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Willingness to take risks for sustainability during the COVID-19 pandemic

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ABSTRACT

This paper empirically shows an increase in investor attention to sustainability during the COVID-19 pandemic using various measures of investor sentiment. To understand the drivers of increased interest in sustainability among investors, we use evidence from two experiments conducted before and during the pandemic. Results collected in an investment task reveal that the shift towards sustainable investments during the pandemic is primarily driven by risk-averse individuals and those with pessimistic risk expectations. These findings suggest that investors exhibit a "willingness to take risks" for sustainability during times of crises.

1. Introduction

The positive association between the sustainability profile of an asset and its stock market performance during crises has been extensively documented in empirical studies (Broadstock et al., 2021; Engelhardt et al., 2021; Kanamura, 2021; Pástor and Vorsatz, 2020; Yu, 2022; Ding et al., 2020; Albuquerque et al., 2020; Ramelli and Wagner, 2020; Cornett et al., 2016; Lins et al., 2017). While most of these studies do not elaborate on the underlying mechanisms of the link between sustainability and financial performance during crises, investor behavior has been identified as a key factor in the stock price resilience of sustainable assets (Albuquerque et al., 2020; Lins et al., 2017). It remains an open question whether investors act more responsibly during crises, or if the increase in investor sentiment for sustainability is influenced by favorable risk or return expectations for sustainable assets. Lööf et al. (2022), for example, present empirical evidence for good ESG performance to mitigate financial risk, particularly during the COVID-19 crisis. At the same time, it is unclear if investors are aware of the fact that ESG stocks imply lower financial risk. Lashkaripour (2023) reports investors to hold green assets despite negative expected returns during the crisis, which indicates that they gain some form of non-pecuniary benefit. Similarly, Ferriani and Natoli (2021) report that environmental concerns continue to be a major factor for investors during COVID-19, leading them to opt for low-ESG-risk investment funds. While evidence points towards an increase in prosocial behavior during the pandemic, for example, concerning levels of generosity (Lotti and Pethiyagoda, 2022), compassion and prosocial behavior towards neighbors (Galea, 2020), altruism (Vieira et al., 2022), and volunteering (Trautwein et al., 2020), it is an open question if this social responsibility has indeed transferred to financial markets. We aim to address the following research questions: (i) Did investor sentiment for sustainability significantly change during the pandemic, and (ii) which factors influence investor sentiment for sustainability during the crisis?

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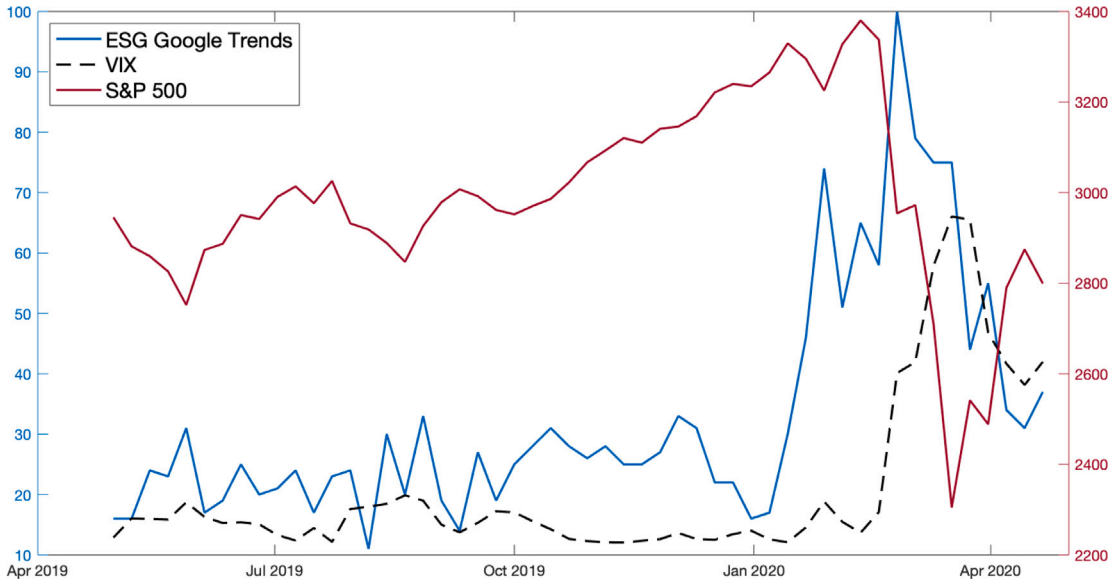

Fig. 1. Expected risk, stock performance, and sustainability sentiment (Google Trends of the term "ESG" as well as "Environmental, Social, and Governance" on a weekly basis).

The nature of the initial phase of the COVID-19 pandemic lends itself particularly well to study a potential change in sustainable market behavior. It induced a significant drop in stock prices and an increase in the volatility index (VIX — a proxy for the stock market's expectation of volatility). At the very same time, sustainability seems to have captured investors' attention (Fig. 1). The concurrence of the increase in investor interest for sustainability with the sharp rise in expected volatility and the drop in market prices would imply that (i) either (a fraction of) market participants shift towards social responsibility despite pessimistic performance and risk expectations, or (ii) (a fraction of) market participants expect these assets to be more resilient than the market. In this paper, we shed light on the drivers of sustainable investment behavior during the time of the crisis by combining empirical and experimental evidence for the US market.

In the first part of the paper, we introduce new empirical measures for *sentiment for sustainability* in the financial market and evaluate changes in these measures during the crisis.

In the second part, we report evidence from two identical artefactual field experiments (Harrison and List, 2004; Levitt and List, 2009) carried out online before (November 2019) and during the initial phase of the COVID-19 crisis (March 2020). Subjects were asked to allocate an endowment between a risk-free asset providing a fixed pay-out and a risky investment product with a given expected return and standard deviation replicating a stock index. The participants were randomly allocated to one of two groups: in the control group, no information beyond expected return and risk of the investment product was given, while participants in the treatment group were given the additional information that the investment is classified as sustainable. Our experimental setup is unique in that it examines market behavior *during* a natural shock while also comparing it to a previous experiment, thereby establishing a natural difference-in-difference setting.

Our analyses yield three main results. First, for each of our empirical market-wide indicators of investor sentiment for sustainability, we document a significant increase during the crisis. Second, we observe a significant difference in allocation to the risky asset between control and treatment at the time of the crisis, while both groups allocated similar amounts, on average, before. Third, we identify the increase in sustainable investments to be significantly affected by risk averse individuals, respectively those with pessimistic risk expectations. The uncertainty surrounding the pandemic thus prompts risk-averse individuals and those concerned about risk, to focus on sustainability by increasing their exposure to the risky sustainable asset.

This paper adds to the discussion on the prevalence of a willingness to pay (WTP) for sustainability (for example discussed by Barber et al., 2021; Gutsche and Ziegler, 2019; Rossi et al., 2019; Apostolakis et al., 2018) by arguing that, during times of turmoil, investors may indeed exhibit an increased "willingness to take risks (WTTR)" for sustainability. This finding supports the notion that investors view sustainability as a necessity, not a luxury good (Pástor and Vorsatz, 2020). Whether preferences of investors for sustainable assets are affected by socioeconomic and financial market shocks is an important question to consider. The stability of economic preferences lies at the heart of behavioral and microeconomic research. Systematic changes in preferences can have vital consequences in the real world, especially in light of the presumably important contribution of sustainable finance to solving global challenges.

2. Empirical evidence: Investor sentiment for sustainable assets

2.1. Data and variables

Our sample includes the constituents of the U.S. equity index S&P 1500. We obtain quarterly accounting information, daily trading volumes, and shares outstanding on our sample from Compustat Capital IQ, and daily stock prices (end of the day) to calculate realized and idiosyncratic volatility from CRSP. The commonly used daily Fama–French 5-factors for North America were accessed via the online platform by Kenneth R. French to estimate the daily idiosyncratic stock price volatility (IDIOVOL).

To assess the sustainability of the stocks in our sample, we use firm-level sustainability ratings, also known as ESG (Environmental, Social, and Governance) ratings provided by OWL Analytics.[1]

To empirically document investor sentiment for sustainability, we combine two approaches: (i) market-based investor sentiment as measured using trading volume and market valuation; and (ii) retail and institutional investor attention as measured by online search behavior.

(i) Since investor sentiment for a specific stock is expected to be reflected in the respective trading behavior (Barber and Odean, 2008; Baker and Wurgler, 2007), our first market-based measure is (abnormal) turnover (trading volume divided by shares outstanding) calculated in line with Chae (2005). As a second market-based indicator we use the logarithm of the market-to-book ratio to assess whether the crisis led to a valuation premium for social responsibility (Naughton et al., 2019; Baker and Wurgler, 2007; Mian and Sankaraguruswamy, 2012).

(ii) To proxy for retail investor attention, we use the search frequency in Google. To capture attention paid towards a particular stock in our sample, we follow Da et al. (2011) and examine the search volume for corresponding ticker symbols. Our measure of institutional investor attention is based on that of Ben-Rephael et al. (2017), which uses the news searching and news reading activity for specific stocks on Bloomberg terminals. Tables A1 and A2 in Appendix A (provided as part of the supplementary material available online) contain a detailed description of all variables considered together with their sources, as well as summary statistics of our sample across all variables.

2.2. Empirical results

For a first diagnostic insight into the time varying nature of investor sentiment, Fig. 2 displays each indicator as a time series for the period leading up to the crisis. We divide our equity sample into quintiles according to the latest available ESG score as of the beginning of the period and study average sentiment effects for the top quintile, representing the group with the best ratings and the bottom quintile, representing the stocks with the lowest rating. According to Fig. 2 we identify a visible difference in terms of trend in investor sentiment between top and bottom social responsibility quintiles for all our sentiment and attention indicators.

We continue with examining the significance of the difference empirically using panel regression analyses. Recall that the announcement of the pandemic of the World Health Organization was officially made on 11 March, the period of interest is therefore partitioned into the following two sub-periods:

- Crisis: 11 March 2020 – 31 March 2020
- Pre-Crisis: 1 January 2020 – 10 March 2020

We estimate the following regression model for each stock i in our sample in the first quarter of 2020:

$$\begin{aligned} Sentiment_{i,t} = {} & a_{i,t} + \beta_{1,i}\ ESG_{i,t-1} + \beta_{2,i} Crisis + \beta_{3,i}(\ ESG_{i,t-1} \times Crisis) + \beta_{4,i}\ SIZE_{i,t-1} + \beta_{5,i}\ LEV_{i,t-1} \\ & + \beta_{6,i}\ CASH_{i,t-1} + \beta_{7,i}\ ROA_{i,t-1} + \beta_{8,i}\ VOL1Y_{i,t-1} + \beta_{9,i}\ IDIOVOL_{i,t-1} + \beta_{10,i}\ RETURN_{i,t-1} + \epsilon_{i,t}\ , \end{aligned} \tag{1}$$

In this model, the coefficient of interest is the interaction term between ESG and the dummy $Crisis$ as it provides an indication if a given sentiment indicator adjusts differently according to the level of the ESG rating during the crisis; $Sentiment$ is measured based on the different attention and sentiment indicators defined in Section 2.1, namely daily observations of turnover ($Turnover$), abnormal turnover (Abn_Turn), and Bloomberg Sentiment (AIA), and weekly observations of Google sentiment (GSI) for the first quarter of 2020, and the natural logarithm of the market_book ratio (log_MB) assessed on a quarterly level between February 2019 and end of March 2020 ; $ESG_{i,t-1}$ is the lagged OWL ESG score of firm i; $Crisis$ is a dummy taking the value 1 during the crisis and 0 before; $SIZE_{i,t-1}$ is lagged firm size; $LEV_{i,t-1}$ is the lagged leverage; $CASH_{i,t-1}$ is the lagged cash ratio; $ROA_{i,t-1}$ is lagged return on assets; $VOL1Y_{i,t-1}$ is lagged realized stock volatility; $IDIOVOL_{i,t-1}$ is lagged idiosyncratic volatility, $RETURN_{i,t-1}$ is lagged daily realized stock price return.

Table 1 displays the regression results. The interaction term $Crisis \times ESG$ is significant and positive for all sentiment and attention variables under consideration.[2] Results furthermore reveal that all indicators (except abnormal turnover) generally dropped substantially during the crisis (coefficient for the variable $Crisis$) while not being significantly related to ESG overall (coefficient for the variable ESG). This finding reflects that investor attention substantially shifts towards higher levels of social responsibility

[1] OWL Analytics provides "Consensus" scores that include metrics of most traditional rating providers as a subset (https://owlesg.com/consensus-scores), which helps us to cope with the documented disagreement between sustainability scores across rating agencies (Berg et al., 2022; Brandon et al., 2021).

[2] Results remain statistically significant if we alter the definition of the sub-periods, for example by extending both sub-periods, or by specifying the start of the crisis by late February.

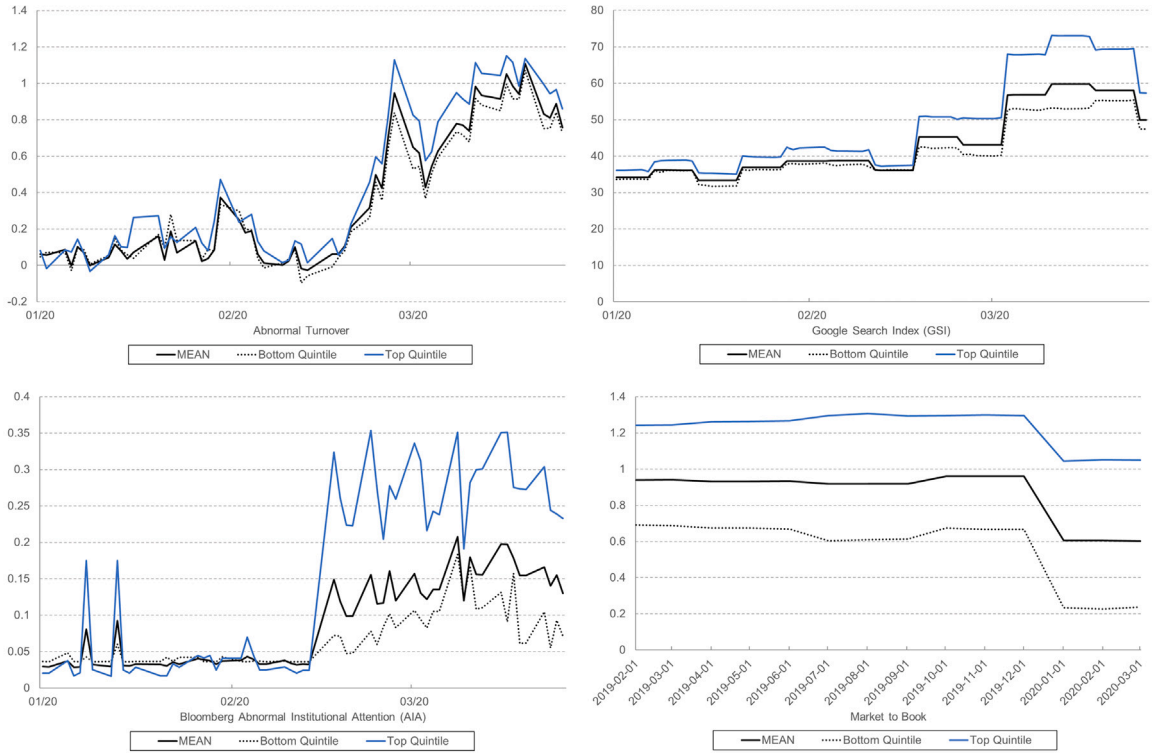

Fig. 2. Sentiment and attention indicators. The figure displays each sentiment and attention indicator as a time series during the period 1 January 2020 to 31 March 2020 (for quarterly estimations on market-to-book ratios we use data between February 2019 and end of March 2020). We divide our equity sample into quintiles according to the latest available ESG score as of the beginning of the crisis and study average sentiment effects for the top quintile, representing the group with the best sustainability ratings and the bottom quintile, representing the stocks with the lowest sustainability rating in reference to the overall mean of the sample.

Table 1
Regression analysis of sentiment indicators. This Table shows the results using model (1) with daily observations of turnover ($Turnover$), abnormal turnover (Abn_Turn), Bloomberg Sentiment (AIA) and weekly observations of Google sentiment (GSI) for the first quarter of 2020. The dummy variable $Crisis$ takes on the value 1 for days/weeks between March 11, 2020 and March 31, 2020. The natural logarithm of the market_book ratio (log_MB) is assessed on a quarterly level between February 2019 and end of March 2020. Lagged control variables include firm size (SIZE), leverage (LEV), cash ratio (CASH), return on assets (ROA), stock volatility (VOL1Y), idiosyncratic volatility (IDIOVOL) and daily return (RETURN). Standard errors are clustered at company level. Specifications presented in columns 2, 4, 6, 8, and 10 include firm fixed effects instead of control variables. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. t statistics in parentheses.

	Turn	Turn	Abn_Turn	Abn_Turn	AIA	AIA	GSI	GSI	log_MB	log_MB
Crisis	−12.389***	−12.843***	0.489***	0.450***	−0.308***	−0.254***	−9.768	−19.588***	−0.974***	−0.950***
	(−4.917)	(−7.147)	(5.043)	(6.241)	(−3.920)	(−4.739)	(−1.322)	(−3.421)	(−7.758)	(−10.302)
ESG	0.055		−0.002		−0.000		−0.040		0.002	
	(1.264)		(−0.997)		(−0.245)		(−0.297)		(0.469)	
Crisis × ESG	0.300***	0.307***	0.004**	0.005***	0.008***	0.007***	0.561***	0.750***	0.013***	0.013***
	(5.547)	(7.911)	(2.107)	(3.429)	(5.195)	(6.415)	(3.803)	(6.524)	(5.297)	(7.102)
Constant	−19.943***	2.313***	0.157*	0.223***	−0.238***	0.069***	23.562***	40.396***	0.104	0.945***
	(−6.584)	(79.111)	(1.739)	(132.947)	(−3.045)	(55.930)	(3.620)	(314.065)	(0.393)	(455.275)
Controls	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Sect. FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
ISIN FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
# ISIN	1150	1307	1150	1307	849	1004	1101	1249	1113	1267
R-sq.	0.240	0.760	0.255	0.419	0.089	0.305	0.102	0.427	0.439	0.960
F-stat.	17.519	124.191	444.540	3622.527	39.163	144.994	65.590	413.109	94.380	493.487
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

during the crisis. The results are strongly significant after the consideration of a set of lagged control variables (columns 1, 3, 5, 7, and 9)[3] and with the use of company fixed effects (columns 2, 4, 6, 8, and 10). While the results indicate a clear trend in all our measures of investor sentiment and attention, they do not provide insight into why these stocks capture investors' interest during the COVID-19-induced market crisis. We next analyze sustainable investment decisions experimentally for the same period.

3. Experimental design

We ran two identical experiments, eliciting risk attitude, risk and return expectations, as well as preferences for sustainable investments. The first experiment was conducted during the week of November 23–30, 2019. At that time, knowledge of the imminent pandemic was absent, and the stock market was in a strong bull phase. The second experiment was conducted during the week of March 13–20, 2020.

3.1. Experimental questions

The participants engaged in three parts of the experiment, as described next. The detailed experimental instructions and questions can be found in Appendix B (provided as part of the supplementary material available online).

(i) Risk aversion. The elicitation method of Gneezy and Potters (1997) is used as a measure of risk preferences with real monetary payoffs. The participants were told that they are offered USD 10 and were given the option of choosing how much of this endowment they would like to keep for sure and how much they would like to allocate to a coin flip. They were rewarded twice the amount allocated to the coin flip if the coin landed on Heads, otherwise they lose. Because the expected payoff is independent of the chosen allocation, risk aversion is equivalent to choosing a risk-free allocation.

(ii) Social responsibility in the market. Subjects were asked to allocate an initial endowment of USD 10 between a risk-free asset providing a fixed pay-out of 1.5% (Alternative A) and a risky investment product (Alternative B) with an expected return of 3.6% and a standard deviation of 12.6%. Similar to Bradbury et al. (2015) and Kirchler et al. (2018), we used an existing investment index as proxy ("MSCI World ESG Leaders Index") to calculate semi-annual returns and standard deviations for a two-year period leading up to the first experiment. We collated the amount invested in equity across all participants and invested it in the equity index, and we paid out the corresponding investment wins and losses after a period of 6 months.

The participants were randomly allocated to one of two groups: in the *control* group, no information beyond expected return and risk of the stock index is given, while in the *treatment group* participants were given the following additional information: *"Alternative B is classified as a socially responsible investment, which is the general term for sustainable and responsible investment and any other investment that incorporates environmental, social and governance criteria in the investment process".* With this approach, we were not forced to provide any false information, which could technically be referred to as deception of subjects (Charness et al., 2022), (which would be the case in the opposite setting, when allocating to a conventional equity index, but informing treated individuals about its socially responsible characteristics).

Immediately after this task, participants were asked about their risk and return expectations for risky Alternative B compared to a standard market index:

(i) *What is your return expectation for Alternative B over the next six months compared to the S&P 500?*

(ii) *What is your risk expectation for Alternative B over the next six months compared to the S&P 500?*

Note that the two questions were incentivized, so participants could earn money with being as close to reality as possible with their risk and return assessment (in terms of realized return and volatility).

(iii) Financial literacy and demographics. At the end of the experiment, subjects completed a questionnaire that included three questions eliciting financial literacy following Cohn et al. (2015) and collected information about their demographics.

3.2. Subjects, reward structure, and procedure

A total of $N_0 = 211$ subjects participated in the experiment before the crisis, and a total of $N_1 = 400$ subjects participated in the experiment during the crisis.

Subjects were recruited from the online recruitment platform Amazon MTurk. Given the purpose of our study, our principal reason for choosing MTurk is the need for almost instantaneous participation during a specific week of the COVID crisis. That said, and despite the popularity of MTurk, there are concerns that call into question the validity of research conclusions based on its data. We have followed the best practice recommendations of Aguinis et al. (2021) for addressing validity threats in research using MTurk data (i.e. we made choices regarding minimum age, investment experience, and high qualification of participants — so-called "Master Workers"). On top of a participation fee of USD 5, the decisions in the experiment were also compensated. The participants were informed that only a randomly selected number of them (precisely 10) were to be rewarded based on their choices in the experiment. Furthermore, while the participation fee of USD 5 was immediately paid out, the participants had to wait 6 months until the rewards based on their decisions were transferred. Variable definitions are provided in Table A3, and descriptive statistics and randomization checks on demographics in Table A4, both part of Appendix A (provided as part of the supplementary material available online).

[3] The choice of control variables is informed by prior studies assessing the relationship between financial performance and social responsibility (Lins et al., 2017; Becchetti and Ciciretti, 2011).

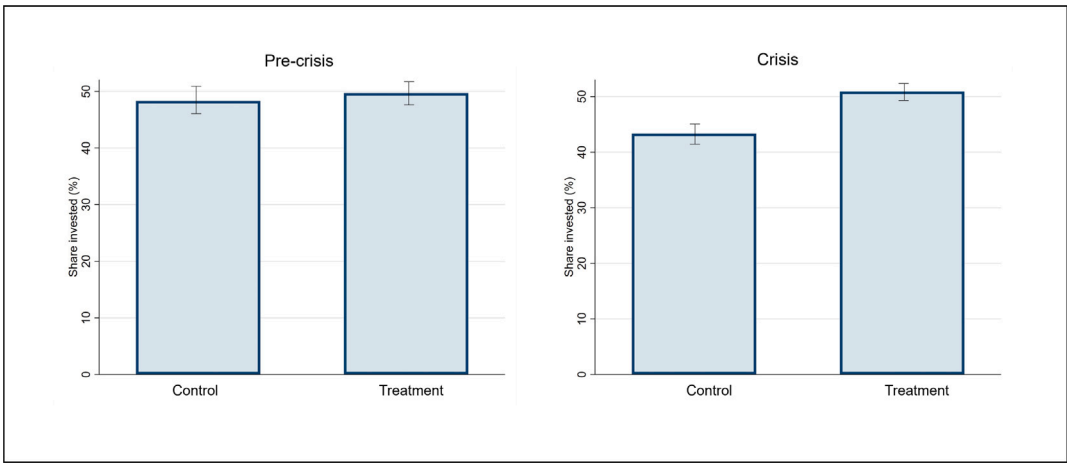

Fig. 3. Investment allocation and risk perception before and during crisis — treatment versus control. The Figure displays the average percent allocation to the risky equity index before and during the crisis for control (no sustainability information) and treatment groups (with sustainability information).

4. Experimental results

4.1. Allocation to risky asset

We document the change in allocation to both traditional and sustainable equity before versus during the crisis in Fig. 3. Before the crisis, we find no significant difference in the allocation distributions between control and treatment, which implies that adding sustainability information to the investment task did not alter participants' allocation to equity in either direction.

During the crisis, we observe a 10 percent reduction in average allocation to the risky asset for the control group (from 48.3% to 43.4%), confirming Huber et al. (2021), who show that allocations to a risky asset in an experimental task were 12 percentage lower in March 2020 than in December 2019. At the same time, the average allocation in the treatment group increases to 51% during the crisis. Table 2 contains the summary and significance statistics which confirm the statistical significance of this difference. These findings prevail statistically highly significant (at the 1% level) when using a standard ordinary least squared (OLS) regression (Table 3, column 3). The significance drops to the 10% level once we account for demographics, financial literacy, risk aversion, and risk and return expectations as control variables (column 4).

We continue with comparing risk aversion and risk expectations between the two periods Pre-crisis (E_0) and Crisis (E_1) in Table 2. Our results do not reveal significant changes in average levels of risk aversion. Concerning risk expectations, participants perceive the sustainable asset significantly less risky in both periods, while return expectations do not exhibit a significant difference between the two groups before and during the crisis. At the same time, our results in Panel B (Table 2) indicate significant differences in allocations to the risky asset between the control and treatment groups, especially among risk-averse participants and those who anticipate higher risk for the sustainable asset compared to the benchmark during the crisis. While before the crisis, risk averse and pessimistic participants (with regards to the riskiness of the asset) invested an equivalent or slightly larger amount in the control condition, during the crisis, allocations to the risky asset were significantly larger in treatment for these participants. This finding is consistent with the results from the regression analysis presented in Table 3, columns 5 and 6. While risk aversion is significantly linked to lower levels of investment in the control condition during the crisis, this significance vanishes in the treatment condition. Return and risk expectations have no significant influence on the allocation to the risky asset during the crisis. At the same time, the coefficient related to risk expectations differs between the treatment and control conditions. In the control condition, risk expectations are negatively associated with the invested amount, while in the treatment condition, the sign changes to positive, though neither coefficient is statistically significant.

4.2. Difference-in-differences analysis

We proceed by estimating the significance of the difference in allocation to the risky asset between treatment and control groups before and during the crisis using difference-in-difference analyses. To do so, we calculate an interaction term between the condition (control = 0, treatment = 1) and the period (pre-crisis = 0, crisis = 1). The difference-in-difference coefficient (DiD) quantifies the significance of the difference between conditions based on the period. As indicated by the significance of the DiD coefficient in column 1 (Table 4), the allocation increases in the treatment condition during the crisis for the whole sample (significant at the 5% level). When we divide our sample into risk-averse and risk-neutral/seeking individuals, the results in columns 2 and 3 show that the DiD coefficient is significant only for the risk-averse individuals. Additionally, columns 4 and 5 provide evidence that the DiD coefficient is highly significant for participants with high risk expectations concerning the risky assets compared to the benchmark

Table 2
Summary statistics. This Table provides summary statistics and differences between control and treatment for the periods Pre-crisis and Crisis for risk aversion, risk and return expectations, and the average amount invested (investment). All variables are defined in Table A3 (provided as part of the supplementary material available online). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, based on double-sided t-tests.

Pre-crisis					Crisis		
Risk aversion		Mean			0.16		0.17
		Std. Err.			0.025		0.019
		Difference			**−.016**		
Panel A		Pre-crisis			Crisis		
		(A) Control	(B) Treatment	Difference	(C) Control	(D) Treatment	Difference
Risk expectations	Mean	2.71	2.27	**0.44*****	2.43	2.08	**0.36*****
	Std. Err.	0.07	0.07		0.06	0.06	
Number of observations		104	105		198	194	
Return expectations	Mean	4.80	4.89	**−0.10**	4.70	4.80	**−0.09**
	Std. Err.	0.15	0.14		0.12	0.11	
Number of observations		104	105		198	194	
Panel B							
Investment (%)	Mean	48.34	49.72	**−1.38**	43.36	50.93	**−7.57*****
	Std. Err.	3.04	2.65		1.80	2.23	
Number of observations		106	105		200	200	
Investment (%) (high Risk_A)	Mean	52.69	32.71	**19.98***	21.78	47.75	**−25.97*****
	Std. Err.	10.08	6.87		5.43	6.21	
Number of observations		16	17		37	32	
Investment (%) (low Risk_A)	Mean	47.56	53.01	**−5.44***	48.25	51.53	**−3.28**
	Std. Err.	3.13	2.75		2.29	1.80	
Number of observations		90	88		163	168	
Investment (%) (high Risk_E)	Mean	48.16	48.08	**.08**	41.04	53.10	**−12.06*****
	Std. Err.	3.22	4.17		2.57	2.64	
Number of observations		91	48		144	79	
Investment (%) (low Risk_E)	Mean	49.4	51.11	**−1.71**	49.30	49.50	**−.20**
	Std. Err.	3.04	2.65		4.40	2.42	
Number of observations		15	57		56	121	

Table 3
Allocation to equity. The Table reports results to the OLS regression model $y_{i,s} = \beta_0 + \beta_1 \text{Treatment}_i + \beta_2 X_i + \epsilon_i$, where the dependent variable $y_{i,s}$ is the percentage allocation to equity of individual i under treatment s, X_i is the set of control variables for subjects' demographic information, risk aversion, and financial literacy, and ϵ_i is the idiosyncratic error term. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. t statistics in parentheses.

	Pre-crisis (E_0)	Pre-crisis (E_0)	Crisis (E_1)	Crisis (E_1)	Crisis (E_1) control	Crisis (E_1) treatment
Treatment	1.384	1.613	7.570***	5.306*		
	(0.34)	(0.36)	(2.64)	(1.79)		
Financial Literacy		2.512		0.803	−0.452	0.438
		(1.13)		(0.51)	(−0.20)	(0.20)
Risk_Averse		−6.781		−14.377***	−23.317***	−3.766
		(−1.01)		(−3.13)	(−3.84)	(−0.56)
Return_Expectation		2.569*		1.228	0.204	1.637
		(1.69)		(1.23)	(0.15)	(1.18)
Risk_Expectation		0.422		−1.120	−4.021	2.192
		(0.15)		(−0.64)	(−1.60)	(0.96)
Demographics	Included	Included	Included	Included	Included	Included
Constant	48.340***	11.868	43.355***	29.653***	36.320**	40.462***
	(15.89)	(0.78)	(19.40)	(2.96)	(2.56)	(3.12)
Observations	211	205	400	385	193	192
Adjusted R^2	−0.004	0.019	0.015	0.060	0.135	−0.014

(column 5), while it is slightly negative and insignificant for those with low risk expectations (column 4). These results confirm that the increase in risky allocation during the crisis in the treatment condition is primarily driven by risk-averse participants and those with high risk expectations.

Table 4
Difference-in-difference analyses. This Table reports results of the regression model $y_i = \beta_0 + \beta_1 \text{DiD} + \epsilon_i$, where the dependent variable y_i is the percentage allocation to equity of individual i, DiD is the interaction term between the condition (treatment versus control) and time (pre-crisis versus crisis), and ϵ_i is the idiosyncratic error term. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. t statistics in parentheses.

	All	Not risk averse	Risk averse	Low risk expectation	High risk expectation
DiD	4.657**	2.231	16.250**	−0.613	8.575***
	(1.99)	(0.94)	(2.17)	(−0.17)	(2.68)
Constant	46.268***	49.299***	31.500***	50.117***	44.527***
	(30.73)	(31.94)	(7.39)	(18.84)	(24.47)
Observations	611	509	102	249	362
Adjusted R^2	0.004	−0.000	0.035	−0.004	0.012

5. Conclusion

Through empirical financial market data and experimental evidence, we identify a significant positive increase in socially responsible market behavior during the COVID-19 crisis. Our experimental findings reveal that the increase is associated with investors' risk attitudes and expectations. While there is no general increase in risk aversion during the crisis, risk-averse participants and those with pessimistic risk expectations significantly increase their allocation to the sustainable investment option. This evidence highlights the prevalence of a "willingness to take risks" for sustainability during the crisis and reinforces the notion that investors view sustainability as a necessity, not a luxury good (Pástor and Vorsatz, 2020). This finding is relevant to the theoretical and empirical research discussing an enhancement of traditional utility functions by adding non-financial criteria (Barreda-Tarrazona et al., 2011; Levitt and List, 2007; Utz et al., 2014). We provide initial evidence that investors may associate sustainability with their risk tolerance rather than return expectations.

More broadly, our results emphasize the crucial role of market conditions in shaping sustainable investment behavior. We demonstrate that socioeconomic and crisis-induced factors significantly impact sustainable investment decisions. During extreme crises like the COVID pandemic, agents tend to behave more responsibly, possibly regardless of their risk attitudes. Future research should thoroughly explore the relationship between social and risk preferences and assess the prevalence of a "willingness to take risks for sustainability". It should also examine how preferences for sustainability may change in response to various socioeconomic and financial market crises. Studying the stability of sustainability preferences is vital for policymakers as they amend regulations across various jurisdictions to align sustainability preferences with investment products. If sustainability preferences fluctuate with market cycles, they should be collected periodically.

CRediT authorship contribution statement

Julia Meyer: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Funding acquisition.

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.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

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