JYX
JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

This is a self-archived version of an original article. This version may differ from the original in pagination and typographic details.

Author(s): Vu, Thanh Nam

Title: ESG performance and sustainability concerns exposure

Year: 2025

Version: Published version

Copyright: © 2024 The Author. Published by Elsevier Inc.

Rights: CC BY 4.0

Rights url: https://creativecommons.org/licenses/by/4.0/

Please cite the original version:

Vu, T. N. (2025). ESG performance and sustainability concerns exposure. Finance Research Letters, 71, Article 106434. https://doi.org/10.1016/j.frl.2024.106434

Finance Research Letters 71 (2025) 106434

Contents lists available at ScienceDirect

Finance Research Letters

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

ESG performance and sustainability concerns exposure

Thanh Nam Vu *

School of Business and Economics, University of Jyväskylä, Finland

ARTICLE INFO

Keywords:
ESG
ESG risk
Sustainability
Corporate governance
Public concerns

ABSTRACT

This paper analyzes stock returns' sensitivity to the newly introduced sustainability concerns index based on media indicators from LSEG MarketPsych for the US market from 2010 to 2023. While the results demonstrate that better ESG performance mitigates equities' sensitivity to sustainability concerns in society, the effects are mainly driven by firms' governance rather than environmental or social performance. This study underscores the vital role of good governance and management among ESG criteria for firms in promoting the stability of stock returns to changes in public concerns regarding sustainability issues.

1. Introduction

National and global sustainability matters and concerns, e.g., climate change, social equality, and human freedom, pose considerable risks for firms due to the business environment's changes. The previous literature highlights that the public's perception of sustainability issues, particularly climate change, is crucial in shaping the connection between corporate sustainability activities and firms' financial outcomes (Ozkan et al., 2023), affecting stock returns (Ardia et al., 2023; Engle et al., 2020). These findings imply that the fluctuations in stock returns during shifts in climate change concerns differ across varying levels of the sustainability performance of firms. However, the specific evidence of these differences remains unexamined. Therefore, this study investigates the impact of ESG performance on firms' exposure to societal sustainability concerns. Specifically, we examine the role of ESG performance in alleviating firms' sensitivity to sustainability concerns.

Existing studies have introduced the influence of markets' perceptions of sustainability issues on the conditional ESG performance and expected returns relationship (Ardia et al., 2023; Pástor et al., 2022, 2021; Vu et al., 2025). Theoretical frameworks proposed by Pástor et al. (2021) and Pedersen et al. (2021) posit that the relationship between ESG and returns hinges on investors' awareness and preferences for sustainability. Drawing from these insights, we assume that sustainability concerns impact stock returns, but this association varies among firms with different levels of ESG performance. In other words, the fluctuations in stock returns surrounding changes in sustainability concerns differ across varying ESG performance levels. Departing from this perspective, we investigate the following hypothesis:

H1. There is an association between firms' ESG performance and the sensitivity of stock returns to sustainability concerns.

Previous findings illustrate the role of ESG performance in mitigating firm risk (Chollet and Sandwidi, 2018; He et al., 2023; Liu et al., 2023; Tzouvanas and Mamatzakis, 2021), crash risk (Nguyen et al., 2023; Yu et al., 2023), or climate risk (Hossain and Masum, 2022; Ozkan et al., 2023). In addition, good ESG performances tend to protect firms from changes in regulations concerning sustainability (Grewal et al., 2019). Those benefits are attributed to the lower harmful impact of ESG risk-induced events (Hoepner et al., 2024) on companies that actively engage in sustainability development. Besides, ESG practices could serve as a protection mechanism

* Corresponding author at: School of Business and Economics, University of Jyväskylä, P.O. Box 35, FI-40014 Jyväskylä, Finland.
E-mail address: vuthanam@jyu.fi.

https://doi.org/10.1016/j.frl.2024.106434
Received 3 September 2024; Received in revised form 5 November 2024; Accepted 5 November 2024
Available online 6 November 2024
1544-6123/© 2024 The Author. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

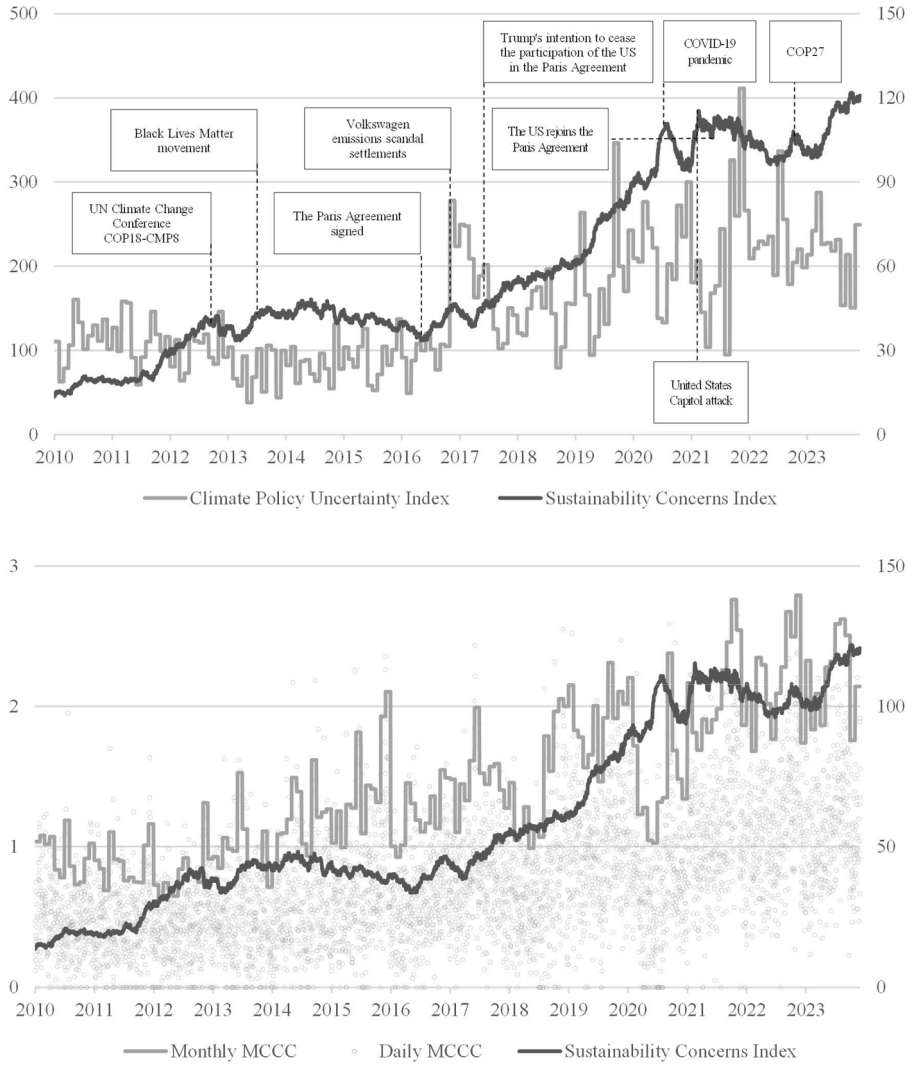

Fig. 1. Evolution of Sustainability Concerns Index, Climate Policy Uncertainty Index, and Media Climate Change Concerns Index (MCCC) during 2010–2023.

to mitigate probabilities of regulatory actions and customer criticism against companies. Hence, we suggest a negative association between ESG performance and firms' sensitivity to sustainability concerns.

H2. Firms with good ESG performance are less sensitive to changes in sustainability concerns.

We measure firms' exposure to sustainability concerns by calculating the correlation between daily stock returns and the sustainability concerns index. The index is constructed utilizing indicators from LSEG MarketPsych, which capture the public perspectives on sustainability reflected in discussions in the media. Using a sample of US firms from 2010 to 2023, we find evidence that firms with better ESG performance exhibit less sensitivity to sustainability concerns. However, the Governance (G) pillar, rather than the Environmental (E) and the Social (S) pillars, play a pivotal role in mitigating the risks associated with shifts in the public perspectives on sustainability. Thus, corporations should consider prioritizing governance performance before going further to environmental and social criteria in their sustainability risk management strategies.

This research contributes to the literature on the association among ESG, stock returns, and risk, along with the shifts in public concerns and awareness about sustainability issues. The findings are connected to the previous studies on ESG performance and firm risk (Chollet and Sandwidi, 2018; He et al., 2023; Hoepner et al., 2024; Hossain and Masum, 2022; Tzouvanas and Mamatzakis, 2021). We also provide evidence on the connection between ESG performance and market valuation adjustments in response to general sustainability concerns, providing a possible explanation for the conditional ESG investment performance as detailed by (Ardia et al., 2023; Choi et al., 2020; Pástor et al., 2022, 2021; Vu et al., 2025). Besides, understanding the relationship between ESG activities and exposure to sustainability concerns is vital for firms' risk management, benefiting managers and investors from this enhanced

knowledge of using sustainability criteria in hedging and risk management practices.

2. Data

First, to measure public concerns about sustainability in the US market, we construct the Sustainability Concerns Index (SCI) by adopting the calculation of Beckmann and Rogmann (2024) and using country-level ESG data from LSEG MarketPsych ESG Analytics (MarketPsych). MarketPsych provides indicators that capture public perceptions of national sustainability issues by monitoring real-time discussions across newspapers and social media. To construct the indicators, MarketPsych analyzes texts from millions of daily articles and public social media content covering ESG topics in thirteen languages (as of 2021).[1] The daily data source of MarketPsych incorporates over two million articles and posts from millions of authors across news publishers, blogs, and social media. Additionally, contents classified as self-reports, promotion, spam, or content automation are excluded from the embedded texts for constructing the indicators.[2] Based on this setting, the indicators from MarketPsych reflect broad public and external perceptions about focus themes.

In this paper, we use the country's ESG Controversy score from MarketPsych, similar to Beckmann and Rogmann (2024). This ESG Controversy score reflects the collective media discussions, including only negative ESG-related coverage about national practices violating sustainable development goals,[3] particularly highlighting society's concerns about sustainability. The country's ESG Controversy scores are scaled from 1 to 100 with an opposite valence (high scores are subjectively negative).[4] Another key indicator from the MarketPsych to construct the sustainability concerns index in the study is the intensity of media coverage ("buzz") representing the amount of relevant news and social media posts that the MarketPsych analyzes to calculate the country's ESG scores and thus also being a proxy for the media attention. More specifically, in this paper (following Beckmann and Rogmann, 2024), where we concentrate only on the US data, the sustainability concerns index for the US is calculated as follows:

$$\text{Sustainability Concerns Index}_t = \frac{\text{buzz}_t}{\text{meanbuzz}} \times \text{ESGControversy}_t \tag{1}$$

where ESGControversy is the daily ESG Controversy score for the US from MarketPsych, buzz is the total number of relevant references for the US, and meanbuzz is the average buzz over the whole sample period. By the nature of Eq. (1), a high controversy score with low media attention can be similar to a low score with high attention.

Fig. 1 presents the evolution of the daily SCI compared to the Climate Policy Uncertainty Index (CPU)[5] (Gavriilidis, 2021). Similar to Beckmann and Rogmann (2024), the SCI based on our calculation is highly correlated with the CPU (corr = 0.67). There is also a strong co-movement between the SCI and the Media Climate Change Concerns Index (MCCC)[6] (Ardia et al., 2023), with a correlation of 0.78 during the examined period. The SCI exhibited an upward trend during the sample period, and its fluctuation is closely related to major historical events. Differing from the CPU and the MCCC, the SCI captures all public concerns about sustainability-related themes rather than only climate issues. The SCI reached the relatively lowest point in the last decade (2013–2023) when the Paris Agreement was signed in 2016, but it continued to increase substantially after that and reached a peak during the intensification of the COVID-19 pandemic. In recent times, the SCI soared to the highest level in 2023 along the world scene with increasing disarray, e.g., record global temperatures,[7] the acceleration of anti-ESG movement,[8] immigrant crisis,[9] or escalating geopolitical conflicts.[10]

Next, to measure the sensitivity of stock returns to national sustainability concerns, we introduce Sustainability beta (β_{SC}), following the ideas of (Chen et al., 2023; Zhang et al., 2024a, 2023, 2024b). For each stock and each year, we estimate the below linear regression model to measure how firms' stock returns respond to the change in the SCI, controlling for the effects of market returns:

$$R_{i,t} = \beta_{0,i} + \beta_{\Delta\text{SCindex},i,0} \times \Delta\text{SCindex}_t + \beta_{\Delta\text{SCindex},i,1} \times \Delta\text{SCindex}_{t-1} + \beta_{m,i} \times R_{m,t} + \varepsilon_{i,t} \tag{2}$$

[1] https://www.lseg.com/content/dam/lseg/en_us/documents/media-centre/press-releases/refinitiv/marketpsych-esg-analytics-factsheet.pdf (accessed Sep 24, 2024)

[2] https://www.lseg.com/content/dam/marketing/en_us/documents/white-papers/refinitiv-marketpsych-esg-analytics-whitepaper.pdf (accessed Sep 24, 2024)

[3] The national ESG Controversy score only measure the prevalence of negative themes, events, and commentary: growing levels of waste and pollution, climate change, population disease burden, unfair wage issues, workplace abuse, labor law violations, tax fraud, anger towards country's governance, division within the society, social turbulence, etc.

[4] The original scores from the MarketPsych (core package) have a subjectively positive meaning, i.e., from most controversies (1) to fewest controversies (100). The score is converted to negative valence framework by subtracting 101 points and getting absolute value.

[5] CPU data is downloaded from https://www.policyuncertainty.com.

[6] MCCC data is downloaded from https://sentometrics-research.com.

[7] Perkins-Kirkpatrick, S., Barriopedro, D., Jha, R., Wang, L., Mondal, A., Libonati, R. and Kornhuber, K., 2024. Extreme terrestrial heat in 2023. Nature Reviews Earth and Environment, 5(4), 244-246. https://doi.org/10.1038/s43017-024-00536-y

[8] Tang, O., Shi, X. and Jiu, L., 2024. Value creation or political trick? An event study on anti-ESG regulations. Finance Research Letters, 65, 105530. https://doi.org/10.1016/j.frl.2024.105530

[9] For example, the US-Mexico border crisis peak. https://homeland.house.gov/2023/10/26/factsheet-final-fy23-numbers-show-worst-year-at-americas-borders-ever/ (accessed Sep 24, 2024)

[10] For example, the Hamas-led attack on Israel in October 2023. https://www.hrw.org/news/2024/07/17/october-7-crimes-against-humanity-war-crimes-hamas-led-groups (assessed Sep 24, 2024)

Table 1
Variable descriptions and descriptive statistics.

Panel A. Summary statistics

Variable	Definition	N	Mean	SD	P25	Median	P75
$\beta_{SC,\,t}$	Sustainability concerns exposure of equity	19,482	12.62	15.30	3.32	7.71	15.79
ESG_{t-1}	LSEG ESG rating of equity	19,482	40.54	19.38	25.38	37.05	54.17
E_{t-1}	LSEG E rating of equity	19,482	36.39	26.47	13.33	31.57	58.28
S_{t-1}	LSEG S rating of equity	19,482	42.84	20.95	26.60	39.41	57.45
G_{t-1}	LSEG G rating of equity	19,482	48.72	22.41	30.60	49.35	66.72
$SIZE_{t-1}$	Natural logarithm of the market value (in billion) of equity	19,482	1.10	1.75	−0.13	1.07	2.23
BM_{t-1}	Book-to-market ratio	19,482	0.55	0.65	0.22	0.42	0.72
ROA_{t-1}	Net income divided by total assets	19,482	0.00	0.16	0.00	0.03	0.07
LEV_{t-1}	Ratio of total liabilities to total assets	19,482	0.58	0.23	0.42	0.59	0.77
$SIGMA_{t-1}$	Standard deviation of firm's daily returns (%) over the year	19,482	2.65	1.59	1.55	2.15	3.31

Panel B. Correlation matrix

		1	2	3	4	5	6	7	8	9
1	$\beta_{SC,\,t}$									
2	ESG_{t-1}	−0.18								
3	E_{t-1}	−0.15	0.85							
4	S_{t-1}	−0.12	0.87	0.73						
5	G_{t-1}	−0.14	0.73	0.40	0.40					
6	$SIZE_{t-1}$	−0.30	0.61	0.59	0.58	0.32				
7	BM_{t-1}	0.03	−0.06	−0.08	−0.10	0.01	−0.24			
8	ROA_{t-1}	−0.35	0.23	0.14	0.13	0.22	0.36	−0.02		
9	LEV_{t-1}	−0.17	0.19	0.12	0.11	0.15	0.13	0.09	0.15	
10	$SIGMA_{t-1}$	0.36	−0.26	−0.20	−0.17	−0.22	−0.40	0.05	−0.51	−0.24

Note. The table reports the summary statistics and the correlation matrix of all variables. The sample period is from 2010 to 2023.

where R_i is the daily excess return (%) over the risk-free rate of stock i, ΔSCindex is the daily change of SCI $\Delta SCindex_t = LOG(SCindex_t/SCindex_{t-1})$, R_m is the daily market excess return,[11] and ε_i is the error term. The equation includes the lagged change of SCI to capture the non-synchronizing measurement, similar to Chen et al. (2023) and Zhang et al. (2024a, 2024b, 2023). Then, the β_{SC} is the absolute value of the yearly estimated $\beta_{\Delta SCindex}$, calculated as:

$$\beta_{SC,i} = \left|\beta_{\Delta SCindex,i,0} + \beta_{\Delta SCindex,i,1}\right| \tag{3}$$

This β_{SC} measures the strength of stocks' response to the changes in the SCI, i.e., the firm's exposure to sustainability concerns, with a high β_{SC} implying that stocks are more sensitive (either positively or negatively) to society's concern about sustainability. This calculation uses the absolute value to capture the magnitude rather than the direction of the impact, ensuring that stocks with either particularly high (positive) or low (negative) returns during changes in sustainability concerns are identified as having higher sensitivity. This transformation makes β_{SC} comparable between firms with positive and negative $\beta_{\Delta SCindex}$. Using absolute values also allows consistent interpretation across groups of firms whose stock returns are either negatively or positively correlated with the changes in the SCI.[12]

The main explanatory variables in this study are the LSEG (total and pillar) ESG scores, measuring the ESG performance of firms. Other control variables are detailed in Table 1. The data is extracted from the LSEG Eikon. The sample data includes companies headquartered in the US and listed on NASDAQ or NYSE. After removing non-available observations across the variables, the final sample covers 2750 firms, spans from 2010 to 2023, and includes 19,482 firm-year observations. All variables are winzorized at 0.1 % and 99.9 % levels. The descriptive statistics of variables and the correlation matrix are shown in Table 1.

As seen in Table 1, the average value for E score is 36.39, the lowest among all scores of ESG (40.54), S (42.84), and G (48.72). The average sustainability beta is 12.62, with a standard deviation of 15.30, indicating a significant variation in the sensitivity to sustainability concerns among the firms examined. The correlation matrix shows that the firms' sustainability betas negatively correlate with the ESG performance (total and individual pillar scores). This first evidence suggests that companies with good ESG performance tend to be less sensitive to the sustainability concerns in society.

[11] Risk-free rates and market returns are downloaded from Kenneth French's data library. https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[12] For example, one might expect stocks in the clean energy industry to have a positive $\beta_{\Delta SCindex}$, while stocks in the fossil fuel industry would likely have a negative $\beta_{\Delta SCindex}$. Within the group of firms with positive $\beta_{\Delta SCindex}$, a higher value indicates greater sensitivity to sustainability concerns. In contrast, for firms with negative $\beta_{\Delta SCindex}$, a lower (more negative) value reflects greater sensitivity. A more general interpretation for both groups of firms is that higher $|\beta_{\Delta SCindex}|$ implies greater sensitivity. Besides, the magnitudes (absolute values) are more meaningful when comparing the sensitivity of firms across two groups with opposite signs of $\beta_{\Delta SCindex}$.

Table 2
Effects of ESG performance on firms' sensitivity to sustainability concerns.

Dependent variable: $\beta_{SC,\,t}$						
ESG_{t-1}	−0.1255***	−0.0372***	−0.0201***			
	(−19.86)	(−5.04)	(−3.26)			
E_{t-1}				−0.0058		
				(−1.28)		
S_{t-1}					−0.0066	
					(−1.16)	
G_{t-1}						−0.0139***
						(−3.07)
$SIZE_{t-1}$		−1.6900***	−0.6621***	−0.6629***	−0.7498***	−0.7488***
		(−17.80)	(−7.79)	(−7.52)	(−8.91)	(−10.43)
BM_{t-1}			0.4206	0.5461*	0.3779	0.4018
			(1.59)	(1.74)	(1.50)	(1.56)
ROA_{t-1}			−13.9243***	−12.2242***	−13.9698***	−13.8049***
			(−10.98)	(−6.62)	(−10.99)	(−10.90)
LEV_{t-1}			−1.6007***	−1.4523**	−1.7636***	−1.7011***
			(−2.83)	(−2.35)	(−3.14)	(−3.04)
$SIGMA_{t-1}$			2.2580***	2.3717***	2.2760***	2.2541***
			(15.50)	(15.86)	(15.63)	(15.47)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	19,482	19,482	19,482	19,482	19,482	19,482
R^2 Adj.	0.21	0.24	0.29	0.26	0.29	0.29

Note: This table reports the panel estimation results based on the regression model (4) for testing the association between ESG performance and firms' exposure to the change in sustainability concerns. The dependent variable β_{SC} is Sustainability concerns exposure of equity. The focused independent variable is ESG or individual E, S, or G performance. The other independent variables are detailed in Table 1. T-statistics are in parentheses, based on standard errors clustered by firms. ***, **, * denote statistical significance at the 1 %, 5 %, and 10 % levels.

3. Empirical analysis

3.1. Baseline results

We employ the following regression model to examine the relationship between ESG performance and firms' exposure to sustainability concerns:

$$\beta_{SC,i,t} = \alpha_0 + \alpha_{ESG} ESG_{i,t-1} + \sum \gamma_k Control_{k,i,t-1} + \text{Industry FE} + \text{Year FE} + \varepsilon_{i,t} \quad (4)$$

where β_{SC} is sustainability beta; ESG is LSEG ESG/E/S/G performance rating of a firm; Control includes SIZE, BM, ROA, LEV, and SIGMA; Industry and Year FE are industry- and year-fixed effects.

Table 2 presents results from estimating the regression model in Eq. (4). Generally, the coefficients of ESG variables are statistically significant and negative. While the magnitude of the association between ESG performance and firms' exposure to sustainability concerns reduces after controlling for the key financial variables, the effects are still highly significant at 1 % level. Hence, we obtain strong evidence that high ESG performance relates to a firm's less sensitivity to sustainability concerns. For example, the coefficient of ESG is –0.0201 in regression 3 in Table 2, implying that a one-point increase in ESG ratings reduces the sustainability beta by 0.0201. This means that when the SCI changes by 1 %, one point higher in ESG ratings reduces the fluctuation in stock returns by 0.0002 percentage points.

However, when using the pillar ratings, we find that the relationship between ESG performance and sensitivity to sustainability concerns seems to be driven mainly by the G pillar, as the parameter estimate for the effects of this pillar is also highly statistically significant. In contrast, neither the E nor S performance significantly connects to firms' exposure to sustainability concerns. This evidence indicates that not all ESG efforts and practices are relevant for firms' exposure to sustainability concerns. The returns of stocks with better governance and management, but not necessarily environmental or social performance, seem to be more stable in response to the changes in sustainability concerns in society. Among the three broad individual ESG pillars, improving corporate governance is relatively critical to sustainable risk management. This implication is highly intuitive because good corporate governance is the foundation for managing all business risks, including sustainability-related risks. Sound corporate governance is one of the crucial prerequisites to successfully managing environmental and social challenges.[13] Good governance and management could increase managers' incentives to reduce their firm's risk (Gormley and Matsa, 2016). Besides, the G pillar is arguably stronger correlated with firms' future fundamentals than the E and S pillars (Pedersen et al., 2021). Good G performance implies the openness to the market (stakeholders) for corporate control and links to the openness of private information flow to the market (Ferreira and Laux, 2007), thus

[13] World Bank Group (2017). Who cares wins: connecting financial markets to a changing world. http://documents.worldbank.org/curated/en/280911488968799581/Who-cares-wins-connecting-financial-markets-to-a-changing-world (Accessed August 19, 2024)

Table 3
ESG performance and sustainability concerns exposure – Industry analysis.

Dependent variable: $\beta_{SC,\,t}$	Cyclicals	Non-Cyclicals	Energy	Financials	Healthcare	Industrials & Materials	Technology	Real Estate
ESG_{t-1}	−0.0137**	−0.0139**	−0.0111*	−0.0202***	−0.0127**	−0.0120*	−0.0123*	−0.0140**
	(−2.13)	(−2.19)	(−1.81)	(−3.14)	(−2.09)	(−1.77)	(−1.91)	(−2.15)
$D_{ind}\times ESG_{t-1}$	−0.0021	0.0082	−0.0384	0.0141	−0.0121	−0.0049	−0.0061	0.0047
	(−0.14)	(0.55)	(−1.54)	(1.33)	(−0.70)	(−0.47)	(−0.44)	(0.37)
D_{ind}	1.3455*	−0.1704	2.6865**	−2.8125***	2.0771**	0.0663	0.3720	−1.8617***
	(1.74)	(−0.18)	(2.12)	(−5.02)	(2.35)	(0.13)	(0.53)	(−3.12)
E_{t-1}	0.0010	−0.0009	−0.0001	−0.0077	−0.0011	0.0022	−0.0013	−0.0007
	(0.23)	(−0.19)	(−0.01)	(−1.64)	(−0.25)	(0.46)	(−0.29)	(−0.15)
$D_{ind}\times E_{t-1}$	−0.0183	−0.0021	−0.0194	0.0055	0.0069	−0.0139*	0.0036	0.0089
	(−1.61)	(−0.16)	(−1.13)	(0.66)	(0.46)	(−1.66)	(0.36)	(0.87)
D_{ind}	1.8512***	0.2207	1.5239*	−1.8531***	1.1935	0.4854	−0.0700	−2.2561***
	(3.06)	(0.26)	(1.73)	(−4.21)	(1.41)	(1.11)	(−0.14)	(−4.65)
S_{t-1}	−0.0010	−0.0013	0.0015	−0.0072	−0.0026	0.0003	−0.0009	−0.0002
	(−0.16)	(−0.22)	(0.26)	(−1.21)	(−0.46)	(0.05)	(−0.15)	(−0.03)
$D_{ind}\times S_{t-1}$	−0.0057	0.0013	−0.0360	0.0213**	−0.0078	−0.0076	−0.0031	0.0065
	(−0.45)	(0.09)	(−1.59)	(2.18)	(−0.52)	(−0.79)	(−0.23)	(0.51)
D_{ind}	1.4878**	0.1376	2.5722**	−3.0490***	1.9440**	0.1605	0.2677	−1.9632***
	(2.10)	(0.15)	(2.26)	(−5.64)	(2.37)	(0.32)	(0.38)	(−2.95)
G_{t-1}	−0.0119**	−0.0125***	−0.0118***	−0.0152***	−0.0106**	−0.0109**	−0.0100**	−0.0122**
	(−2.50)	(−2.68)	(−2.63)	(−3.00)	(−2.43)	(−2.15)	(−2.05)	(−2.56)
$D_{ind}\times G_{t-1}$	0.0046	0.0147	−0.0090	0.0028	−0.0056	−0.0031	−0.0102	0.0068
	(0.33)	(1.09)	(−0.35)	(0.30)	(−0.33)	(−0.33)	(−0.89)	(0.61)
D_{ind}	1.0073	−0.5748	1.6660	−2.3820***	1.8261*	0.0509	0.5623	−2.0034***
	(1.26)	(−0.63)	(1.08)	(−4.28)	(1.94)	(0.09)	(0.85)	(−3.17)

Note: This table reports the panel regression estimates of the model (5) with industry dummies to test the association between ESG performance and firms' exposure to changes in sustainability concerns. The dependent variable β_{SC} is Sustainability concerns exposure of equity. The focused independent variables are ESG performance and the interaction between ESG performance and industry dummy D_{ind}. D_{ind} obtains the value of 1 if a firm is in the industry indicated on the top row and 0 otherwise. Other variables are detailed in Table 1. T-statistics are in parentheses and based on standard errors clustered by firms. ***, **, * denote statistical significance at the 1 %, 5 %, and 10 %.

strengthening accountability to investors.[14] In terms of E and S performance, the market seems to ignore these efforts in the short term (Edmans, 2011), and the higher costs associated with these activities could pose potential risks for firms as these efforts may not yield immediate returns (Habermann and Fischer, 2023). It is also argued that some criteria are more complex to define, observe, and measure improvements, especially social topics (Hoepner et al., 2024), creating challenges for investors to recognize and evaluate these efforts to integrate into the pricing process.

Overall, the results from the baseline models support both hypotheses about the negative association between ESG performance and exposure to sustainability concerns. However, in terms of mitigating the sensitivity to sustainability concerns, companies may find it beneficial to prioritize enhancing their governance and management practices before focusing on other environmental and social activities. Strong governance and management serve as solutions for more effective monitoring and mitigating potential risks perceived by investors. The findings could also potentially explain the impact of temperature sensitivity on financial performance in Zhang et al. (2024a) and climate risk exposure premium in returns in Zhang et al. (2023) by establishing a connection to ESG premium.

3.2. Robustness tests

3.2.1. Industry analysis

To consolidate the findings and test whether specific industries drive the results, we compare the association between ESG performance and sustainability concerns exposure of stocks in a specified industry to others. An industry dummy variable and its interaction with the ESG performance are added to extend the Eq. (4) as follows:

$$\beta_{SC,i,t} = \alpha_0 + \alpha_{ESG} ESG_{i,t-1} + \alpha_{ind} ESG_{i,t-1} \times D_{ind} + dD_{ind} + \sum \gamma_k Control_{k,i,t-1} + Year\ FE + \varepsilon_{i,t} \quad (5)$$

where D_{ind} is a dummy variable getting a value of 1 if the firm is in the specified industry[15] and 0 otherwise; other variables are as in Eq. (4).

Across all regressions in Table 3, the estimated coefficients for ESG and G are highly significant and negative, while there is no

[14] Harvard Business Review (2022). It's Time to Focus on the "G" in ESG. https://hbr.org/2022/11/its-time-to-focus-on-the-g-in-esg (Accessed August 19, 2024)
[15] The industries are classified according to TRBC Sector Classification (Refinitiv Business Classification)

significant estimate for E and S, providing supporting evidence for the results in the previous sections. We see that the sensitivity of firms to sustainability concerns decreases when the ESG and G performance increases in all industries with statistically significant estimates. No substantial evidence of industry-specific effects seems to exist in the relationship between the ESG or G performance and the exposure to sustainability concerns, as the parameter estimates on the interaction coefficient ($D_{ind}\times$ESG/G) are statistically insignificant across the regressions. Only a weakly significant estimate is observed in the interaction coefficient ($D_{ind}\times$E), column 7 Table 3, at the level of 10 %, implying that a better E performance seems to reduce the sustainability concerns exposure of a firm in the Industrials and Materials industries. An exception is observed in the Financials industry, which exhibits a positive association between the S performance and sensitivity level. This result indicates that investing in efforts related to the S criteria might not always be beneficial, in line with Habermann and Fischer (2023).

3.2.2. Endogeneity issues

Despite using the lagged independent variables to control for potential reversed causality, the regression models still subjectively contain endogeneity issues. One mechanism is that firms with low sensitivity to sustainability concerns may operate in industries more inclined to enhance ESG-friendly practices. Additionally, companies highly sensitive to sustainability issues have incentives to strengthen their ESG activities. Firms with greater resources for diversity mitigating business risks may also have more capacity to improve their overall ESG performance. Some studies also indicate the impact of global and national risk and issues on the ESG performance of firms (for example, Jiang et al., 2024; Safiullah and Kabir, 2024).

Therefore, to consolidate the findings, we use instrumental variables and apply a two-stage least squares (2SLS) regression approach to further address the endogeneity issue. Based on He et al. (2023), Ozkan et al. (2023), and Shafer and Szado (2020), we choose two instrumental variables (IV): industry ESG mean and state ESG mean. The first IV is the mean of ESG (E, S, or G) ratings among the firms in the same industry and year, and the second IV is the mean of ESG (E, S, or G) ratings among the firms in the same state and year. The ESG performance of a firm is influenced by the ESG performance of other firms due to the nature of the industry or legal framework and societal perspectives. The LSEG ESG rating metrics also incorporate those correlations, as the individual firm rating is benchmarked against its counterparts in the same industry and geographical area. However, the firm sensitivity of a single company cannot affect the ESG ratings of other companies in the same industry and geographical area.

The estimation results from the 2SLS regressions are reported in Table A1 in the Appendix. The results support our main findings in the previous section. The estimated coefficients of the aggregate ESG and G scores (instrumented) are significant and negative, implying the negative relationship between ESG/G performance and sustainability beta. Regarding the E and S pillars, the parameter estimates remain non-significant.

3.2.3. Alternative measures of public concerns

For further robustness checks, we replace the SCI with the CPU (Gavriilidis, 2021) and the MCCC (Ardia et al., 2023) to calculate β_{SC} and perform regression using Eq. (4) with these recalculated dependent variables. The results are presented in Table A2 in the Appendix. Although evidence of relationships between E (using the MCCC) or both E and S (using the CPU) with sustainability beta can be observed from the results, the estimated coefficients for these pillars are only statistically significant at the level of 10 %. Only ESG and G performance exhibit substantial association with sustainability concerns exposure with a significant level of 1 % when using either the CPU or the MCCC. The results consolidate evidence that improving ESG, particularly G, performance reduces firms' sensitivity to sustainability concerns in society. The significant results for the E pillar when using the MCCC align with Ardia et al. (2023) and Pástor et al. (2022), suggesting that the size of the "greenium"[16] depends on public concerns about climate change (proxied by the MCCC), as green and brown stocks respond to climate concerns with varying intensities. The substantially significant estimates for G also align with a broader analysis of Vu et al. (2025), which suggests that governance seems to be the primary driver of the conditional performance of ESG portfolios, particularly in response to general sustainability concerns in society.

3.3. Changes in the sustainability concerns and the expected returns adjustment

In this section, we analyze the mechanism of the relationship between ESG performance and firms' sensitivity to sustainability concerns. The difference in the exposure levels in the previous sections underscores the variance in reassessing firms' market value across different ESG ratings amidst shifts in societal concerns and perspectives regarding sustainability. We argue that changes in sustainability concerns trigger market revaluation, but the stock price adjustment range depends on the ESG performance of firms. To examine the above assumption, we use a panel regression that models the magnitude of abnormal returns as a function of an interaction effect between the firm's ESG performance and the daily changes in sustainability concerns, given as:

$$\left|AR_{i,t}\right| = \delta_0 + \delta_1\left|\Delta SCindex_t\right| + \delta_2\left|\Delta SCindex_t\right| \times ESG_{i,y-1} + \delta_3 ESG_{i,y-1} + \sum \gamma_k Control_{k,i,y-1} + \text{Industry FE} + \text{Year FE} + \epsilon_{i,t} \quad (6)$$

where $|AR_t| = |R_{i,t} - \alpha_t - \beta_t \times R_{m,t}|$ denotes the abnormal returns on stock i, $R_{i,t}$ is the daily excess return over the risk-free rate of stock i at time t, $R_{m,t}$ is market returns over the risk-free rate at time t, α_t and β_t are CAPM alpha and beta estimated over a 90-day window [t–100, t–11] using OLS regression for each firm i; other variables are as in Eq. (4).

[16] The greenium is defined as the difference between the expected returns of stocks with low carbon emissions (green – good environmental scores) and higher carbon emissions (brown – bad environmental scores)

Table 4
Market revaluation and changes in concerns about sustainability.

Dependent variable: $\lvert AR_t \rvert$				
	ESG	E	S	G
$\lvert \Delta SCindex_t \rvert$	−0.0250***	−0.0093***	−0.0183***	−0.0191***
	(−8.79)	(−4.26)	(−6.40)	(−6.18)
$\lvert \Delta SCindex_t \rvert \times ESG_{t-1}$	0.0005***	0.0002***	0.0003***	0.0003***
	(8.54)	(4.61)	(5.41)	(5.22)
ESG_{t-1}	−0.0017***	−0.0005**	−0.0008***	−0.0013***
	(−5.81)	(−2.36)	(−3.00)	(−5.86)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	4,852,064	4,852,064	4,852,064	4,852,064
R^2 Adj.	0.14	0.13	0.14	0.14

Note: The table reports the panel regression results based on the model (6) for testing the association between abnormal returns' magnitudes and changes in sustainability concerns. The dependent variable $\lvert AR_t \rvert$ is the absolute value of the difference between the realized return and predicted CAPM return estimated over a 90-day window [t–100, t–11]. The main independent variables are the change level of sustainability concerns and its interaction with firms' yearly ESG (or E, S, G) performance. Control includes SIZE, BM, ROA, LEV, and SIGMA (yearly); Industry and Year FE are industry- and year-fixed effects. T-statistics are in parentheses and based on standard errors clustered by firms. ***, **, * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

As seen in Table 4, we find strong evidence of the relationship between sustainability concerns changes and firms' revaluation. Ardia et al. (2023) and Pástor et al. (2021) argue that these shifts in public concerns impact firms' expected cash flow and discount rate contingent upon their ESG performance. Consequently, ESG performance contributes to expected returns and price adjustments in response to changes in sustainability concerns. While sustainability concerns are related to stock returns, the study's objective is not to explore a new pricing factor, as public concerns and attention are supposedly linked to systematic risk (Sautner et al., 2023). However, the focus is on the interaction terms with ESG performance, whose estimated coefficients are statistically significant. Notably, the signs of interaction terms' estimates are opposite to those of the changes in sustainability concerns. These results support our above argument that the ESG performance of firms moderates the market revaluation of stock prices in response to shocks in sustainability concerns. We find that stock prices are adjusted less in reaction to sustainability concerns for firms with higher ESG performance, i.e., stocks with good ESG ratings tend to be less sensitive to sustainability concerns than low-rated ones. Also, these differences in value adjustment possibly explain the conditional performance of ESG investments, which depends on public concerns and beliefs, as shown by Ardia et al. (2023), Choi et al. (2020), Pástor et al. (2021), and Vu et al. (2025).

4. Conclusion

Our findings show that good ESG practices can benefit firms by reducing the sensitivity of stock returns to societal sustainability concerns. Among the three broad ESG themes, governance is particularly crucial for firms to maintain the stability of their value amidst escalating sustainability concerns, underscoring the pivotal role of robust governance practices. Given the intensified global sustainability concerns nowadays, our analysis highlights the importance of enhancing firms' ESG practices. Also, the study contributes insights into understanding the ESG-risk relationship and the conditional performance of ESG investments, which are among the essential research themes in the sustainable finance literature.

CRediT authorship contribution statement

Thanh Nam Vu: Writing – review & editing, Writing – original draft, Visualization, Software, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interests

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The author is grateful for the kind comments and valuable suggestions from editor Tony Klein, reviewers, Juha-Pekka Junttila, Heikki Lehkonen, Markku Kaustia, Matthijs Lof, Sina Seyfi, Eduardo Schwartz, Gabriel de la Fuente, Ingrid Serrano-Bran, Guillermo Badía, David Cabreros, Tomi Soininen, and participants in the 2024 Nordic-Iberian Doctoral Workshop on Business Economics, the 2024 GSF Summer Workshop in Finance, and the 2023 JyIMaF Winter seminar. The author especially thanks Heikki Lehkonen for arranging the data access rights. The work is supported by OP Research Foundation [grant numbers 20220058 and 20230027].

Appendix

Table A1, Table A2

Table A1
Instrumental variables estimation.

	1st step				2nd step				
Dependent variable:	ESG_t	E_t	S_t	G_t		$\beta_{SC,\,t}$	$\beta_{SC,\,t}$	$\beta_{SC,\,t}$	$\beta_{SC,\,t}$
$ESG_{ind,t}$	0.3792***				$\widehat{ESG}_{t-1}$	−0.1112***			
	(3.81)					(−3.03)			
$ESG_{state,t}$	0.6119***				$\hat{E}_{t-1}$		−0.0271		
	(9.82)						(−1.23)		
$E_{ind,t}$		0.6588***			$\hat{S}_{t-1}$			−0.0306	
		(11.71)						(−1.01)	
$E_{state,t}$		0.5042***			$\hat{G}_{t-1}$				−0.0666***
		(8.70)							(−2.60)
$S_{ind,t}$			0.5787***						
			(6.67)						
$S_{state,t}$			0.6565***						
			(10.89)						
$G_{ind,t}$				0.5351***					
				(5.70)					
$G_{state,t}$				0.7116***					
				(12.35)					
Controls	Yes	Yes	Yes	Yes	Controls	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Industry Dummy	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Year Dummy	Yes	Yes	Yes	Yes
N	19,482	19,482	19,482	19,482	N	19,482	19,482	19,482	19,482
R^2 Adj.	0.44	0.49	0.41	0.20	R^2 Adj.	0.28	0.29	0.29	0.29
					Weak instruments	293.62***	431.79***	345.68***	315.12***
					Wu-Hausman test	6.40**	0.78	0.65	4.40**

Note: This table presents the results of the 2SLS regression for the impact of ESG performance on firms' exposure to sustainability concerns. The dependent variable in the second step is sustainability beta. In the first step, the dependent variable is ESG or individual E, S, or G rating. The instrumental variables are the industry (ind) average value of ESG or E, S, or G performance and the state averages for the same variables. The control variables are SIZE, BM, ROA, LEV, and SIGMA (see detail in Table 1). ***, **, * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A2
Alternative measures of societal concerns.

Dependent variable:	$\beta_{SC,\,t}$ (CPU)				$\beta_{SC,\,t}$ (MCCC)			
ESG_{t-1}	−0.0007***				−0.0003***			
	(−4.15)				(−3.77)			
E_{t-1}		−0.0004*				−0.0001*		
		(−1.85)				(−1.84)		
S_{t-1}			−0.0003*				−0.0001	
			(−1.93)				(−1.42)	
G_{t-1}				−0.0005***				−0.0002***
				(−4.07)				(−3.69)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	19,482	19,482	19,482	19,482	19,482	19,482	19,482	19,482
R^2 Adj.	0.27	0.26	0.27	0.27	0.30	0.29	0.30	0.30

Note: This table reports the panel estimation results based on the regression model (4). The dependent variable β_{SC} is calculated using CPU and MCCC instead of SCI. β_{SC}(CPU/MCCC) is estimated by using monthly/daily data due to the availability of the index. Independent variables are detailed in Table 1. T-statistics are in parentheses, based on standard errors clustered by firms. ***, **, * denote statistical significance at the 1 %, 5 %, and 10 % levels, respectively.

Data availability

The authors do not have permission to share data.

References

Ardia, D., Bluteau, K., Boudt, K., Inghelbrecht, K., 2023. Climate change concerns and the performance of green vs. brown stocks. Manag. Sci. mnsc 4636. https://doi.org/10.1287/mnsc.2022.4636, 2022.

Beckmann, J., Rogmann, J., 2024. Determinants and effects of country ESG controversy. Energy Econ., 107326 https://doi.org/10.1016/j.eneco.2024.107326.

Chen, Z., Da, Z., Huang, D., Wang, L., 2023. Presidential economic approval rating and the cross-section of stock returns. J. Financ. Econ. 147, 106–131. https://doi.org/10.1016/j.jfineco.2022.10.004.

Choi, D., Gao, Z., Jiang, W., 2020. Attention to global warming. Rev. Financ. Stud. 33, 1112–1145. https://doi.org/10.1093/rfs/hhz086.

Chollet, P., Sandwidi, B.W., 2018. CSR engagement and financial risk: a virtuous circle? International evidence. Glob. Finance J. 38, 65–81. https://doi.org/10.1016/j.gfj.2018.03.004.

Edmans, A., 2011. Does the stock market fully value intangibles? Employee satisfaction and equity prices. J. Financ. Econ. 101, 621–640. https://doi.org/10.1016/j.jfineco.2011.03.021.

Engle, R.F., Giglio, S., Kelly, B., Lee, H., Stroebel, J., 2020. Hedging climate change news. Rev. Financ. Stud. 33, 1184–1216. https://doi.org/10.1093/rfs/hhz072.

Ferreira, M.A., Laux, P.A., 2007. Corporate Governance, Idiosyncratic risk, and information flow. J. Finance 62, 951–989. https://doi.org/10.1111/j.1540-6261.2007.01228.x.

Gavriilidis, K., 2021. Measuring climate policy uncertainty. SSRN Electron. J. https://doi.org/10.2139/ssrn.3847388.

Gormley, T.A., Matsa, D.A., 2016. Playing it safe? Managerial preferences, risk, and agency conflicts. J. Financ. Econ. 122, 431–455. https://doi.org/10.1016/j.jfineco.2016.08.002.

Grewal, J., Riedl, E.J., Serafeim, G., 2019. Market reaction to mandatory nonfinancial disclosure. Manag. Sci. 65, 3061–3084. https://doi.org/10.1287/mnsc.2018.3099.

Habermann, F., Fischer, F.B., 2023. Corporate social performance and the likelihood of bankruptcy: evidence from a period of economic upswing. J. Bus. Ethics 182, 243–259. https://doi.org/10.1007/s10551-021-04956-4.

He, G., Liu, Y., Chen, F., 2023. Research on the impact of environment, society, and governance (ESG) on firm risk: an explanation from a financing constraints perspective. Finance Res. Lett. 58, 104038. https://doi.org/10.1016/j.frl.2023.104038.

Hoepner, A.G.F., Oikonomou, I., Sautner, Z., Starks, L.T., Zhou, X.Y., 2024. ESG shareholder engagement and downside risk. Rev. Finance 28, 483–510. https://doi.org/10.1093/rof/rfad034.

Hossain, A.T., Masum, A.-A., 2022. Does corporate social responsibility help mitigate firm-level climate change risk? Finance Res. Lett. 47, 102791. https://doi.org/10.1016/j.frl.2022.102791.

Jiang, Y., Klein, T., Ren, Y.-S., Duong, D., 2024. Global geopolitical risk and corporate ESG performance. J. Environ. Manage. 370, 122481. https://doi.org/10.1016/j.jenvman.2024.122481.

Liu, D., Gu, K., Hu, W., 2023. ESG performance and stock idiosyncratic volatility. Finance Res. Lett. 58, 104393. https://doi.org/10.1016/j.frl.2023.104393.

Nguyen, D.T., Tran, V.T., Phan, D.H.B., 2023. Does green activity impact stock price crash risk? The role of climate risk. Finance Res. Lett. 55, 103879. https://doi.org/10.1016/j.frl.2023.103879.

Ozkan, A., Temiz, H., Yildiz, Y., 2023. Climate risk, corporate social responsibility, and firm performance. Br. J. Manag. 34, 1791–1810. https://doi.org/10.1111/1467-8551.12665.

Pástor, Ľ., Stambaugh, R.F., Taylor, L.A., 2022. Dissecting green returns. J. Financ. Econ. 146, 403–424. https://doi.org/10.1016/j.jfineco.2022.07.007.

Pástor, Ľ., Stambaugh, R.F., Taylor, L.A., 2021. Sustainable investing in equilibrium. J. Financ. Econ. 142, 550–571. https://doi.org/10.1016/j.jfineco.2020.12.011.

Pedersen, L.H., Fitzgibbons, S., Pomorski, L., 2021. Responsible investing: the ESG-efficient frontier. J. Financ. Econ. 142, 572–597. https://doi.org/10.1016/j.jfineco.2020.11.001.

Safiullah, M., Kabir, Md.N., 2024. Corporate political risk and environmental performance. Glob. Finance J. 60, 100939. https://doi.org/10.1016/j.gfj.2024.100939.

Sautner, Z., Van Lent, L., Vilkov, G., Zhang, R., 2023. Firm-level climate change exposure. J. Finance 78, 1449–1498. https://doi.org/10.1111/jofi.13219.

Shafer, M., Szado, E., 2020. Environmental, social, and governance practices and perceived tail risk. Account. Finance 60, 4195–4224. https://doi.org/10.1111/acfi.12541.

Tzouvanas, P., Mamatzakis, E.C., 2021. Does it pay to invest in environmental stocks? Int. Rev. Financ. Anal. 77, 101812. https://doi.org/10.1016/j.irfa.2021.101812.

Vu, T.N., Lehkonen, H., Junttila, J.-P., Lucey, B., 2025. ESG investment performance and global attention to sustainability. North Am. J. Econ. Finance 75, 102287. https://doi.org/10.1016/j.najef.2024.102287.

Yu, H., Liang, C., Liu, Z., Wang, H., 2023. News-based ESG sentiment and stock price crash risk. Int. Rev. Financ. Anal. 88, 102646. https://doi.org/10.1016/j.irfa.2023.102646.

Zhang, Y., He, M., Liao, C., Wang, Y., 2023. Climate risk exposure and the cross-section of Chinese stock returns. Finance Res. Lett. 55, 103987. https://doi.org/10.1016/j.frl.2023.103987.

Zhang, Y., Song, B., He, M., Wang, Y., 2024a. Abnormal temperature and the cross-section of stock returns in China. Int. Rev. Financ. Anal. 94, 103274. https://doi.org/10.1016/j.irfa.2024.103274.

Zhang, Yaojie, Zhang, Yuxuan, Ren, X., Jin, M., 2024b. Geopolitical risk exposure and stock returns: evidence from China. Finance Res. Lett. 64, 105479. https://doi.org/10.1016/j.frl.2024.105479.