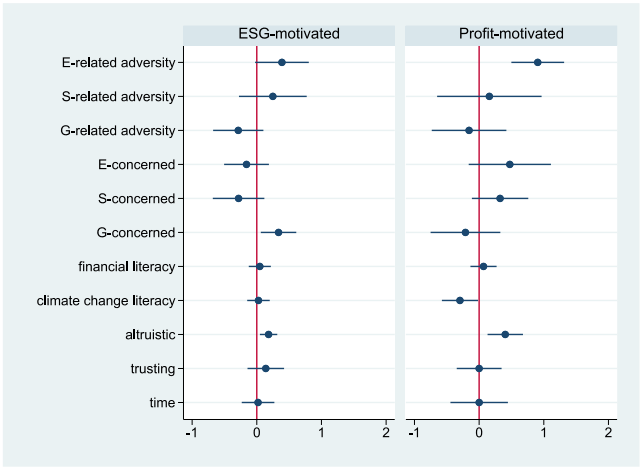
3.3. Willingness to forgo returns

We addressed our third research question by regressing the willingness to forgo returns on the determinants. Results from the OLS

[5] Definitions of motives are detailed in Table 1.



(a) Full sample



(b) Subsamples by motivation

Fig. 3. Relationship between adversity experiences and the willingness to forgo returns. Point estimates and 90% CI are indicated by dots and horizontal lines, respectively.

estimation are displayed in Fig. 3 and reported in Table A.6. Moving from zero to positive exposure to E-related adversities is related to a 0.56 unit increase in the willingness to forgo returns, which compares to sacrificing 0.25 percentage points of profits.

Unlike in the previous section, we found little evidence that ESG-motivated investors sacrifice profits in response to environmental events, although they are willing to do so if they are altruistic or concerned about governance issues. Those driven by pecuniary motives, however, are more willing to buy ESG funds at the expense of financial performance.

3.4. Alternative specifications and robustness

We tested the robustness of the baseline analysis in several ways. First, we changed the definition of adversities by defining a dummy that indicated the experience of all types of adversity. Second, we replaced literacy scores with dummies that equal 1 if respondents gave the correct answers to all three questions of financial (climate change) literacy. Third, we ran ordered logit regressions to estimate the willingness to forgo returns when investing in ESG. The baseline results hold consistently across different specifications, as shown in Table A.7. In addition, we conducted propensity score matching (PSM) to tackle the potential endogeneity issue.[6] Covariate balance and propensity score density are presented in Figs. B.1 and B.2, respectively. The results illustrated in Fig. B.3 support our baseline results.

4. Discussion

Overall, our findings resonate with Malmendier (2021) that personal experiences are associated with financial behavior. Intuitively, individuals who experience loss behave more rationally by minimizing their expected losses, as disasters lead them to update their beliefs (Bissiri et al., 2016). In an investment context, people who have experienced adversities may assign a greater probability to future risks, thereby reallocating their portfolios toward greener assets to hedge climate-related risks (Arfaoui et al., 2024; Liu et al., 2023). However, why do investors respond most aggressively to E-related adversities? One possible explanation is that environmental adversities are usually associated with natural disasters, which materialize quickly. They tend to be highly visible, often causing immediate and tangible damage. For example, floods can damage property, render people homeless, or even cause fatalities, and extreme temperatures harm people's health, causing extra medical expenditures. Moreover, environmental disasters often evoke strong emotional reactions and reshape individuals' preferences, thereby leading to prosocial behaviors (Whitt and Wilson, 2007; Cassar et al., 2017). ESG investment thus may surge as a result of increased demand for ethical outcomes. In contrast, social and governance issues can be less salient since they usually unfold gradually or are hard to observe.[7] Therefore, average retail investors might pay less attention to those issues when making investment decisions.[8]

Nevertheless, the reaction to a specific type of adversity varies across investor groups. Our results suggest that literate investors, either in financial issues or climate change, are more reactive to G-related adversities, implying that an understanding of non-financial information requires some knowledge of financial matters (Anderson and Robinson, 2022; D'Hondt et al., 2022). Another explanation is that financially literate investors are more aware of measurable risk and returns, pay more attention to corporate governance issues that directly affect financial returns, and thus respond more aggressively to the G component than their lower-literate peers. Investors who possess a good knowledge of climate change recognize that weak governance undermines the credibility of a firm's climate strategy and signals less resilience to climate risk in the longer run and thus could react stronger to governance issues by diversifying their portfolios towards ESG funds. Given that the G component receives the least attention, but most investors are affected by the adversities related to it,[9] a deeper understanding of governance issues and how they can be addressed in an ESG framework is necessary.

[6] To be more specific, we first estimated the propensity scores using a logistic model, where adversity experiences were regressed on individual characteristics. The estimated scores thus represent the conditional probability of experiencing adversities. A one-to-one nearest neighbor matching with a caliper of 0.2 was conducted based on the scores. We then implemented Inverse Probability Weighting (IPW) when analyzing the portfolio share and the return trade-offs to avoid sample loss, since we had only 323 ESG investors but a greater number of individuals who experienced adversities than those who did not.

[7] Over 50 percent of investors in our sample reported themselves to be E- or S-concerned. However, only 14 percent of them expressed concerns about governance issues.

[8] Among the three ESG dimensions, E-related motives were most frequently reported by ESG investors, followed by S-related motives, and lastly G-related motives.

[9] Of all investors, 17.5 percent suffered from G-related tragedies. Among ESG-motivated investors, 25 percent reported a G-related motive, while 68 percent and 61 percent of them reported E-related motives and S-related motives, respectively.

Moreover, our results highlight a divergence between experience-driven and concern-driven ESG behavior. For lower-literacy investors, personal experiences have a stronger relationship with ESG engagement than stated concerns, whereas for higher-literacy individuals, the opposite pattern holds. This finding aligns with Huang (2019) who showed that less sophisticated investors tend to follow their past experiences in making financial decisions. Regarding climate change literacy, our results reveal little evidence that higher climate change knowledge translates into stronger ESG engagement, larger ESG portfolios, or greater willingness to trade financial returns for ESG integration. This finding is consistent with Anderson and Robinson (2022), who found that environmentally conscious individuals do not necessarily hold greener portfolios, possibly due to financial disengagement. Nonetheless, we found that climate-literate investors better reflect environmental concerns in their decisions, underscoring the role of climate literacy in financial behavior. These findings are indicative of the importance of financial literacy and climate change awareness in fostering ESG engagement.

We also document the heterogeneity in ESG shares and the willingness to forgo returns regarding investment motives. While ESG-motivated investors hold a larger portion of ESG stocks, they are reluctant to sacrifice financial returns in response to adversities. Interestingly, return-driven investors are willing to forgo financial performance (at least in the short term) when faced with adversity. A possible explanation is that investors do not pay more for sustainable outcomes (Heeb et al., 2022). Instead, they are willing to pay more (at least in the short term) for returns and resilience in the long run (Capotă et al., 2022). Alternatively, ESG-motivated investors have already borne lower returns by holding more ESG assets and are thus unwilling to sacrifice further returns.

5. Conclusion

This study examines how personal experiences related to ESG adversities shape individual ESG investment behavior in Japan. Using survey data, we explored whether such experiences are associated with the decision to invest in ESG assets, the extent of ESG portfolio allocation, and the willingness to trade financial returns for ESG values. Our results suggest that ESG-related adversities, particularly environmental ones, are associated with a greater likelihood of ESG participation, higher portfolio allocations, and a greater willingness to accept lower returns for ESG values. These patterns vary across investor profiles, with motivations and literacy levels moderating the responses.

While our results offer insights into the experience-investment relationship in sustainable finance, the specific context of Japan's retail investment market limits the generalizability of our findings. Additionally, the causal mechanisms linking personal experiences to investment behavior need further exploration. Nevertheless, this research highlights the relevance of personal experiences in shaping ESG investment behavior and invites future studies to examine the relationship across different markets and cultural contexts. Recognizing the role of personal experience may help policymakers and financial institutions design more targeted ESG engagement strategies, particularly for retail investors whose preferences and values are often underrepresented.

CRediT authorship contribution statement

Xiao Jia: Formal analysis, Data curation, Conceptualization, Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Investigation. **Yuki Yamamoto:** Writing – review & editing, Validation, Methodology. **Ken'ichi Matsumoto:** Investigation, Funding acquisition, Conceptualization, Resources, Writing – review & editing, Supervision, Project administration, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This research was performed by the Environment Research and Technology Development Fund (JPMEERF20242M02) of the Environmental Restoration and Conservation Agency provided by Ministry of the Environment of Japan.

Appendix A

See Tables A.1 to A.7.

Table A.1
The extensive margin: currently holding ESG assets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Full sample				Financial literacy high	Financial literacy low	Climate change literacy high	Climate change literacy low
Dependent variable: Current ownership of ESG assets								
E-related adversity	0.0622***	0.1116***			0.0289**	0.0840***	0.0328**	0.0791***
	(0.0105)	(0.0120)			(0.0123)	(0.0148)	(0.0167)	(0.0125)
S-related adversity	0.0532***		0.1324***		0.0348*	0.0564***	0.0300	0.0679***
	(0.0136)		(0.0162)		(0.0187)	(0.0132)	(0.0215)	(0.0170)
G-related adversity	0.0285***			0.0761***	0.0375***	0.0173*	0.0419***	0.0198*
	(0.0095)			(0.0101)	(0.0144)	(0.0100)	(0.0160)	(0.0115)
E-concerned	0.0331***	0.0370***			0.0539***	0.0177*	0.0568***	0.0222***
	(0.0074)	(0.0080)			(0.0086)	(0.0095)	(0.0118)	(0.0080)
S-concerned	−0.0020		0.0028		−0.0076	−0.0009	0.0056	−0.0071
	(0.0059)		(0.0055)		(0.0109)	(0.0109)	(0.0112)	(0.0075)
G-concerned	0.0283***			0.0385***	0.0183	0.0387***	0.0436**	0.0207**
	(0.0104)			(0.0108)	(0.0119)	(0.0133)	(0.0213)	(0.0084)
financial literacy	−0.0034	−0.0046	−0.0038	−0.0069**			−0.0027	−0.0026
	(0.0032)	(0.0031)	(0.0032)	(0.0031)			(0.0051)	(0.0032)
climate change literacy	0.0032	0.0031	0.0064**	0.0051	0.0053	0.0038		
	(0.0034)	(0.0038)	(0.0031)	(0.0034)	(0.0041)	(0.0044)		
altruistic	0.0088***	0.0114***	0.0138***	0.0147***	0.0058	0.0094***	0.0046	0.0107***
	(0.0022)	(0.0023)	(0.0022)	(0.0022)	(0.0042)	(0.0030)	(0.0053)	(0.0026)
trusting	0.0181***	0.0184***	0.0210***	0.0214***	−0.0028	0.0289***	0.0198**	0.0173**
	(0.0066)	(0.0067)	(0.0071)	(0.0068)	(0.0081)	(0.0078)	(0.0100)	(0.0074)
time	−0.0090*	−0.0111**	−0.0117***	−0.0134***	0.0076	−0.0185***	−0.0161*	−0.0031
	(0.0048)	(0.0050)	(0.0045)	(0.0047)	(0.0052)	(0.0068)	(0.0086)	(0.0045)
Observations	4877	4877	4877	4877	2238	2639	1657	3220

Clustered standard errors in parentheses.
Standard errors clustered at the prefecture level. Reported values stand for average marginal changes.
Several observations dropped due to missing values in education.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2
The extensive margin: ESG-aware investors except the former ESG investors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Full sample				Financial literacy high	Financial literacy low	Climate change literacy high	Climate change literacy low
Dependent variable: Current ownership of ESG assets								
E-related adversity	0.0651***	0.1173***			0.0294**	0.0876***	0.0355**	0.0820***
	(0.0111)	(0.0124)			(0.0128)	(0.0157)	(0.0178)	(0.0136)
S-related adversity	0.0584***		0.1409***		0.0379*	0.0618***	0.0315	0.0753***
	(0.0147)		(0.0179)		(0.0201)	(0.0139)	(0.0220)	(0.0189)
G-related adversity	0.0302***			0.0787***	0.0410***	0.0176*	0.0436***	0.0211*
	(0.0099)			(0.0109)	(0.0149)	(0.0105)	(0.0165)	(0.0121)
E-concerned	0.0331***	0.0371***			0.0554***	0.0169*	0.0565***	0.0219**
	(0.0078)	(0.0084)			(0.0090)	(0.0098)	(0.0125)	(0.0086)
S-concerned	−0.0035		0.0013		−0.0070	−0.0034	0.0041	−0.0084
	(0.0062)		(0.0056)		(0.0113)	(0.0117)	(0.0112)	(0.0079)
G-concerned	0.0287***			0.0397***	0.0191	0.0391***	0.0463**	0.0199**
	(0.0111)			(0.0112)	(0.0130)	(0.0135)	(0.0223)	(0.0089)
financial literacy	−0.0035	−0.0051	−0.0044	−0.0076**			−0.0028	−0.0025
	(0.0034)	(0.0033)	(0.0034)	(0.0033)			(0.0053)	(0.0034)
climate change literacy	0.0025	0.0024	0.0055	0.0042	0.0050	0.0026		
	(0.0038)	(0.0041)	(0.0034)	(0.0036)	(0.0043)	(0.0047)		
altruistic	0.0098***	0.0126***	0.0153***	0.0162***	0.0062	0.0110***	0.0049	0.0122***
	(0.0023)	(0.0024)	(0.0024)	(0.0023)	(0.0045)	(0.0033)	(0.0056)	(0.0029)
trusting	0.0180***	0.0182***	0.0212***	0.0216***	−0.0036	0.0292***	0.0212**	0.0164**
	(0.0069)	(0.0069)	(0.0073)	(0.0071)	(0.0087)	(0.0080)	(0.0103)	(0.0073)
time	−0.0087*	−0.0112**	−0.0112**	−0.0132***	0.0078	−0.0190***	−0.0164*	−0.0025
	(0.0050)	(0.0053)	(0.0048)	(0.0050)	(0.0053)	(0.0073)	(0.0087)	(0.0051)
Observations	4660	4660	4660	4660	2160	2500	1603	3057

Clustered standard errors in parentheses.
Standard errors clustered at the prefecture level. Reported values stand for average marginal effects.
Several observations dropped due to missing values in education.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3
The extensive margin: current or former ESG participation among ESG-aware investors.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Full sample				Financial literacy high	Financial literacy low	Climate change literacy high	Climate change literacy low
Dependent variable: Current or past ownership of ESG assets								
E-related adversity	0.0792***	0.1270***			0.0357*	0.1157***	0.0541**	0.0928***
	(0.0138)	(0.0129)			(0.0189)	(0.0189)	(0.0245)	(0.0189)
S-related adversity	0.0716***		0.1467***		0.0465*	0.0917***	0.0492*	0.0942***
	(0.0168)		(0.0184)		(0.0268)	(0.0239)	(0.0287)	(0.0231)
G-related adversity	0.0262**			0.0781***	0.0622***	−0.0122	0.0402**	0.0149
	(0.0119)			(0.0127)	(0.0173)	(0.0140)	(0.0187)	(0.0152)
E-concerned	0.0213*	0.0263**			0.0542***	−0.0034	0.0375**	0.0124
	(0.0123)	(0.0122)			(0.0147)	(0.0152)	(0.0172)	(0.0135)
S-concerned	−0.0209**		−0.0140*		−0.0136	−0.0281**	−0.0026	−0.0318***
	(0.0087)		(0.0084)		(0.0132)	(0.0129)	(0.0140)	(0.0101)
G-concerned	0.0363***			0.0424***	0.0292	0.0423***	0.0619**	0.0206*
	(0.0135)			(0.0129)	(0.0189)	(0.0144)	(0.0259)	(0.0107)
financial literacy	−0.0094*	−0.0106**	−0.0099**	−0.0134***			−0.0107	−0.0077
	(0.0049)	(0.0047)	(0.0047)	(0.0046)			(0.0070)	(0.0054)
climate change literacy	−0.0083	−0.0092	−0.0059	−0.0073	−0.0042	−0.0095		
	(0.0059)	(0.0060)	(0.0057)	(0.0057)	(0.0064)	(0.0074)		
altruistic	0.0224***	0.0247***	0.0267***	0.0280***	0.0116**	0.0296***	0.0116*	0.0273***
	(0.0036)	(0.0035)	(0.0036)	(0.0035)	(0.0055)	(0.0054)	(0.0069)	(0.0049)
trusting	0.0059	0.0050	0.0084	0.0082	−0.0175*	0.0198**	0.0186	−0.0004
	(0.0060)	(0.0059)	(0.0061)	(0.0059)	(0.0103)	(0.0083)	(0.0118)	(0.0066)
time	−0.0060	−0.0077	−0.0083	−0.0104*	0.0100	−0.0155	−0.0185*	0.0022
	(0.0063)	(0.0062)	(0.0061)	(0.0059)	(0.0075)	(0.0103)	(0.0100)	(0.0073)
Observations	4877	4877	4877	4877	2238	2639	1657	3220

Clustered standard errors in parentheses.
Standard error clustered at the prefecture level. Reported values stand for average marginal effects.
Several observations dropped due to missing values in education.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4
The extensive margin: current or former ESG participation among all respondents.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Full sample				Financial literacy high	low	Climate change literacy high	low
Dependent variable: Current or past ownership of ESG assets								
E-related adversity	0.0403***	0.0746***			0.0190	0.0514***	0.0295**	0.0457***
	(0.0064)	(0.0070)			(0.0125)	(0.0087)	(0.0133)	(0.0098)
S-related adversity	0.0535***		0.1032***		0.0315*	0.0617***	0.0369**	0.0654***
	(0.0099)		(0.0115)		(0.0178)	(0.0118)	(0.0166)	(0.0127)
G-related adversity	0.0149**			0.0464***	0.0395***	−0.0025	0.0239**	0.0090
	(0.0061)			(0.0068)	(0.0107)	(0.0058)	(0.0101)	(0.0076)
E-concerned	0.0140**	0.0172***			0.0372***	0.0024	0.0247***	0.0094
	(0.0059)	(0.0059)			(0.0086)	(0.0067)	(0.0089)	(0.0064)
S-concerned	−0.0090**		−0.0035		−0.0077	−0.0099*	0.0016	−0.0140***
	(0.0043)		(0.0041)		(0.0083)	(0.0054)	(0.0071)	(0.0052)
G-concerned	0.0318***			0.0377***	0.0295**	0.0331***	0.0413***	0.0257***
	(0.0080)			(0.0076)	(0.0135)	(0.0072)	(0.0151)	(0.0064)
financial literacy	−0.0007	−0.0009	−0.0005	−0.0026			−0.0001	−0.0003
	(0.0026)	(0.0026)	(0.0025)	(0.0026)			(0.0039)	(0.0028)
climate change literacy	−0.0034	−0.0035	−0.0017	−0.0025	−0.0013	−0.0035		
	(0.0028)	(0.0029)	(0.0027)	(0.0027)	(0.0039)	(0.0030)		
altruistic	0.0156***	0.0176***	0.0184***	0.0193***	0.0103***	0.0178***	0.0095***	0.0180***
	(0.0016)	(0.0015)	(0.0016)	(0.0016)	(0.0033)	(0.0021)	(0.0036)	(0.0021)
trusting	0.0062**	0.0059**	0.0079**	0.0078***	−0.0089	0.0121***	0.0139**	0.0032
	(0.0031)	(0.0030)	(0.0032)	(0.0029)	(0.0062)	(0.0034)	(0.0063)	(0.0033)
time	−0.0042	−0.0060**	−0.0054*	−0.0069**	0.0059	−0.0078*	−0.0110**	−0.0004
	(0.0030)	(0.0030)	(0.0030)	(0.0029)	(0.0042)	(0.0045)	(0.0053)	(0.0031)
Observations	9995	9995	9995	9995	3669	6326	3142	6853

Clustered standard errors in parentheses.
Standard error clustered at the prefecture level. Reported values stand for average marginal effects.
Several observations dropped due to missing values in education.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5
The intensive margin: shares of ESG assets.

	(1)	(2)	(3)	(4)	(5)	(6)
	Current ESG investors				ESG-motivated	Profit-motivated
Dependent variable: Share of ESG assets in the current portfolio						
E-related adversity	1.1029**	1.7111***			1.3933**	−0.4222
	(0.5302)	(0.5272)			(0.6807)	(1.0084)
S-related adversity	0.5895		1.2744**		0.4197	−0.2966
	(0.4918)		(0.5484)		(0.5504)	(1.2360)
G-related adversity	0.5700			1.2100***	0.7180	0.7563
	(0.4507)			(0.3603)	(0.6261)	(0.9297)
E-concerned	0.5257	0.7799**			0.2158	0.5010
	(0.3942)	(0.3848)			(0.4983)	(0.5732)
S-concerned	−0.5942		−0.2578		−0.9672	−0.9102
	(0.3687)		(0.3825)		(0.5915)	(0.6594)
G-concerned	1.3022***			1.2816***	1.6024***	0.3838
	(0.3657)			(0.3610)	(0.4229)	(0.7529)
financial literacy	−0.4137**	−0.4092***	−0.4418***	−0.5198***	−0.3022	−0.4306
	(0.1600)	(0.1448)	(0.1507)	(0.1323)	(0.2146)	(0.4335)
climate change literacy	−0.0412	−0.1208	−0.0510	−0.1273	−0.0913	0.5661
	(0.2701)	(0.2761)	(0.2693)	(0.2973)	(0.2973)	(0.5824)
altruistic	0.7351***	0.8063***	0.8866***	0.8109***	0.3665	1.5058***
	(0.2272)	(0.2358)	(0.2434)	(0.2361)	(0.2533)	(0.4614)
trusting	0.1803	0.0436	0.1307	0.1583	0.6380*	−0.3179
	(0.3048)	(0.3011)	(0.2931)	(0.2990)	(0.3738)	(0.4197)
time	−0.0891	−0.2275	−0.1105	−0.1216	0.0475	−0.3932
	(0.3547)	(0.3274)	(0.3433)	(0.3582)	(0.4496)	(0.4688)
Observations	323	323	323	323	231	92

Clustered standard errors in parentheses.
Standard error clustered at the prefecture level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6
Willingness to sacrifice returns.

	(1) Current ESG investors	(2)	(3)	(4)	(5) ESG-motivated	(6) Profit-motivated
Dependent variable: tolerance for lower returns						
E-related adversity	0.5602***	0.5586***			0.3891	0.9065***
	(0.1930)	(0.1501)			(0.2466)	(0.2391)
S-related adversity	0.2145		0.3184*		0.2484	0.1582
	(0.2485)		(0.1830)		(0.3111)	(0.4735)
G-related adversity	−0.2169			0.0823	−0.2864	−0.1556
	(0.2087)			(0.1719)	(0.2309)	(0.3383)
E-concerned	0.0691	0.0875			−0.1589	0.4745
	(0.1331)	(0.1265)			(0.2057)	(0.3728)
S-concerned	−0.0387		0.0360		−0.2815	0.3243
	(0.1594)		(0.1514)		(0.2368)	(0.2556)
G-concerned	0.1575			0.1850	0.3364**	−0.2114
	(0.1393)			(0.1362)	(0.1629)	(0.3162)
financial literacy	0.0258	0.0139	−0.0122	−0.0293	0.0468	0.0678
	(0.0885)	(0.0853)	(0.0903)	(0.0850)	(0.1014)	(0.1186)
climate change literacy	−0.0598	−0.0796	−0.0834	−0.1074	0.0259	−0.2965*
	(0.0881)	(0.0851)	(0.0908)	(0.0969)	(0.1035)	(0.1638)
altruistic	0.2701***	0.2697***	0.2903***	0.2990***	0.1823**	0.4040**
	(0.0580)	(0.0618)	(0.0578)	(0.0605)	(0.0797)	(0.1605)
trusting	0.0627	0.0505	0.0713	0.0746	0.1394	0.0004
	(0.1283)	(0.1182)	(0.1229)	(0.1244)	(0.1679)	(0.2032)
time	0.0105	0.0036	0.0298	−0.0017	0.0196	0.0006
	(0.1150)	(0.1092)	(0.1162)	(0.1056)	(0.1498)	(0.2605)
Observations	323	323	323	323	231	92

Clustered standard errors in parentheses.
Standard error clustered at the prefecture level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7
Results from alternative specifications.

	Currently hold ESG				Ever held ESG				Share of ESG		Willingness to forgo returns	
E-related adversity	0.0494***		0.0514***		0.0659***		0.0329***		1.2390**		0.8580***	
	(0.0067)		(0.0070)		(0.0095)		(0.0043)		(0.5202)		(0.2808)	
S-related adversity	0.0426***		0.0462***		0.0606***		0.0407***		0.6322		0.1528	
	(0.0090)		(0.0095)		(0.0119)		(0.0059)		(0.4888)		(0.3170)	
G-related adversity	0.0261***		0.0275***		0.0239**		0.0135**		0.5150		−0.1892	
	(0.0078)		(0.0081)		(0.0106)		(0.0053)		(0.4495)		(0.2659)	
All adversities		0.1068***		0.1146***		0.1506***		0.0878***		1.4242**		0.5767***
		(0.0107)		(0.0116)		(0.0148)		(0.0074)		(0.5910)		(0.2048)
Model	Binomial logistic regression								OLS		Ordinal logistic regression	
Literacy measure	dummy	score	dummy	score	dummy	score	dummy	score	dummy	score	dummy	score
Observations	4877	4877	4660	4660	4877	4877	9995	9995	323	323	323	323

Clustered standard errors in parentheses.
Standard error clustered at the prefecture level.
Several observations dropped due to missing values in education.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix B

See Figs. B.1 to B.3.

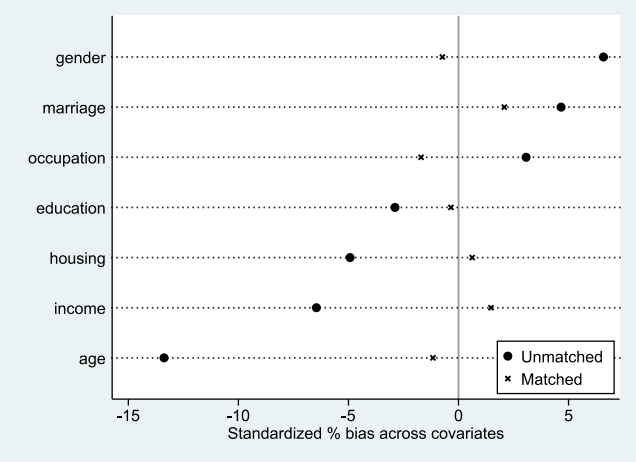


Fig. B.1. Balance improvement by covariates.

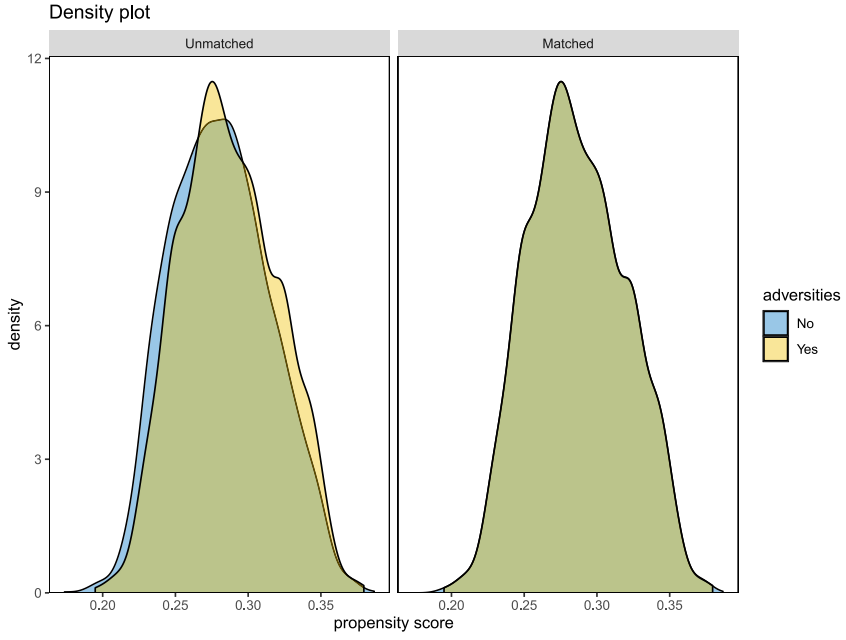
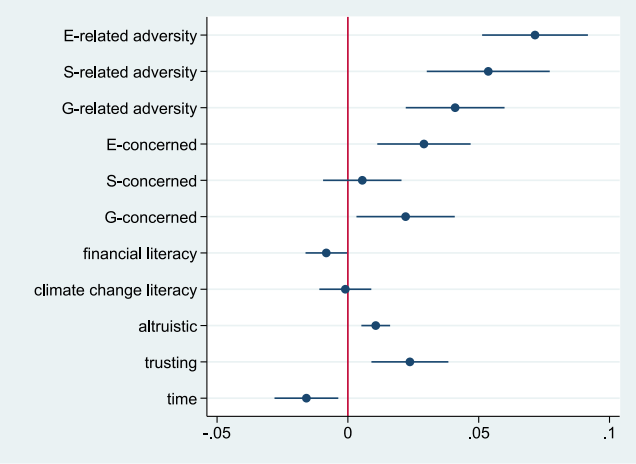
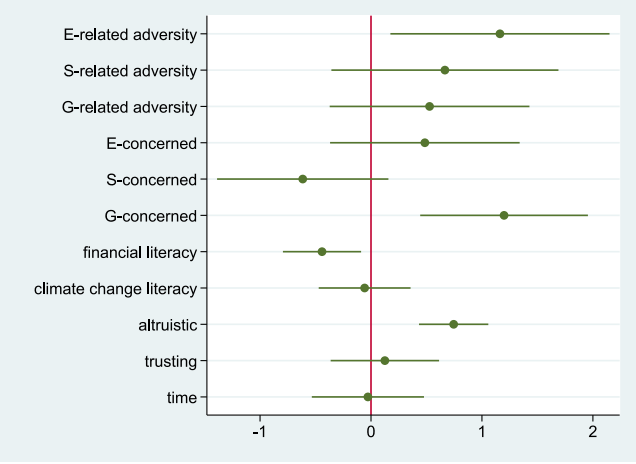


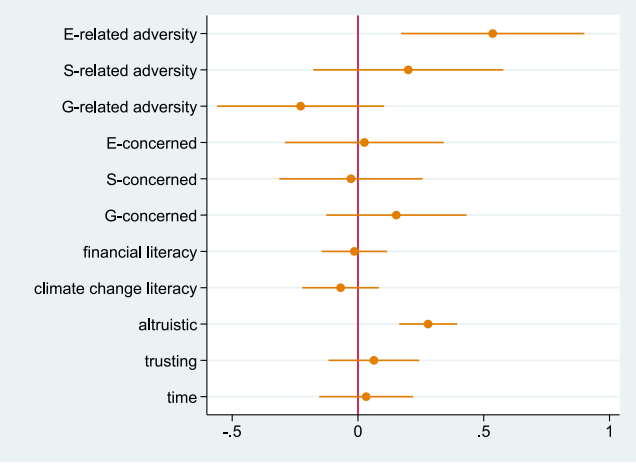
Fig. B.2. Propensity score density.



(a) Extensive margin



(b) Intensive margin



(c) Willingness to forgo returns

Fig. B.3. Results from the matched sample. Point estimates and 90% CI are indicated by dots and horizontal lines, respectively.

Data availability

The authors do not have permission to share data.

References

Anderson, A., Robinson, D.T., 2022. Financial literacy in the age of green investment. Rev. Financ. 26 (6), 1551–1584.

Arfaoui, N., Naeem, M.A., Maherzi, T., Kayani, U.N., 2024. Can green investment funds hedge climate risk? Financ. Res. Lett. 60, 104961.

Assaf, C., Monne, J., c Harriet, L., Meunier, L., 2024. ESG investing: Does one score fit all investors' preferences? J. Clean. Prod. 443, 141094.

Barber, B.M., Morse, A., Yasuda, A., 2021. Impact investing. J. Financ. Econ. 139 (1), 162–185.

Barber, B.M., Odean, T., 2013. Chapter 22 - The Behavior of Individual Investors. In: Constantinides, G.M., Harris, M., Stulz, R.M. (Eds.), In: Handbook of the Economics of Finance, vol. 2, Elsevier, pp. 1533–1570.

Bauer, R., Ruof, T., Smeets, P., 2021. Get real! Individuals prefer more sustainable investments. Rev. Financ. Stud. 34 (8), 3976–4043.

Bianchi, M., Wang, G., Liu, Z., 2022. Are We Becoming Greener? Life-Time Experiences and Responsible Investment. TSE Working Paper, n.22-1382.

Bissiri, P.G., Holmes, C.C., Walker, S.G., 2016. A general framework for updating belief distributions. J. R. Stat. Soc. Ser. B Stat. Methodol. 78 (5), 1103–1130.

Brodback, D., Guenster, N., Mezger, D., 2019. Altruism and egoism in investment decisions. Rev. Financ. Econ. 37 (1), 118–148.

Capotă, L.-D., Giuzio, M., Kapadia, S., Salakhova, D., 2022. Are Ethical and Green Investment Funds More Resilient?. Working Paper Series, (2747), European Central Bank.

Cassar, A., Healy, A., von Kessler, C., 2017. Trust, risk, and time preferences after a natural disaster: Experimental evidence from thailand. World Dev. 94, 90–105.

Chiah, M., Tian, X., Zhong, A., 2025. Nature's impact: Do extreme natural disasters influence retail investors? J. Econ. Behav. Organ. 232, 106954.

D'Hondt, C., Merli, M., Roger, T., 2022. What drives retail portfolio exposure to ESG factors? Financ. Res. Lett. 46, 102470.

Falk, A., Becker, A., Dohmen, T., Huffman, D., Sunde, U., 2023. The preference survey module: A validated instrument for measuring risk, time, and social preferences. Manag. Sci. 69 (4), 1935–1950.

Giglio, S., Maggiori, M., Stroebel, J., Tan, Z., Utkus, S., Xu, X., 2025. Four facts about ESG beliefs and investor portfolios. J. Financ. Econ. 164, 103984.

Global Sustainable Investment Alliance, 2023. Global sustainable investment review 2022. https://www.gsi-alliance.org/members-resources/gsir2022/. (Accessed June 14, 2025).

Gutsche, G., Nakai, M., Arimura, T.H., 2021. Revisiting the determinants of individual sustainable investment—The case of Japan. J. Behav. Exp. Financ. 30, 100497.

Heeb, F., Kölbel, J.F., Paetzold, F., Zeisberger, S., 2022. Do investors care about impact? Rev. Financ. Stud. 36 (5), 1737–1787.

Huang, X., 2019. Mark Twain's Cat: Investment experience, categorical thinking, and stock selection. J. Financ. Econ. 131 (2), 404–432.

Larcker, D.F., Watts, E.M., 2020. Where's the greenium? J. Account. Econ. 69 (2), 101312.

Li, Q., Watts, E.M., Zhu, C., 2024. Retail investors and ESG news. J. Account. Econ. 78 (2), 101719.

Liu, H., Zhang, W., Zhang, X., Li, D., 2023. Abnormal temperature and retail investors' trading behavior. Financ. Res. Lett. 55, 103944.

Malmendier, U., 2021. Experience Effects in Finance: Foundations, Applications, and Future Directions. NBER Working Papers, (29074), National Bureau of Economic Research, Inc.

Malmendier, U., Nagel, S., 2011. Depression babies: Do macroeconomic experiences affect risk taking? Q. J. Econ. 126 (1), 373–416.

Marshall, B.R., Nguyen, H.T., Nguyen, N.H., Visaltanachoti, N., Young, M., 2021. Do climate risks matter for green investment? J. Int. Financ. Mark. Institutions Money 75, 101438.

Misev, M.A., Balles, P., 2024. Natural Disasters, Investor Attention, and Non-Fundamental Green Asset Demand. Working Papers, (2024/07), Faculty of Business and Economics - University of Basel.

Nomura Holdings, Inc., 2022. Japan retail investors embrace ESG amid pandemic. https://www.nomuraconnects.com/focused-thinking-posts/japan-retail-investors-embrace-esg-amid-pandemic-nomura-survey-shows/. (Accessed June 14, 2025).

Porzio, C., Salerno, D., Stella, G.P., 2023. Retail investors' sensitivity to the development and promotion of CSR issues. Financ. Res. Lett. 53, 103642.

Riedl, A., Smeets, P., 2017. Why do investors hold socially responsible mutual funds? J. Financ. 72 (6), 2505–2550.

Rossi, M., Sansone, D., van Soest, A., Torricelli, C., 2019. Household preferences for socially responsible investments. J. Bank. Financ. 105, 107–120.

Siemroth, C., Hornuf, L., 2023. Why do retail investors pick green investments? A lab-in-the-field experiment with crowdfunders. J. Econ. Behav. Organ. 209, 74–90.

Strahilevitz, M.A., Odean, T., Barber, B.M., 2011. Once burned, twice shy: How naive learning, counterfactuals, and regret affect the repurchase of stocks previously sold. J. Mark. Res. 48 (SPL), S102–S120.

Whitt, S., Wilson, R.K., 2007. Public goods in the field: Katrina evacuees in Houston. South. Econ. J. 74 (2), 377–387.