"*Put your money where your mouth is*" – Case of Corporate Environmental Commitments

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Abstract

For the first time using a global sample of 2500 firms across 41 countries between 2003–2022 we explore how environmental and social factors influence corporate environmental commitments. Using the oldest existing database on environmental, social and governance (ESG) we find firms with higher GHG emissions tend to make more ambitious environmental commitments. Furthermore, we document a positive correlation between a firm's corporate social standing—measured through reputation and legal risks—and its environmental commitments. Outcome of these findings will help governments, policymakers and investors in making the green transition.

Keywords: Environmental commitments; environmental, social and governance (ESG) scores; greenhouse gas (GHG) emissions; corporate social responsibility (CSR); environmental performance.

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1. Introduction

In the lead-up to the 2021 UN COP26 climate summit in Glasgow, over 1,000 firms with capitalisation amounting to $23 trillion, made commitments to reduce their carbon emissions (Financial Times, 2024). However, since then, substantial number of firms revised their ambitious net-zero emissions targets signalling a significant shift in the private sector's approach in addressing climate crisis (CDP, 2024). This anecdotal evidence suggests that further investigation of this topic is warranted.

Literature is not clear about what motivates firms or countries to signal their environmental commitments. They could stem from pressures by different stakeholders including governments, regulators, and social groups or simply peer pressure (Albitar et al., 2023; Boiral et al., 2012; Berger-Schmitz et al., 2023; Cao, Liang, & Zhan, 2019; Delmas & Montes-Sancho, 2010; Dyck et al., 2019a; Freiberg et al., 2021; Lemma, et al., 2021; Littlewood et al., 2018; Privato et al., 2024; Ramadorai & Zeni, 2024). Equally, they might be a result of increasing incentives from financial markets, such as improved loan contract terms for presenting green credentials (Cheng, Ioannou and Serafeim, 2014; Lemma, Lulseged and Tavakolifar, 2021; Degryse et al., 2023). It might be also a momentum building, namely when the firm's commitments execution (e.g., carbon reduction pathway), is already well advanced it might result in more future committments (Bolton & Kacperczyk, 2023b).

Another issue altogether is whether commitments are meaningful or merely empty promises (Dahlmann, Branicki and Brammer, 2019; Coen, Herman and Pegram, 2022; Bingler et al., 2024; Treepongkaruna et al., 2024). United Nations Secretary-General António Guterres, in his speech at the high-level meeting, expressed concerns regarding 'greenwashing' in net-zero commitments.[1] Limited empirical evidence suggests that corporate commitments in reducing emissions may serve merely as symbolic gestures or public relations strategies to preserve a reputable corporate image (Bowen and Aragon-Correa, 2014; Doda et al., 2016; Dahlmann, Branicki and Brammer, 2019; Bingler et al., 2024).

[1] The Guterres quote on 2022 Report of United Nations' High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities. Available at: https://www.un.org/sites/un2.un.org/files/high-levelexpertgroupupdate7.pdf (Accessed: 2 September 2024)

We contribute towards this important literature and pose the following question: How do environmental factors, such as GHG emissions, and social factors, including reputation and regulatory demands, drive firms to signal their environmental commitments?

Using a global sample of 2,500 companies from 41 countries between 2003–2022, we find that firms with higher GHG emissions have a higher level of environmental commitments. This effect is stronger in countries with more stringent climate policies, including government's active participation in international climate-related activities such as hosting COP (Bolton & Kacperczyk, 2023b; Treepongkaruna et al., 2024). We find somewhat conflicting results to those of Bolton and Kacperczyk (2023a) who only look at emissions of firms who signed up to pledges/conventions Carbon Disclosure Project (CDP) and/or Science Based Targets Initiative (SBTi). In addition, we find GHG emissions performance on corporate environmental commitment is more pronounced for firms facing financial constraints. Firm's environmental commitment is also driven by factors related to corporate social status including reputation, legal risk, and superior environmental performance compared to their peers (Delmas and Montes-Sancho, 2010; Boiral, Henri and Talbot, 2012; Cao, Liang and Zhan, 2019; Ramadorai and Zeni, 2024)

Our research contributes to the scant empirical literature on the determinants of firms' environmental commitments. Recent studies, using theoretical and empirical approaches have explored solely commitments of the US firms and yield inconclusive results (Freiberg et al., 2021; Boiral, Henri and Talbot, 2012; Dyck et al., 2019a; Lemma, Lulseged and Tavakolifar, 2021; Bolton and Kacperczyk, 2023b; Boiral, Henri and Talbot, 2012; Littlewood et al., 2018; Berger-Schmitz et al., 2023; Privato, Johnson and Busch, 2024). Therefore, examination of the environmental commitments at the global level remains untapped. Moreover, inevitably we contribute towards the literature on environmental disclosures (e.g., ESG scores) and firms' environmental (i.e., emissions) performance. Binglier et al. (2024) highlight that voluntary climate disclosures frequently coincide with a rise in instances of "cheap talk," which correlates with greater negative media coverage and accelerated growth in emissions. Additionally, scores issued by external agencies do not always correlate with improved environmental performance. For example, Treepongkaruna et al. (2024) reveals that highly environmentally-rated firms do not necessarily have lower carbon emissions than their lower rated counterparts. Similarly, the work of van Binbergen and Brøgger (2024) indicates that while lower emissions have been associated with higher environmental ratings, higher environmental ratings have, in turn, been linked to higher, rather than lower, emissions. We enhance this literature by documenting that

firms with higher environmental commitment scores do not achieve improved emissions performance.

From a practical perspective, our findings suggest that firms with higher emissions performance are more inclined to invest in sustainability efforts to mitigate their emissions. This reflects a proactive approach to managing environmental risks, making these firms attractive for long-term investment. It aligns with the findings of Bolton and Kacperczyk (2023a), which show that investor demand for emissions premia increases when facing higher emissions risk. Moreover, firms with a strong social standing—such as those with higher reputations or lower legal risks—are more likely to take decisive actions in addressing environmental concerns. It is extremely important for investors, since social status can serve as a key indicator when evaluating a firm's long-term sustainability strategies. Additionally, our findings offer insights for policymakers, emphasizing the importance of national leadership in climate protection through stricter climate policies and active participation in international agreements. This is evidence to show that national efforts work effectively to spur firm' commitment to climate change.

The paper is organized as follows: Section 2 reviews relevant literature and outlines the theoretical framework, Section 3 describes data, Section 4 details the model, Section 5 presents results, Section 6 covers robustness checks, and Section 7 concludes.

2. Theoretical Framework and Hypothesis development

2.1 Corporate Environmental Commitment and Emissions Performance

Research on the relationship between corporate environmental commitment and emissions performance is somewhat limited, focusing primarily on two main strands. The first, examines how environmental commitments improve emissions performance (Bolton & Kacperczyk, 2023b; Coen, Herman, & Pegram, 2022; Dahlmann, Branicki, & Brammer, 2019; Downar, Ernstberger, Reichelstein, Schwenen, & Zaklan, 2021; Huang & Kung, 2010; Ioannou, Li, & Serafeim, 2016). The second, more limited, explores how emissions status of firms impacts ambitions for their environmental commitment decisions (Berger-Schmitz et al., 2023; Boiral et al., 2012; Bolton & Kacperczyk, 2023b; Littlewood et al., 2018). Our study expands the latter strand by investigating how emissions exposure influences commitment levels and the factors moderating this effect.

Firms' environmental commitments can be explained through the perspective of signalling theory (Spence, 1973), which emphasizes information asymmetry and cost-benefit dynamics. The most widely discussed environmental commitment in existing literature is the commitment to reducing emissions. One of the main reasons that firms make public commitments to emission reductions to close the information gap with stakeholders such as shareholders and regulators by sharing their environmental strategies. Firms typically possess better information about their own operations compared to investors or customers. For firms with higher emissions, this information gap is even more critical, as stakeholders are likely to scrutinize them more closely (Matsumura, Prakash, & Vera-Muñoz, 2014). Publicly committing to emission reduction serves as a signal that these firms are proactive in addressing environmental concerns, thereby reducing uncertainty and earning stakeholder trust. Benlemlih (2017) found that firms with strong CSR records use these as indicators of financial stability and quality. Similarly, high-emission firms can publish environmental commitments to convey their intent to improve and provide investors with more information to assess their green initiatives (Lyon & Maxwell, 2011; Lyon & Montgomery, 2015).

Moreover, signalling theory also suggests that the cost of signalling should be lower for those with higher quality or better attributes, making it rational for them to signal. Bolton and Kacperczyk (2023b) observes a greater likelihood of SBTi among firms with lower emissions. Boiral, et al. (2012) mention that economic motivations, including the reduction of production costs and responding to consumer demands, are pivotal factors influencing a firm's commitment to reducing emissions. Previous research by Clarkson, et al. (2008) on firms' environmental protection also finds that superior environmental performers are more open in their voluntary disclosure channel. In a similar context, other studies also indicate that voluntary carbon disclosure acts as a vital signalling mechanism, suggesting a strong positive relationship between emissions disclosure and emissions-environmental performance (Al-Tuwaijri et al., 2004; Dawkins & Fraas, 2011; Giannarakis et al., 2018; Giannarakis, et al., 2017; Luo, 2019).

However, we argue that firms with higher emissions are subjected to more intense external pressures from regulators, investors, and consumers, making it imperative for them to signal higher commitment. For these firms, the costs of remaining silent or failing to act are significantly higher as these can cause a reputational damage or diminished investor confidence. Based on this view, we formulate our first hypothesis as follows:

Hypothesis I: Corporate GHG emissions performance is positively associated with corporate environmental commitment.

2.2 Corporate Environmental Commitment and Social Status

According to the stakeholder theory (Freeman, 1984), organisations should create value for all stakeholders, not just for shareholders. Stakeholders include employees, customers, suppliers, communities, and the environment—all of whom increasingly scrutinise corporate environmental impacts as climate concerns grow. Consequently, firms are investing more in environmental management to meet stakeholder expectations (Alt, Díez-de-Castro, & Lloréns-Montes, 2015). We argue that a key driving force behind firms' environmental commitments is stakeholder orientation (Cadez, Czerny, & Letmathe, 2019; Dhanda, Sarkis, & Dhavale, 2022; Dyck, Lins, Roth, & Wagner, 2019; Liesen, Hoepner, Patten, & Figge, 2015). Boiral, Henri and Talbot (2012) indicate that, alongside economic motivations, social factors significantly influence firms' commitment to reducing greenhouse gas (GHG) emissions. Previous studies further affirm that corporate environmental commitments are influenced not only by economic incentives but also by the values upheld by the company's executives and the social responsibility of the company (Bansal and Roth, 2000; Bansal, 2003; Boiral, 2005).

This implies that firms with stronger social profiles are more likely to engage in sustainability, safeguarding reputational assets that can be at risk if they fail to meet societal standards. Desai et al. (2023) examine carbon-reduction pledges of US oil and gas companies and reveal that reputation is one of potential determinant of firm environmental pledges. Other studies show that firms are more likely to firms adopt environmental management practices, in response to increasing regulatory pressures, to avoid legal risk (Delmas & Montes-Sancho, 2010; Delmas & Toffel, 2008; Wang, Li, & Zhao, 2018). This brings us to our second hypothesis:

Hypothesis II: Corporate social status— characterised by reputation and legal standing—is positively associated with corporate environmental commitments.

3. Data Description

3.1 Data sources and sample

We assemble a comprehensive dataset of 2,500 firms for the period from 2003 to 2022, by integrating data from S&P Global Trucost, and Thomson Reuters Refinitiv. ISIN identifier and company names are employed to match these datasets. To assess a firm's environmental commitments, we use leadership scores (range on a scale from 0 to 100) for the overall environmental pillar (ENVL), along with sub-criteria related to emissions (e.g., atmospheric emissions, energy, transportation). Details are presented in Table 1. These principles of action are globally accepted norms and standards set by organizations such as the United Nations (UN Global Compact 2000, Sustainable Development Goals 2015), the International Labour Organization (ILO), the Organization for Economic Co-operation and Development (OECD) and, Global Reporting Initiative (GRI) 2016 Standards.

The Trucost database provides annual firm-level data on GHG emissions. Scope 1 emissions are direct emissions produced from sources owned or controlled by organizations. Scope 2 emissions are indirect emissions related to the generation of purchased energy (such as electricity, steam, heat, or cooling). Meanwhile, GHG Scope 3 refers to the indirect greenhouse gas emissions in a company's value chain. Thomson Reuters Refinitiv database provides yearly firm-level financial and board characteristics data. In this research, we follow the study of Bolton and Kacperczyk (2023a) to use GHG scope 3 upstream as limitations in the availability of GHG Scope 3 downstream data from Trucost. The choice of these variables will be explained in detail in the following sections.

3.2 Summary Statistics

Table 2 summarises the descriptive statistics for these variables across the full sample. The average ENVL score is 3.438, equivalent to 31.12 out of 100. Among emission-related commitments, the commitment score for atmospheric emissions management (ENV24L) is the highest, at 3.635, approximately 37.90. This suggests that firms take more committed actions toward direct emissions-related commitments.

Figures 1 and 2 present the environmental scores by year and region over the sample period. Excluding Africa due to limited data, Europe emerges as the most active region in corporate environmental pledging, with countries achieving the highest scores, such as France, Finland, the Netherlands, and the United Kingdom. Figure 3 shows environmental commitment scores

by industry, with the lowest scores in healthcare-related sectors and the highest in passenger airlines, textiles, and retail/industrial REITs.

Table 1. Variables description.

Variables	Proxy	Description and calculation	Data Source
Dependent Variables Corporate Environmental Commitments Score			
Commitments in the Environmental Pillar and Sub criteria * *(value obtained using the natural logarithm)*	ENVL	Environmental Pillar (E-Pillar)	S&P Trucost
	ENV11L	Environmental and Eco-Design	
	ENV22L	Energy Use	
	ENV24L	Atmospheric Emissions Management	
	ENV26L	Management of Local Pollution	
	ENV27L	Management of the Environmental Impacts from Transportation	
Future Emissions Performance	LOG3Y_S1	Natural logarithm of three-year-ahead GHG Scope 1 absolute emissions	S&P Trucost
	LOG3Y_S2	Natural logarithm of three-year-ahead GHG Scope 2 absolute emissions	
	LOG3Y_S3	Natural logarithm of three-year-ahead GHG Scope 3 absolute emissions	
Independent variables Environmental Performance			
	LOGS1	Natural logarithm of GHG Scope 1 absolute emissions	S&P Trucost
	LOGS2	Natural logarithm of GHG Scope 2 absolute emissions	
	LOGS3	Natural logarithm of GHG Scope 3 absolute emissions	
	LOGS12	Natural logarithm of GHG Scope 1 and 2 absolute emissions	
	LAG1Y_LOGS1	Lagged value of LOGS1 from one year prior	
	LAG1Y_LOGS2	Lagged value of LOGS2 from one year prior	

	LAG1Y_LOGS3	Lagged value of LOGS3 from one year prior	
	INDUSTRY_LOGS1	Average of LOGS1 for all firms in the same industry-country-year	
	INDUSTRY_LOGS12	Average of LOGS12 for all firms in the same industry-country-year	
	COUNTRY_LOGS1	Average of LOGS1 for all firms in the same country-year	
	INDUSTRY_LOGS12	Average of LOGS12 for all firms in the same country-year	
Control variables Firm's financial characteristics			
Firm Size	LOGSIZE	Natural logarithm of market capitalization	Refinitiv
Leverage	DEBT_ASSETS	Total debts to total assets	
Return on Equity	ROE_ACTUAL	Actual Return on Equity divided by 100	
Investment	INVEST_ASSETS	Total capital expenditures (capex) to total assets	
Firm Growth	PRICE_TO_BOOK	Market price to book value per share divided by 100	
Cash holdings	CASH_HOLDINGS	Total cash or cash equivalents to Total Assets	
Liquidity	CURRENT_RATIO	Current ratio	
Cash flow	OCF_ASSETS	Cash flow from operating activities or equivalents to total assets	
Profitability	EBIT_MARGIN	Operating earnings over operating sales divided by 100	
Board's characteristics			
Board Size	BOARD_SIZE	Size of board	Refinitiv
Diversity of board	BOARD_GENDER	Percentage of female members on the board	
Board Skills	BOARD_SKILLS	Percentage of members holding specific or financial skills on the board	
Board Independence	BOARD_INDEPENDENCE	Percentage of independent members on the board	
Duality	CEO_DUALITY	Dummy = 1 if the company has CEO-Chairman Duality	

ESG Compensation Policy	ESG_COMPENSATION	Dummy = 1 if the company has an ESG compensation policy	
National Macro and Governance			
GDP	LNGDP	Natural logarithm of a country's gross domestic product	
GDP capita growth	GDP_CAPITA_GROWTH	Growth rate in GDP per capita	
Inflation	INFLATION	The rate of inflation represents the fluctuation in prices of goods and services over time	World Bank
Legal Enforcement	WGOV	Principal component analysis of three categories of the Worldwide Governance Indicators: Regulatory Quality, Rule of Law, and Control of Corruption.	
Climate Vulnerability	CVUL	Climate vulnerability index from Notre Dame Global Adaptation Initiative	Notre Dame
National Aggressiveness in Climate Protection			
The Climate Change Performance Index	LN_CCPI	Natural logarithm of national climate policy index	Germanwatch
Sovereign Environmental Commitment Score	SOV_ENV_COM	Natural logarithm of Sovereign Environmental Commitment Score	
Instrumental variables Firm Social Status			
Firm Reputation	REPUTATION	Reputation risk score	
Firm Legal Risk	LEGAL_SECURITY	Corporate legal security risk score	Refinitiv
Firm Environmental Outperformance	ENV_SECTOR_GAP	The difference between the corporate environmental score and the industry environmental benchmark.	

Table 2. Descriptive statistics (full sample).

	N	Mean	P25	P50	P75	Std. Dev.
ENVL	12,432	3.438	3.135	3.584	3.871	0.629
ENV11L	12,403	4.040	3.784	4.174	4.369	0.427
ENV22L	11,013	3.619	3.401	3.401	3.871	0.494
ENV24L	3,355	3.635	3.401	3.401	4.174	0.393
ENV26L	1,255	3.737	3.401	3.401	4.174	0.424
ENV27L	4,097	3.566	3.401	3.401	3.401	0.343
LOGSIZE	12,432	22.776	21.880	22.739	23.647	1.412
LOGS1	12,420	12.004	10.197	11.816	13.618	2.702
LOGS2	12,432	11.740	10.499	11.840	13.131	2.015
LOGS3	12,432	13.623	12.440	13.761	14.935	1.862
LOGS12	12,432	12.937	11.423	12.815	14.364	2.296
ROE_ACTUAL_100	12,432	0.002	0.001	0.001	0.002	0.006
INVEST_ASSETS	12,432	0.049	0.023	0.040	0.064	0.042
DEBT_ASSETS	12,432	0.271	0.156	0.263	0.378	0.158
PRICE_TO_BOOK_100	12,432	0.043	0.012	0.020	0.037	0.244
CASH_HOLDINGS	12,432	0.094	0.032	0.070	0.129	0.089
CURRENT_RATIO	12,432	1.696	1.009	1.388	1.966	1.342
OCF_ASSETS	12,432	0.094	0.054	0.085	0.124	0.074
EBIT_MARGIN_100	12,432	0.001	0.001	0.001	0.002	0.012
REPUTATION	9,101	3.570	3.367	3.584	3.807	0.334
LEGAL_SECURITY	9,075	3.529	3.332	3.584	3.784	0.375
BOARD_SIZE	12,432	10.749	8	10	12	3.435
BOARD_GENDER_DIVERSITY	12,432	20.034	9.091	20.000	30.000	14.120
BOARD_SPECIFIC_SKILLS	12,432	49.080	33.333	50.000	65.000	22.042
BOARD_INDEPENDENCE	12,432	59.153	38.462	62.500	83.333	26.771
CEO_DUALITY	12,432	0.367	0	0	1	0.482
ESG_COMPENSATION	12,427	0.392	0	0	1	0.488

LNGDP	12,432	28.787	27.964	28.686	30.29	1.352
GDP_CAPITA_GROWTH	12,432	0.928	-0.171	1.440	2.426	3.683
INFLATION	12,432	1.865	0.561	1.531	2.450	2.066
WGOV	12,432	1.275	1.256	1.428	1.660	0.621
CVUL	12,432	0.323	0.297	0.302	0.360	0.042
LN_CCPI	12,043	3.800	3.621	3.884	4.080	0.375
SOV_ENV_COM	10,844	4.421	4.263	4.477	4.605	0.203

Notes: Table 2 provides descriptive statistics of the main variables for the full sample.

Table 3. Corporate Environmental Commitment Score by country.

	Number of Observations	Mean ENVL	Number of Firms	Number of Industries
Australia	568	3.219	3.296	136
Austria	81	3.493	3.638	17
Belgium	137	3.604	3.689	28
Brazil	152	3.375	3.497	39
Canada	487	3.275	3.434	129
Chile	85	3.400	3.584	17
China	263	2.979	3.091	67
Colombia	28	3.610	3.676	7
Denmark	112	3.425	3.526	20
Finland	149	3.690	3.784	22
France	692	3.806	3.882	111
Germany	535	3.482	3.611	98
Greece	25	3.403	3.401	5
India	255	3.504	3.584	58
Indonesia	76	3.049	3.135	22
Ireland	79	3.242	3.401	12
Israel	16	2.315	2.197	6
Italy	211	3.567	3.664	44
Japan	1,923	3.479	3.611	353
Luxembourg	29	3.476	3.664	6

Malaysia	110	3.261	3.367	24
Mexico	102	3.366	3.584	20
Morocco	10	3.614	3.584	2
Netherlands	209	3.589	3.829	37
New Zealand	116	3.403	3.497	32
Norway	92	3.301	3.497	16
Peru	39	3.024	3.045	14
Philippines	61	2.794	2.996	15
Poland	30	3.410	3.597	7
Portugal	55	3.648	3.807	11
Russia	78	3.439	3.541	17
Singapore	110	3.436	3.555	23
South Africa	141	3.615	3.664	28
South Korea	282	3.255	3.401	76
Spain	233	3.557	3.689	37
Sweden	251	3.608	3.714	52
Switzerland	320	3.377	3.466	61
Thailand	93	3.592	3.714	20
Turkey	85	3.430	3.555	17
United Kingdom	1,116	3.634	3.738	211
United States of America	2,996	3.349	3.497	583

Notes: Table 3 provides descriptive statistics of corporate environmental commitment Score (ENVL) by country.

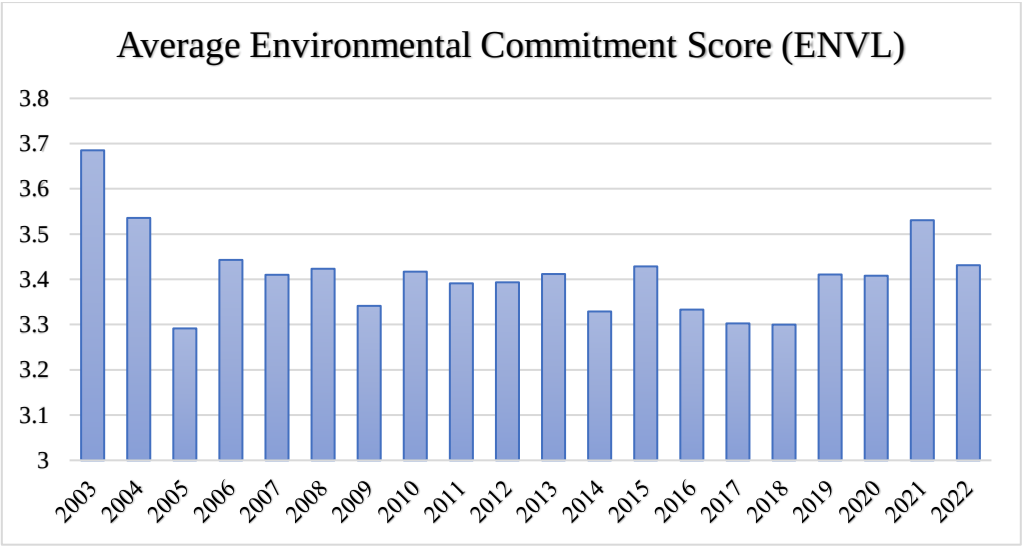
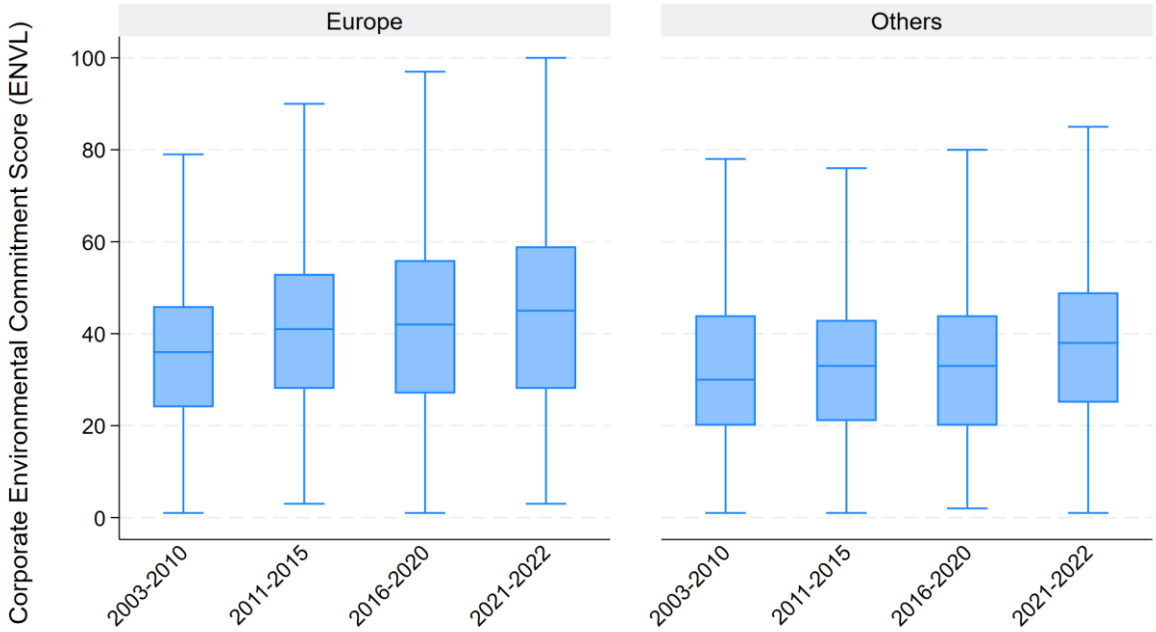


Figure 1. Average of corporate commitment score by year



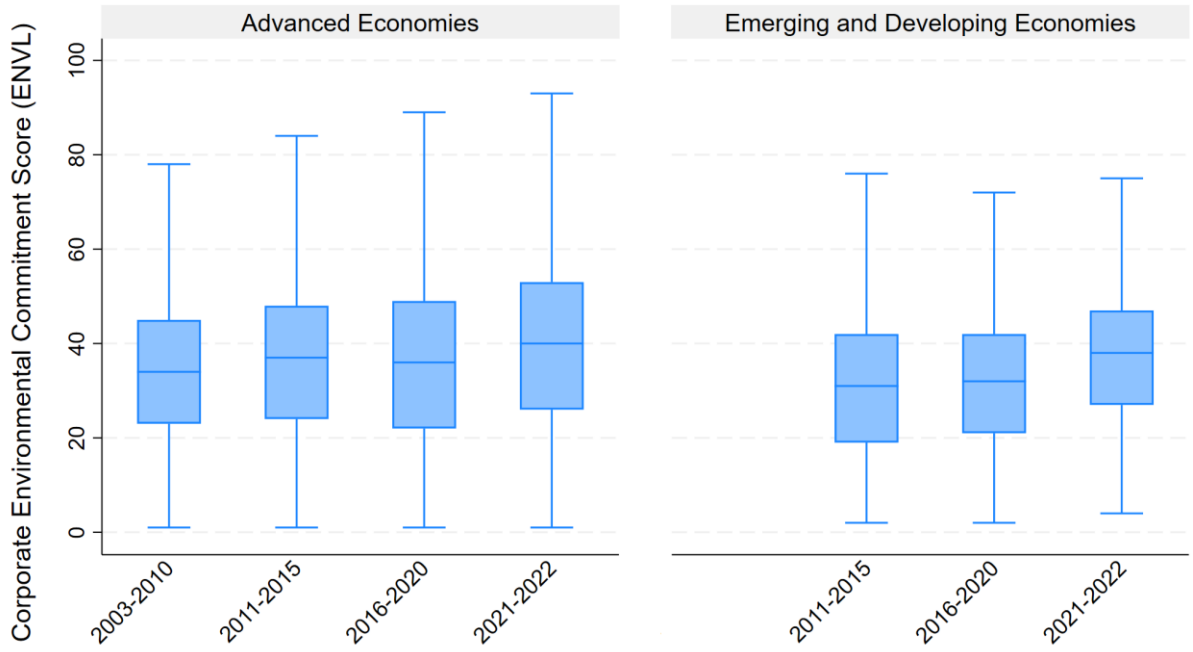


Figure 2. Corporate environmental commitment score (ENVL) on a scale of 0-100 across regions and different types of economies.

Notes: No records for ENVL are observed for emerging and developing economies before 2011; therefore, the data is presented starting from 2011. The types of economies are defined by the IMF classification [2]

[2] IMF, Country Composition of World Economic Outlook (WEO) Groups, accessed at: https://www.imf.org/en/Publications/WEO/weo-database/2023/April/groups-and-aggregates

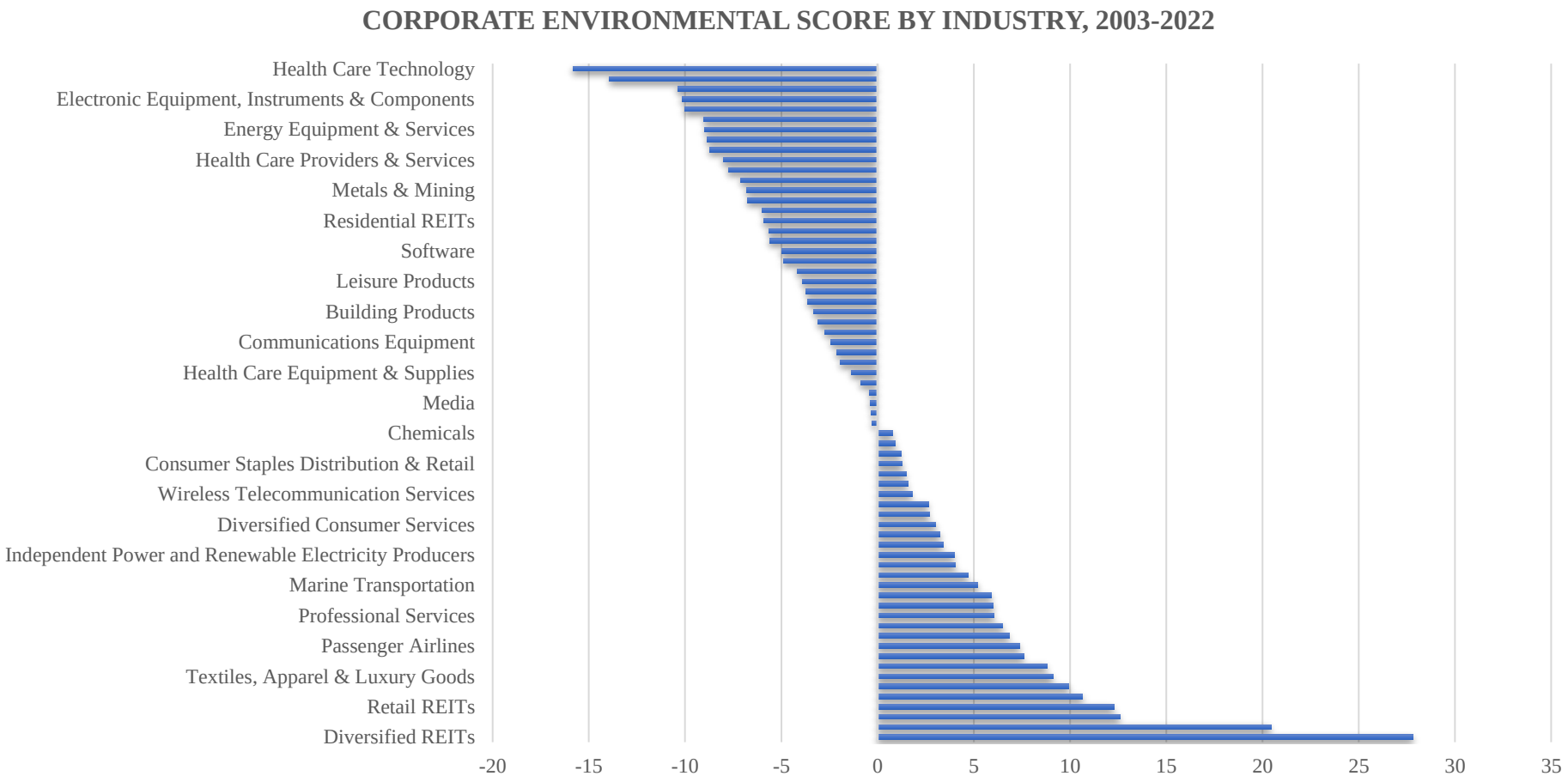


Figure 3. Environmental Commitment Score by Industry (2003-2022). The actual mean score across all industries is 37.59, which is represented as 0 in the figure for comparative purposes.

4. Model Specification

To test Hypothesis 1, we rely on equation (1) shown below. We employ a pooled OLS model with year, country, and industry fixed effects. We examine the extent of firms' emissions and the company-specific characteristics that define their level of environmental commitment. The baseline regression model is as follows:

$$ENVL_{i,t} = \beta_{0i,t} + \beta_1 LOGS_{i,t} + \beta_2 LOGSIZE_{i,t} + \beta_3 DEBT\_ASSETS_{i,t} + \beta_4 INVEST\_ASSETS_{i,t} + \beta_5 ROE\_ACTUTAL_{i,t} + \beta_6 CASH\_HOLDINGS_{i,t} + \beta_7 CURRRENT\_RATIO_{i,t} + \beta_8 PRICE\_TO\_BOOK_{i,t} + \beta_9 OCF\_ASSETS_{i,t} + \beta_{10} EBIT\_MARGIN_{i,t} + \beta_{11} BOARD\_CHARACTERISTICS_{i,t} + \beta_{12} LNGDP_{i,t} + \beta_{13} GDP\_CAPITA\_GROWTH_{i,t} + \beta_{14} INFLATION_{i,t} + \beta_{15} WGOV_{i,t} + \beta_{16} CVUL_{i,t} + \beta_{17} Year\_Effect_{i,t} + \beta_{18} Industry\_Effect_{i,t} + \beta_{19} Country\_Effect_{i,t} + \varepsilon_{i,t} \quad (1)$$

In the main equation (1), the proxy for the corporate environmental commitment level is $ENVL_{i,t}$. It indicates level of commitment of firm i in year t. This research focuses on overall environmental commitment score (ENVL) and its sub-scores for various aspects of environmental responsibility, including environmental strategy, emissions-related factors (such as energy use, atmospheric emissions, local pollution or transportation).

The data for absolute GHG emissions regarding Scope 1, 2 and 3 will be collected and denoted by the variable $LOGS_{i,}$ ($LOGS1_{i,t,}$ $LOGS2_{i,t}$ and $LOGS3_{i,t}$). The set of control variables related to corporate financial performance is chosen following the studies of (Bolton & Kacperczyk, 2023b; Ginglinger & Moreau, 2023; Lemma, Lulseged, & Tavakolifar, 2021; Nguyen & Phan, 2020; Treepongkaruna et al., 2024) and include: Market capitalization; capital expenditure to total assets; return on equity; total debt to total assets; cash holdings; liquidity ratio; the price to book ratio; operating cash flow; and lastly operating earnings. Otherwise, we also add set of board's characteristics to control from corporate governance perspective such as board size, gender diversity, independence, CEO duality, and specific skills, consistent with previous studies (Atif, Hossain, Alam, & Goergen, 2021; Degryse, Goncharenko, Theunisz, & Vadasz, 2023; Homroy, 2023; Iliev & Roth, 2023).

To examine the Hypothesis II on firm's social factors, we use the equation as follows:

$$ENVL_{i,t} = \beta_{0i,t} + \beta_1 REPUTATION_{i,t} + \beta_2 LEGAL\_SECURITY_{i,t} + \beta_3 ESG\_COMPENSATION_{i,t} + \beta_4 BOARD\_CHARACTERISTICS_{i,t} + \beta_5 LNGDP_{i,t} + \beta_6 GDP\_CAPITA\_GROWTH_{i,t} + \beta_7 INFLATION_{i,t} + \beta_8 WGOV_{i,t} + \beta_9 CVUL_{i,t} + \beta_{10} Year\_Effect_{i,t} + \beta_{11} Industry\_Effect_{i,t} + \beta_{12} Country\_Effect_{i,t} + \varepsilon_{i,t} \quad (2)$$

We utilise the corporate risk scores from Refinitiv, focusing on social aspects such as reputation ($REPUTATION_{i,t}$) and legal security ($LEGAL\_SECURITY_{i,t}$), to represent firm-level exposure to reputation and legal issues, drawing on insights from (Bingler, Kraus, Leippold, & Webersinke, 2024; Borghesi, Houston, & Naranjo, 2014; Brammer & Pavelin, 2006; Tascón, Castro, & Ferreras, 2021). Additionally, we consider whether firms with ESG-linked compensation are more likely to engage in stronger commitments, following the study of (Ikram, Li, & Minor, 2023). We use the dummy variable $ESG\_COMPENSATION_{i,t}$ from Refinitiv to indicate whether a firm has an ESG compensation policy. Lastly, we include country-level control variables such as GDP, GDP per capita growth, inflation, legal enforcement, and climate vulnerability (Ferdous, Atawnah, Yeboah, & Zhou, 2024).

5. Empirical Results

5.1 The determinants of environmental commitments

5.1.1 General corporate environmental commitments

Firstly, we begin with the regression of GHG emissions on the general corporate environmental commitment scores. The main results are presented in Table 4. Our analysis includes the overall corporate environmental commitment score (ENVL) and commitment to build-up general environmental strategy (ENV11L). The primary independent variables in our models are the performance measures for GHG emissions in three scopes. Additionally, all regressions incorporate fixed effects for country, industry, and year to control for unobserved heterogeneity.

We uncover an intriguing result: firms with higher exposure to emissions in all scopes are more likely to commit higher to environmental initiatives. The motivations behind this behavior can be multifaceted. Firms with higher emissions might face increased pressure from stakeholders and use such commitments as an internal discipline mechanism to ensure they stay on track for future emissions reductions (Bolton & Kacperczyk, 2023b). Alternatively, in a more dramatic interpretation, these commitments could serve as a signal to the market, demonstrating that the firm is well-managed and financially stable enough to undertake significant emission reduction efforts (Lemma et al., 2021).

Table 4. The pooled OLS regression of corporate emissions on general environmental commitments

	Corporate Environmental Commitment			**Commitment in Environmental Strategy**		
	(1)	(2)	(3)	(4)	(5)	(6)
	ENVL	ENVL	ENVL	ENV11L	ENV11L	ENV11L
LOGS1	0.0233***			0.0227***		
	(0.00572)			(0.00397)		
LOGS2		0.0445***			0.0376***	
		(0.00578)			(0.00410)	
LOGS3			0.0802***			0.0618***
			(0.00915)			(0.00642)
LOGSIZE	0.125***	0.110***	0.0884***	0.0785***	0.0678***	0.0530***
	(0.00876)	(0.00879)	(0.00949)	(0.00582)	(0.00592)	(0.00639)
DEBT_ASSETS	0.0942	0.0911	0.0916	0.0456	0.0476	0.0505
	(0.0637)	(0.0629)	(0.0623)	(0.0417)	(0.0410)	(0.0406)
ROE_ACTUAL	0.445	0.548	0.426	0.0449	0.125	0.0202
	(0.482)	(0.487)	(0.474)	(0.425)	(0.461)	(0.399)
INVEST_ASSETS	0.139	0.126	0.383*	-0.144	-0.154	0.0460
	(0.210)	(0.211)	(0.204)	(0.142)	(0.143)	(0.135)
PRICE_TO_BOOK	0.00826	0.0128	0.0119	0.0180**	0.0209**	0.0195**
	(0.0154)	(0.0147)	(0.0145)	(0.00900)	(0.00855)	(0.00833)
CASH_HOLDINGS	-0.100	-0.0683	-0.0868	-0.0681	-0.0421	-0.0613
	(0.111)	(0.110)	(0.109)	(0.0754)	(0.0752)	(0.0746)
CURRENT_RATIO	-0.0398***	-0.0370***	-0.0292***	-0.0225***	-0.0208***	-0.0153***
	(0.00826)	(0.00817)	(0.00832)	(0.00506)	(0.00499)	(0.00509)
OCF_ASSETS	-0.270**	-0.251**	-0.221**	-0.198***	-0.188**	-0.169**
	(0.111)	(0.110)	(0.109)	(0.0725)	(0.0739)	(0.0723)
EBIT_MARGIN	0.496**	0.404*	0.135	0.155	0.0989	-0.0921
	(0.219)	(0.219)	(0.228)	(0.255)	(0.256)	(0.273)
BOARD_SIZE	0.0172***	0.0157***	0.0133***	0.0124***	0.0110***	0.00945***
	(0.00304)	(0.00294)	(0.00287)	(0.00206)	(0.00201)	(0.00198)
BOARD_GENDER	0.00574***	0.00571***	0.00542***	0.00320***	0.00320***	0.00299***
	(0.000799)	(0.000793)	(0.000791)	(0.000520)	(0.000516)	(0.000517)
BOARD_SKILLS	-0.000682*	-0.000688*	-0.000631	-0.000553**	-0.000563**	-0.000516*
	(0.000393)	(0.000392)	(0.000390)	(0.000273)	(0.000273)	(0.000272)
BOARD_INDEPENDENCE	0.00183***	0.00168***	0.00164***	0.000985***	0.000871***	0.000860***
	(0.000460)	(0.000459)	(0.000453)	(0.000306)	(0.000302)	(0.000299)

CEO_DUALITY	0.0117	0.0121	0.00863	-0.00356	-0.00281	-0.00537
	(0.0186)	(0.0185)	(0.0184)	(0.0121)	(0.0121)	(0.0120)
LNGDP	0.0576	0.0594	0.0507	0.0589	0.0581	0.0510
	(0.0700)	(0.0691)	(0.0688)	(0.0476)	(0.0469)	(0.0468)
GDP_CAPITA_GROWTH	-0.00113	-0.000768	-0.000727	-0.00225	-0.00192	-0.00189
	(0.00215)	(0.00216)	(0.00214)	(0.00152)	(0.00153)	(0.00151)
INFLATION	-0.00733**	-0.00706**	-0.00726**	-0.00447*	-0.00437*	-0.00454*
	(0.00360)	(0.00357)	(0.00351)	(0.00251)	(0.00248)	(0.00246)
WGOV	-0.171**	-0.200**	-0.181**	0.00479	-0.0195	-0.00170
	(0.0809)	(0.0804)	(0.0796)	(0.0562)	(0.0558)	(0.0551)
CVUL	1.069	1.243	0.764	-0.187	-0.0755	-0.453
	(1.435)	(1.435)	(1.415)	(1.018)	(1.013)	(1.000)
Constant	-2.029	-1.966	-1.709	-0.476	-0.354	-0.162
	(2.034)	(2.007)	(1.995)	(1.382)	(1.360)	(1.357)
Country Dummies	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y
Observations	12426	12432	12438	12397	12403	12409
R-Squared						

Notes: This table describes the regressions of GHG emissions on general corporate environmental commitments. The dependent variables are overall Environmental Commitment Score (ENVL) and commitment score in environmental strategy (ENV11L). We also control country, industry and year fixed effects. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

5.1.2 Emissions-related environmental commitments

We continue to examine the impact of corporate GHG emissions on different types of emissions-related environmental commitments, including minimizing energy use, reducing atmospheric emissions, controlling local pollution and managing transportation impacts. Similar to the results in the section on general environmental commitments, we observe a strong positive relationship between the corporate level of emissions and the pledges to reduce energy use in business operations and manage atmospheric emissions as illustrated in Table 5. This result is not surprising, as higher GHG emissions exert more pressure on firms to reduce them, as indicated in the study by (Boiral et al., 2012). However, we do not find strong evidence of corporate commitment to managing environmental impacts, with only a very weak sign of GHG Scope 3 emissions.

Table 5. The pooled OLS regression of corporate emissions on emissions-related environmental commitments.

	Emissions-related environmental commitments											
	Energy Use			Atmospheric Emissions			Local Pollution			Transportation Impacts		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ENV22L	ENV22L	ENV22L	ENV24L	ENV24L	ENV24L	ENV26L	ENV26L	ENV26L	ENV27L	ENV27L	ENV27L
LOGS1	0.00914*			0.0146*			0.0277**			0.00149		
	(0.00494)			(0.00806)			(0.0130)			(0.00720)		
LOGS2		0.0363***			0.0171**			0.0000			-0.00598	
		(0.00527)			(0.00772)			(0.0146)			(0.00842)	
LOGS3			0.0534***			0.0250**			0.0393*			0.0203*
			(0.00807)			(0.0111)			(0.0204)			(0.0116)
Constant	1.141	0.950	1.220	1.266	1.421	1.234	0.998	1.252	1.683	3.559	3.647	3.494
	(1.669)	(1.647)	(1.644)	(2.794)	(2.784)	(2.801)	(4.693)	(4.769)	(4.763)	(2.510)	(2.515)	(2.495)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	11006	11013	11017	3358	3355	3358	992	991	992	3240	3241	3242
R-squared	0.2747	0.2819	0.2827	0.1937	0.1956	0.1942	0.3033	0.2965	0.3021	0.1438	0.1447	0.1456

Notes: This table present the regressions of GHG emissions on emissions-related environmental commitments (Energy Use, Atmospheric Emissions, Local Pollution and Transportation Impacts). We retain country and firm control variables the same as in the main baseline model. For each regression, we also control country, industry and year fixed effects. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively

5.2 Social Factors and Environmental Commitments

In this section, we examine how a firm's social status influences its environmental commitments. Our findings in Table 6 reveals key insights for overall environmental commitments. Firms with higher reputations and stronger legal security are more likely to make ambitious environmental commitments. The REPUTATION variable consistently shows a positive and highly significant effect. Similarly, the LEGAL_SECURITY variable exhibits a strong positive association with commitments, suggesting that firms with robust legal frameworks feel more confident in pledging ambitious environmental targets.

Table 6. The effect of corporate social status on their future environmental commitments

	POOLED OLS		**FIRM FIXED EFFECTS**	
	(1)	(2)	(3)	(4)
	ENVL	ENV11L	ENVL	ENV11L
REPUTATION	0.962***	0.603***	0.640***	0.383***
	(0.0354)	(0.0216)	(0.0433)	(0.0273)
LEGAL_SECURITY	0.417***	0.265***	0.336***	0.193***
	(0.0291)	(0.0187)	(0.0362)	(0.0234)
ESG_COMPENSATION	0.0337**	0.0270**	-0.000966	-0.000929
	(0.0156)	(0.0105)	(0.0140)	(0.00993)
BOARD_SIZE	0.0150***	0.0110***	0.00300	0.00117
	(0.00250)	(0.00170)	(0.00216)	(0.00128)
BOARD_GENDER	0.00315***	0.00194***	0.00128*	0.000442
	(0.000713)	(0.000447)	(0.000660)	(0.000462)
BOARD_SKILLS	-0.000122	-0.000206	-0.000312	-0.000226
	(0.000387)	(0.000253)	(0.000330)	(0.000233)
BOARD_INDEPENDENCE	-0.000256	-0.000266	-0.00142***	-0.000789**
	(0.000420)	(0.000274)	(0.000499)	(0.000323)
CEO_DUALITY	0.0227	0.00765	0.0130	0.0210*
	(0.0169)	(0.0110)	(0.0176)	(0.0119)
LNGDP	0.123	0.131**	0.185**	0.214***
	(0.0781)	(0.0598)	(0.0718)	(0.0539)
GDP_CAPITA_GROWTH	-0.00269*	-0.00161	-0.00270**	-0.00212**
	(0.00151)	(0.00116)	(0.00130)	(0.000950)
INFLATION	0.0149***	0.00514**	0.0129***	0.00358
	(0.00436)	(0.00222)	(0.00314)	(0.00258)
WGOV	-0.291***	-0.0962**	-0.297***	-0.0615
	(0.0700)	(0.0489)	(0.0624)	(0.0427)

CVUL	2.845**	1.178	1.784	0.823
	(1.400)	(0.997)	(1.215)	(0.884)
Constant	-6.355***	-4.064**	-6.010***	-5.224***
	(2.275)	(1.750)	(2.147)	(1.629)
Country Dummies	Y	Y	N	N
Year Dummies	Y	Y	Y	Y
Industry Dummies	Y	Y	N	N
Firm Fixed Effects	N	N	Y	Y
Observations	10042	10017	10042	10017
R-squared	0.5508	0.5275	0.3021	0.2838

Notes: This table describes the regressions of different corporate social statuses such as reputation, legal risk and ESG compensation on corporate environmental commitments. We provide Pooled OLS estimation with country, industry, year dummies and firm-year fixed effects estimations. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively

5.3 Future emissions performance: The influence of corporate environmental commitments

We delve into the impact of emission commitments on future emissions following the studies of (Bolton & Kacperczyk, 2023b; Treepongkaruna et al., 2024). In Table 7, General Environmental Commitment (ENVL), which signifies broad pledges towards environmental responsibility, shows positive coefficients of 0.166 for Scope 1, 0.235 for Scope 2 emissions and 0.204 for Scope 3. This suggests that higher ENVL commitments are associated with increased emissions over a three-year period. We also observe the similar patterns with commitments in environmental strategy (ENV11L) and energy use (ENV22L).

This result aligns with the findings of Doda, Gennaioli, Gouldson, Grover, and Sullivan (2016) and Treepongkaruna et al. (2024), suggesting a prevalent norm of greenwashing in environmental commitments. However, it contrasts with Bolton and Kacperczyk (2023b), who found that companies adhering to science-based standards like SBTi or CDP do see emission reductions. The discrepancy may arise from the fact that our research examines both external and internal environmental commitments, similar to Treepongkaruna et al. (2024), whereas Bolton and Kacperczyk (2023b) focus solely on external science-based verified commitments.

Table 7. Test for the impact of corporate environmental commitments on future emissions performance

	Panel GHG Scope 1				Panel GHG Scope 2				Panel GHG Scope 3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	LOG3Y_S1	LOG3Y_S1	LOG3Y_S1	LOG3Y_S1	LOG3Y_S2	LOG3Y_S2	LOG3Y_S2	LOG3Y_S2	LOG3Y_S3	LOG3Y_S3	LOG3Y_S3	LOG3Y_S3
ENVL	0.166***				0.235***				0.204***			
	(0.0502)				(0.0410)				(0.0337)			
ENV11L		0.340***				0.428***				0.329***		
		(0.0732)				(0.0624)				(0.0519)		
ENV22L			0.0394				0.248***				0.149***	
			(0.0652)				(0.0583)				(0.0434)	
ENV24L				0.132				0.251**				0.108
				(0.116)				(0.119)				(0.0696)
Constant	-0.701	-0.393	-5.319	4.503	4.154	4.319	6.848	-16.62	1.026	0.946	-2.260	5.751
	(6.295)	(6.310)	(6.489)	(9.934)	(5.895)	(5.923)	(6.342)	(12.27)	(3.798)	(3.815)	(3.876)	(6.487)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	7201	7175	6252	2042	7201	7175	6254	2039	7206	7180	6256	2042
R-Squared	0.7210	0.7222	0.7307	0.7472	0.5822	0.5832	0.5924	0.5205	0.7536	0.7527	0.7708	0.7122

Notes: This table presents the regression of emissions-related corporate environmental commitments on GHG emissions performance over the next three years. All regressions include fixed effects for country, industry, and year. Standard errors are clustered at the firm level. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

6. Robustness Tests

6.1 Endogeneity concerns

6.1.1 Propensity score matching and entropy balancing

In this section, we address potential endogeneity concerns by employing propensity score matching (PSM) and entropy balancing techniques. Following the methodologies of Tavakolifar, Omar, Lemma, and Samkin (2021) and Albitar et al. (2023), we implement the PSM approach. We also re-examine Hypothesis 1 using entropy balancing, which reduces model dependence in estimating treatment effects (Hainmueller, 2012; Hainmueller & Xu, 2013).

Following Albitar et al. (2023), we calculate the industry average of GHG emissions by year and country. A dummy variable is created based on a cut-off value derived from the industry's emissions. Firms with high emissions are classified as the treatment group, while the remaining firms constitute the control group. The control group is reweighted to align with the covariate moments of the treatment group (Hainmueller, 2012). We then re-evaluate the main findings using the matched sample, with the results presented in Table 8 for panel overall environmental commitment. In all models, our robustness tests consistently support the primary conclusion regarding the effect of emissions exposure on corporate environmental commitments.

Regarding the panel on emissions-related environmental commitments (Table 9 and 10), we observe strong and consistent effects of GHG emissions across all three scopes on energy use commitments. Additionally, GHG Scope 3 emissions have a clear impact on three types of commitments: energy use, atmospheric emissions, and local pollution.

Table 8. The regression of emissions exposure on environmental performance with PSM and Entropy Balancing

	PSM			Entropy Balancing		
	(1)	(2)	(3)	(4)	(5)	(6)
	ENVL	ENVL	ENVL	ENVL	ENVL	ENVL
LOGS1	0.0228**			0.0358***		
	(0.01076)			(0.0118)		
LOGS2		0.0401***			0.0372***	
		(0.01318)			(0.0144)	
LOGS3			0.0650***			0.0604***
			(0.01630)			(0.0168)
Constant	-8.0602	-4.6677	-4.0240	-7.423	0.773	-6.089
	(4.9751)	(3.04395)	(3.50593)	(4.544)	(3.323)	(3.833)
Control Variables	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y
Observations	10762	10872	10862	9418	9428	9433
R-Squared	0.3950	0.4076	0.4037	0.3938	0.4125	0.4108

Notes: This table provides the regressions of GHG emissions performance on corporate environmental commitments using PSM and entropy balancing approaches. We divided the sample into high (treatment) and low (control) emissions group based on country-industry-year. The control group is reweighted to align with the covariate moments of the treatment group. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

Table 9. The regression of emissions performance on emissions-related environmental commitments with PSM

	Emissions-related environmental commitments											
	Energy Use			Atmospheric Emissions			Local Pollution			Transportation Impacts		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ENV22L	ENV22L	ENV22L	ENV24L	ENV24L	ENV24L	ENV26L	ENV26L	ENV26L	ENV27L	ENV27L	ENV27L
LOGS1	0.0221**			-0.000938			0.0355			0.0156		
	(0.00985)			(0.0149)			(0.0238)			(0.0143)		
LOGS2		0.0637***			0.00982			-0.0165			-0.00223	
		(0.0108)			(0.0149)			(0.0285)			(0.0135)	
LOGS3			0.0293**			0.0392**			0.0670**			0.0158
			(0.0141)			(0.0171)			(0.0326)			(0.0178)
Constant	1.187	1.354	-1.282	7.562*	8.022*	-0.251	-4.543	9.897	3.356	6.560*	9.500**	4.772
	(3.702)	(3.072)	(3.308)	(4.347)	(4.730)	(4.249)	(6.951)	(6.417)	(6.812)	(3.845)	(4.517)	(4.626)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	9768	9878	10045	3623	3696	3914	976	877	873	3072	3033	3467
R-squared	0.3897	0.3608	0.3869	0.2593	0.4819	0.3628	0.4794	0.4408	0.5337	0.2883	0.2267	0.2925

Notes: Table 14 provides the regressions of GHG emissions performance on emissions-related environmental commitments with PSM. We divided the sample into high (treatment) and low (control) emissions group based on country-industry-year. The control group is reweighted to align with the covariate moments of the treatment group. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

Table 10. The regression of emissions performance on emissions-related environmental commitments with entropy balancing

	Emissions-related environmental commitments											
	Energy Use			Atmospheric Emissions			Local Pollution			Transportation Impacts		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ENV22L	ENV22L	ENV22L	ENV24L	ENV24L	ENV24L	ENV26L	ENV26L	ENV26L	ENV27L	ENV27L	ENV27L
LOGS1	0.0244**			-0.00305			0.0665***			0.0158		
	(0.0104)			(0.0150)			(0.0237)			(0.0135)		
LOGS2		0.0474***			0.00333			-0.000907			0.00615	
		(0.00985)			(0.0148)			(0.0300)			(0.0165)	
LOGS3			0.0435***			0.0314*			0.0816**			0.0270
			(0.0141)			(0.0166)			(0.0314)			(0.0219)
Constant	1.615	-0.427	2.450	4.526	7.395*	1.818	-0.209	16.71**	5.760	7.649*	11.57***	5.589
	(3.368)	(3.391)	(3.553)	(4.362)	(4.412)	(4.591)	(7.765)	(7.407)	(6.576)	(3.934)	(4.389)	(4.139)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	8378	8389	8392	2695	2692	2695	659	658	659	2540	2542	2542
R-squared	0.3677	0.3919	0.3890	0.3098	0.4257	0.4048	0.5649	0.4951	0.6016	0.2807	0.3405	0.2684

Notes: This table provides the regressions of GHG emissions performance on emissions-related environmental commitments with the entropy balancing approach. We divided the sample into high (treatment) and low (control) emissions group based on country-industry-year. The control group is reweighted to align with the covariate moments of the treatment group. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

6.1.2 Lagged Variables

Reverse causality is a significant concern in analyzing the relationship between emissions levels and emissions commitments, as current commitments may be influenced by past emissions rather than the other way around. This could be seen in climate finance studies (Asimakopoulos, Asimakopoulos, & Li, 2023; Dahlmann et al., 2019; Treepongkaruna et al., 2024). To address this issue, we applied a lagged variable approach, incorporating past emissions levels instead of current emissions in the regression model. This method allows us to capture the influence of prior emissions on current commitments while minimizing the risk that current sustainable promise could distort the observed relationship. In table 11 for panel overall environmental commitment, the coefficients for all four models, using the one-year lagged emissions amounts for all three scopes against the two commitment scores, are positive and statistically significant. We also observe a similar result for the panel of emissions-related environmental commitments (Table 12). These results indicate that our primary findings are unlikely to be driven by issues of reverse causality.

Table 11. The pooled OLS regression of one-year lagged GHG emissions on environmental commitments.

	Corporate Environmental Commitment			**Commitment in Environmental Strategy**		
	(1)	(2)	(3)	(4)	(5)	(6)
	ENVL	ENVL	ENVL	ENV11L	ENV11L	ENV11L
LAG1Y_LOGS1	0.0244***			0.0237***		
	(0.00579)			(0.00400)		
LAG1Y_LOGS2		0.0482***			0.0394***	
		(0.00585)			(0.00405)	
LAG1Y_LOGS3			0.0822***			0.0637***
			(0.00908)			(0.00625)
Constant	-1.630	-1.382	-1.489	-0.405	-0.118	-0.220
	(2.023)	(1.993)	(1.984)	(1.378)	(1.356)	(1.352)
Control Variables	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y
Observations	12358	12367	12373	12330	12339	12345
R-squared	0.3173	0.3237	0.3290	0.3239	0.3308	0.3362

Notes: This table provides the regressions of lagged one-year GHG emissions performance (Scope 1, 2, and 3) on corporate environmental commitments. The dependent variables are the corporate environmental score ENVL and ENV1.1L. For each regression, we also control country, industry and year fixed effects. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

Table 12. The pooled OLS regression of one-year lagged GHG emissions on emissions-related environmental commitments

	Emissions-related environmental commitments											
	Energy Use			Atmospheric Emissions			Local Pollution			Transportation Impacts		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ENV22L	ENV22L	ENV22L	ENV24L	ENV24L	ENV24L	ENV26L	ENV26L	ENV26L	ENV27L	ENV27L	ENV27L
LAG1Y_LOGS1	0.00675			0.0136*			0.0223*			0.00151		
	(0.00501)			(0.00802)			(0.0127)			(0.00718)		
LAG1Y_LOGS2		0.0369***			0.0236***			-0.00741			-0.00489	
		(0.00537)			(0.00761)			(0.0155)			(0.00851)	
LAG1Y_LOGS3			0.0563***			0.0258**			0.0332*			0.0229**
			(0.00794)			(0.0111)			(0.0195)			(0.0113)
Constant	1.220	1.118	1.127	1.765	1.851	1.712	1.305	1.211	1.791	3.537	3.676	3.381
	(1.673)	(1.648)	(1.645)	(2.756)	(2.734)	(2.757)	(4.724)	(4.798)	(4.777)	(2.519)	(2.524)	(2.502)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	10957	10967	10970	3349	3345	3349	990	990	990	3233	3235	3235
R-squared	0.2748	0.2827	0.2846	0.1947	0.1989	0.1957	0.3034	0.2990	0.3031	0.1436	0.1437	0.1458

Notes: This table provides the regressions of lagged one-year GHG emissions performance (Scope 1, 2, and 3) on corporate emissions environmental commitments. For each regression, we also control country, industry and year fixed effects. We cluster standard errors at the firm level. Numbers in parentheses are robust t-statistics. 1%, 5% and 10% significance levels are denoted by ***, ** and * respectively.

7 Conclusion and discussion

This study explores what drives global firms' environmental commitments using a global sample of 2500 firms across 41 countries. Our analysis shows a positive link between a firm's GHG emissions and the level of its environmental commitments, contrasting with recent findings that low-emission firms are more inclined to join initiatives like the CDP or SBTi (Bolton & Kacperczyk, 2023b). Furthermore, our results indicate that factors tied to corporate reputation, such as social standing and legal risk, correlate with higher environmental commitment, supporting literature on reputation's role in driving environmental performance (Boiral et al., 2012; Brammer & Pavelin, 2006) suggesting that reputational factors, such as social standing and legal risks, also correlate with stronger environmental pledges. However, our reverse analysis reveals no evidence that stronger environmental commitments lead to reduced emissions over time. This finding aligns with studies on the effectiveness of environmental commitments (Treepongkaruna et al., 2024; Van Binsbergen & Brøgger, 2024).

This study contributes to corporate environmental research in several key ways. First, we build on studies of the drivers of environmental commitments (Albitar et al., 2023; Desai et al., 2023) by directly evaluating commitment levels rather than relying on emissions scores or specific climate initiatives. This approach mitigates limitations in existing literature, including the lack of commitment data for firms not involved in major climate initiatives (Ben-Amar et al., 2024; Romito et al., 2024). We also expand on literature around emissions performance and ESG practices, particularly regarding disclosure (Giannarakis et al., 2017; Luo, 2019), and emphasize the roles of corporate reputation and regulatory pressure in motivating ESG practices (Ioannou & Serafeim, 2023; Ramadorai & Zeni, 2024).

Our findings have practical implications for investors and policymakers. For investors, we show that high-emission firms are frequently proactive in making environmental commitments, despite these not necessarily leading to reduced emissions (Bingler et al., 2024; Dahlmann et al., 2019). This suggests investors should focus on firms' concrete actions rather than pledges, as companies may not follow through on all environmental promises. For policymakers, the findings emphasize the impact of strong climate policies and national environmental commitments on corporate engagement. Countries with stringent policies see greater corporate environmental action, implying that effective national frameworks can encourage businesses

to set ambitious environmental goals.

Future research should investigate potential greenwashing by distinguishing between science-based and non-science-based pledges, examining their effects on emissions performance (Ben-Amar et al., 2024; Coen et al., 2022). This study underscores the need for diverse measures to assess climate pledges rather than relying solely on frameworks like SBTi (Edmans & Kacperczyk, 2022). Further research could also explore financial incentives, such as improved capital access or changes to capital structure following environmental commitments, to better understand how such pledges impact firms' financial strategies (Cheng et al., 2014).

REFRENCES

Afrin, R., Peng, N., & Bowen, F. (2022). The Wealth Effect of Corporate Water Actions: How Past Corporate Responsibility and Irresponsibility Influence Stock Market Reactions. *Journal of Business Ethics*, *180*(1), 105–124. https://doi.org/10.1007/s10551-021-04881-6

Albitar, K., Al-Shaer, H., & Liu, Y. S. (2023). Corporate commitment to climate change: The effect of eco-innovation and climate governance. *Research Policy*, *52*(2). https://doi.org/10.1016/j.respol.2022.104697

Ali, R., García-Sánchez, I. M., Aibar-Guzmán, B., & Rehman, R. ur. (2024). Is biodiversity disclosure emerging as a key topic on the agenda of institutional investors? *Business Strategy and the Environment*, *33*(3), 2116–2142. https://doi.org/10.1002/bse.3587

Alt, E., Díez-de-Castro, E. P., & Lloréns-Montes, F. J. (2015). Linking Employee Stakeholders to Environmental Performance: The Role of Proactive Environmental Strategies and Shared Vision. *Journal of Business Ethics*, *128*(1), 167–181. https://doi.org/10.1007/s10551-014-2095-x

Al-Tuwaijri, S. A., Christensen, T. E., & Hughes, K. E. (2004). The relations among environmental disclosure, environmental performance, and economic performance: A simultaneous equations approach. *Accounting, Organizations and Society*, *29*(5–6), 447–471. https://doi.org/10.1016/S0361-3682(03)00032-1

Asimakopoulos, P., Asimakopoulos, S., & Li, X. (2023). The role of environmental, social, and governance rating on corporate debt structure. *Journal of Corporate Finance*, *83*. https://doi.org/10.1016/j.jcorpfin.2023.102488

Atif, M., Hossain, M., Alam, M. S., & Goergen, M. (2021). Does board gender diversity affect renewable energy consumption? *Journal of Corporate Finance*, *66*. https://doi.org/10.1016/j.jcorpfin.2020.101665

Attig, N. (2024). Relaxed Financial Constraints and Corporate Social Responsibility. *Journal of Business Ethics*, *189*(1), 111–131. https://doi.org/10.1007/s10551-023-05353-9

Bansal, P. (2003). From Issues to Actions: The Importance of Individual Concerns and Organizational Values in Responding to Natural Environmental Issues. *Organization Science*, *14*(5), 510–527. https://doi.org/10.1287/orsc.14.5.510.16765

Bansal, P., & Roth, K. (2000). Why companies go green: A model of ecological responsiveness. *Academy of Management Journal*, 43(4), 717–736. https://doi.org/10.5465/1556363

Bassen, A., Buchholz, D., Lopatta, K., & Rudolf, A. R. (2024). Biodiversity management and stock price crash risk. *Business Strategy and the Environment*, *33*(5), 4788–4805. https://doi.org/10.1002/bse.3725

Ben-Amar, W., Comyns, B., & Martinez, I. (2024). Firm commitments on climate change: Effects of science-based targets on financial outcomes during the COVID-19 crisis. *Business Strategy and the Environment*. https://doi.org/10.1002/bse.3890

Benlemlih, M. (2017). Corporate Social Responsibility and Firm Debt Maturity. *Journal of Business Ethics*, *144*(3), 491–517. https://doi.org/10.1007/s10551-015-2856-1

Berger-Schmitz, Z., George, D., Hindal, C., Perkins, R., & Travaille, M. (2023). What explains firms' net zero adoption, strategy and response? *Business Strategy and the Environment*, *32*(8), 5583–5601. https://doi.org/10.1002/bse.3437

Bingler, J. A., Kraus, M., Leippold, M., & Webersinke, N. (2024). How cheap talk in climate disclosures relates to climate initiatives, corporate emissions, and reputation risk. *Journal of Banking and Finance*, *164*. https://doi.org/10.1016/j.jbankfin.2024.107191

Boiral, O. (2005). The impact of operator involvement in pollution reduction: Case studies in Canadian chemical companies. *Business Strategy and the Environment*, *14*(6), 339–360. https://doi.org/10.1002/bse.431

Boiral, O., Henri, J. F., & Talbot, D. (2012). Modeling the Impacts of Corporate Commitment on Climate Change. *Business Strategy and the Environment*, *21*(8), 495–516. https://doi.org/10.1002/bse.723

Bolton, P., & Kacperczyk, M. (2023a). Global Pricing of Carbon-Transition Risk. *Journal of Finance*, *78*(6), 3677–3754. https://doi.org/10.1111/jofi.13272

Bolton, P., & Kacperczyk, M. (2023b). *NBER WORKING PAPER SERIES FIRM COMMITMENTS*. Retrieved from http://www.nber.org/papers/w31244

Borghesi, R., Houston, J. F., & Naranjo, A. (2014). Corporate socially responsible investments: CEO altruism, reputation, and shareholder interests. *Journal of Corporate Finance*, *26*, 164–181. https://doi.org/10.1016/j.jcorpfin.2014.03.008

Brammer, S. J., & Pavelin, S. (2006). Corporate reputation and social performance: The importance of fit. *Journal of Management Studies*, *43*(3), 435–455. https://doi.org/10.1111/j.1467-6486.2006.00597.x

Cadez, S., Czerny, A., & Letmathe, P. (2019). Stakeholder pressures and corporate climate change mitigation strategies. *Business Strategy and the Environment*, *28*(1), 1–14. https://doi.org/10.1002/bse.2070

Campbell, J. L. (2007). Why would corporations behave in socially responsible ways? An institutional theory of corporate social responsibility. *Academy of Management Review*, 32(3), 946–967. https://doi.org/10.5465/amr.2007.25275684

Cao, J., Liang, H., & Zhan, X. (2019). Peer effects of corporate social responsibility. *Management Science*, *65*(12), 5487–5503. https://doi.org/10.1287/mnsc.2018.3100

CDP. (2024). Science-based targets. CDP. Retrieved October 10, 2024, from: https://www.cdp.net/en/campaigns/science-based-targets

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, *35*(1), 1–23. https://doi.org/10.1002/smj.2131

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society*, *33*(4–5), 303–327. https://doi.org/10.1016/j.aos.2007.05.003

Coen, D., Herman, K., & Pegram, T. (2022). Are corporate climate efforts genuine? An empirical analysis of the climate 'talk–walk' hypothesis. *Business Strategy and the Environment*, *31*(7), 3040–3059. https://doi.org/10.1002/bse.3063

Dahlmann, F., Branicki, L., & Brammer, S. (2019). Managing Carbon Aspirations: The Influence of Corporate Climate Change Targets on Environmental Performance. *Journal of Business Ethics*, *158*(1), 1–24. https://doi.org/10.1007/s10551-017-3731-z

Dawkins, C., & Fraas, J. W. (2011). Coming Clean: The Impact of Environmental Performance and Visibility on Corporate Climate Change Disclosure. *Journal of Business Ethics*, *100*(2), 303–322. https://doi.org/10.1007/s10551-010-0681-0

Degryse, H., Goncharenko, R., Theunisz, C., & Vadasz, T. (2023). When green meets green. *Journal of Corporate Finance*, *78*. https://doi.org/10.1016/j.jcorpfin.2023.102355

Delmas, M. A., & Montes-Sancho, M. J. (2010). Voluntary agreements to improve environmental quality: Symbolic and substantive cooperation. *Strategic Management Journal*, *31*(6), 575–601. https://doi.org/10.1002/smj.826

Delmas, M. A., & Toffel, M. W. (2008, October). Organizational responses to environmental demands: Opening the black box. *Strategic Management Journal*, Vol. 29, pp. 1027–1055. https://doi.org/10.1002/smj.701

Desai, H., Lam, P., Li, B., & Rajgopal, S. (2023). An Analysis of Carbon-Reduction Pledges of U.S. Oil and Gas Companies. *Management Science*, *69*(6), 3748–3758. https://doi.org/10.1287/mnsc.2023.4765

Dhanda, K. K., Sarkis, J., & Dhavale, D. G. (2022). Institutional and stakeholder effects on carbon mitigation strategies. *Business Strategy and the Environment*, *31*(3), 782–795. https://doi.org/10.1002/bse.2917

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), 147–160.

Doda, B., Gennaioli, C., Gouldson, A., Grover, D., & Sullivan, R. (2016). Are Corporate Carbon Management Practices Reducing Corporate Carbon Emissions? *Corporate Social Responsibility and Environmental Management*, *23*(5), 257–270. https://doi.org/10.1002/csr.1369

Downar, B., Ernstberger, J., Reichelstein, S., Schwenen, S., & Zaklan, A. (2021). The impact of carbon disclosure mandates on emissions and financial operating performance. *Review of Accounting Studies*, *26*(3), 1137–1175. https://doi.org/10.1007/s11142-021-09611-x

Dyck, A., Lins, K. V., Roth, L., & Wagner, H. F. (2019). Do institutional investors drive corporate social responsibility? International evidence. *Journal of Financial Economics*, *131*(3), 693–714. https://doi.org/10.1016/j.jfineco.2018.08.013

Edmans, A., & Kacperczyk, M. (2022). Sustainable Finance. *Review of Finance*, *26*(6), 1309–1313. https://doi.org/10.1093/rof/rfac069

El-Kassar, A. N., & Singh, S. K. (2019). Green innovation and organizational performance: The influence of big data and the moderating role of management commitment and HR practices. *Technological Forecasting and Social Change*, *144*, 483–498. https://doi.org/10.1016/j.techfore.2017.12.016

Farag, H., Koirala, S., Luo, D., & Rao, S. (2024). Do titans deliver the ESG promise? Societal recognition and responsible corporate decisions. British Journal of Management. https://doi.org/10.1111/1467-8551.12876

Favara, G., Gao, J., & Giannetti, M. (2021). Uncertainty, access to debt, and firm precautionary behavior. *Journal of Financial Economics*, *141*(2), 436–453. https://doi.org/10.1016/j.jfineco.2021.04.010

Ferdous, L. T., Atawnah, N., Yeboah, R., & Zhou, Y. (2024). Firm-level climate risk and accounting conservatism: International evidence. *International Review of Financial Analysis*, *95*. https://doi.org/10.1016/j.irfa.2024.103511

Financial Times. (2024). Companies take step back from making climate target promises. Financial Times. Retrieved September 2, 2024, from https://www.ft.com/content/3ebc5b56-a8f0-4fcd-99dd-9023d7a20013.

Flammer, C., & Luo, J. (2017). Corporate social responsibility as an employee governance tool: Evidence from a quasi-experiment. *Strategic Management Journal*, *38*(2), 163–183. https://doi.org/10.1002/smj.2492

Freeman, R. E. (1984). Strategic management: A stakeholder approach. Boston, MA: Pitman

Giannarakis, G., Zafeiriou, E., Arabatzis, G., & Partalidou, X. (2018). Determinants of Corporate Climate Change Disclosure for European Firms. *Corporate Social Responsibility and Environmental Management*, *25*(3), 281–294. https://doi.org/10.1002/csr.1461

Giannarakis, G., Zafeiriou, E., & Sariannidis, N. (2017). The Impact of Carbon Performance on Climate Change Disclosure. *Business Strategy and the Environment*, *26*(8), 1078–1094. https://doi.org/10.1002/bse.1962

Ginglinger, E., & Moreau, Q. (2023). Climate Risk and Capital Structure. *Management Science*, *69*(12), 7492–7516. https://doi.org/10.1287/mnsc.2023.4952

Graves, S. B., & Waddock, S. A. (1994). Institutional owners and corporate social performance. *Academy of Management Journal*, 37(4), 1034–1046. https://doi.org/10.5465/256611

Hainmueller, J. (2012). Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis*, *20*(1), 25–46. https://doi.org/10.1093/pan/mpr025

Hainmueller, J., & Xu, Y. (2013). ebalance: A Stata Package for Entropy Balancing. In *JSS Journal of Statistical Software* (Vol. 54). Retrieved from http://www.jstatsoft.org/

Hirunyawipada, T., & Xiong, G. (2018). Corporate environmental commitment and financial performance: Moderating effects of marketing and operations capabilities. *Journal of Business Research*, *86*, 22–31. https://doi.org/10.1016/j.jbusres.2018.01.002

Homroy, S. (2023). GHG emissions and firm performance: The role of CEO gender socialization. *Journal of Banking and Finance*, *148*. https://doi.org/10.1016/j.jbankfin.2022.106721

Hong, H., Kubik, J. D., & Scheinkman, J. A. (2012). *NBER WORKING PAPER SERIES FINANCIAL CONSTRAINTS ON CORPORATE GOODNESS*. Retrieved from http://www.nber.org/papers/w18476

Hong, H., Kubik, J. D., Scheinkman, J., Ravina, E., Hirshleifer, D., Schwarz, C., … Wurgler and, J. (2019). *Crime, Punishment and the Value of Corporate Social Responsibility* *. Retrieved from https://ssrn.com/abstract=2492202

Huang, C. L., & Kung, F. H. (2010). Drivers of Environmental Disclosure and Stakeholder Expectation: Evidence from Taiwan. *Journal of Business Ethics*, *96*(3), 435–451. https://doi.org/10.1007/s10551-010-0476-3

Ikram, A., Li, Z. (Frank), & Minor, D. (2023). CSR-contingent executive compensation contracts. *Journal of Banking and Finance*, *151*. https://doi.org/10.1016/j.jbankfin.2019.105655

Iliev, P., & Roth, L. (2023). Director Expertise and Corporate Sustainability. *Review of Finance*, *27*(6), 2085–2123. Oxford University Press. https://doi.org/10.1093/rof/rfad012

Ioannou, I., Li, S. X., & Serafeim, G. (2016). The effect of target difficulty on target completion: The case of reducing carbon emissions. *Accounting Review*, *91*(5), 1467–1492. American Accounting Association. https://doi.org/10.2308/accr-51307

Ioannou, I., & Serafeim, G. (2012). What drives corporate social performance the role of nation-level institutions. *Journal of International Business Studies*, *43*(9), 834–864. https://doi.org/10.1057/jibs.2012.26

Ioannou, I., & Serafeim, G. (2023). What drives corporate social performance? The role of nation-level institutions. *Journal of International Business Studies*, *54*(1), 14–23. https://doi.org/10.1057/s41267-022-00579-7

Jo, H., Kim, H., & Park, K. (2015). Corporate Environmental Responsibility and Firm Performance in the Financial Services Sector. *Journal of Business Ethics*, *131*(2), 257–284. https://doi.org/10.1007/s10551-014-2276-7

King, A., & Lenox, M. (2002). *Exploring the Locus of Profitable Pollution Reduction*.

Koseoglu, M. A., Arici, H. E., Saydam, M. B., & Olorunsola, V. O. (2024). Environmental, social and governance assets and diversity scores: exploring their relationship to carbon emissions in global companies. *Management Decision*. https://doi.org/10.1108/MD-05-2023-0818

Kudłak, R. (2024). Greenwashing or Striving to Persist: An Alternative Explanation of a Loose Coupling Between Corporate Environmental Commitments and Outcomes. *Journal of Business Ethics*. https://doi.org/10.1007/s10551-024-05778-w

Lemma, T. T., Lulseged, A., & Tavakolifar, M. (2021). Corporate commitment to climate change action, carbon risk exposure, and a firm's debt financing policy. *Business Strategy and the Environment*, *30*(8), 3919–3936. https://doi.org/10.1002/bse.2849

Liesen, A., Hoepner, A. G., Patten, D. M., & Figge, F. (2015). Does stakeholder pressure influence corporate GHG emissions reporting? Empirical evidence from Europe. *Accounting, Auditing and Accountability Journal*, *28*(7), 1047–1074. https://doi.org/10.1108/AAAJ-12-2013-1547

Littlewood, D., Decelis, R., Hillenbrand, C., & Holt, D. (2018). Examining the drivers and outcomes of corporate commitment to climate change action in European high emitting industry. *Business Strategy and the Environment*, *27*(8), 1437–1449. https://doi.org/10.1002/bse.2194

Luo, L. (2019). The influence of institutional contexts on the relationship between voluntary carbon disclosure and carbon emission performance. *Accounting and Finance*, *59*(2), 1235–1264. https://doi.org/10.1111/acfi.12267

Lyon, T. P., & Maxwell, J. W. (2011). Greenwash: Corporate environmental disclosure under threat of audit. *Journal of Economics and Management Strategy*, *20*(1), 3–41. https://doi.org/10.1111/j.1530-9134.2010.00282.x

Lyon, T. P., & Montgomery, A. W. (2015). The Means and End of Greenwash. *Organization and Environment*, *28*(2), 223–249. https://doi.org/10.1177/1086026615575332

Matsumura, E. M., Prakash, R., & Vera-Muñoz, S. C. (2014). Firm-value effects of carbon emissions and carbon disclosures. *Accounting Review*, *89*(2), 695–724. https://doi.org/10.2308/accr-50629

McKinsey. (2023). Companies are broadening their commitments to nature beyond carbon. McKinsey & Company. Retrieved January 10, 2025, from: https://www.mckinsey.com/industries/agriculture/how-we-help-clients/natural-capital-and-nature/our-insights/companies-are-broadening-their-commitments-to-nature-beyond-carbon#/

Nguyen, J. H., & Phan, H. V. (2020). Carbon risk and corporate capital structure. *Journal of Corporate Finance*, *64*. https://doi.org/10.1016/j.jcorpfin.2020.101713

Privato, C., Johnson, M. P., & Busch, T. (2024). Raising the bar: What determines the ambition level of corporate climate targets? *Climatic Change*, *177*(9). https://doi.org/10.1007/s10584-024-03783-6

Ramadorai, T., & Zeni, F. (2024). Climate Regulation and Emissions Abatement: Theory and Evidence from Firms' Disclosures. *Management Science*. https://doi.org/10.1287/mnsc.2021.00482

Reid, E. M., & Toffel, M. W. (2009). Responding to public and private politics: Corporate disclosure of climate change strategies. *Strategic Management Journal*, *30*(11), 1157–1178. https://doi.org/10.1002/smj.796

Romito, S., Vurro, C., & Pogutz, S. (2024). Joining multi-stakeholder initiatives to fight climate change: The environmental impact of corporate participation in the Science Based Targets initiative. *Business Strategy and the Environment*, *33*(4), 2817–2831. https://doi.org/10.1002/bse.3639

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355–374. https://doi.org/10.2307/1882010

Surroca, J., Tribó, J. A., & Waddock, S. (2010). Corporate responsibility and financial performance: The role of intangible resources. *Strategic Management Journal*, *31*(5), 463–490. https://doi.org/10.1002/smj.820

Tanthanongsakkun, S., Treepongkaruna, S., & Jiraporn, P. (2023). Carbon emissions, corporate governance, and staggered boards. *Business Strategy and the Environment*, *32*(1), 769–780. https://doi.org/10.1002/bse.3174

Tascón, M. T., Castro, P., & Ferreras, A. (2021). How does a firm's life cycle influence the relationship between carbon performance and financial debt? *Business Strategy and the Environment*, *30*(4), 1879–1897. https://doi.org/10.1002/bse.2722

Tavakolifar, M., Omar, A., Lemma, T. T., & Samkin, G. (2021). Media attention and its impact on corporate commitment to climate change action. *Journal of Cleaner Production*, *313*. https://doi.org/10.1016/j.jclepro.2021.127833

Treepongkaruna, S., Au Yong, H. H., Thomsen, S., & Kyaw, K. (2024). Greenwashing, carbon emission, and ESG. *Business Strategy and the Environment*. https://doi.org/10.1002/bse.3929

Van Binsbergen, J. H., & Brøgger, A. (2024). *The Future of Emissions*.

Wang, S., Li, J., & Zhao, D. (2018). Institutional Pressures and Environmental Management Practices: The Moderating Effects of Environmental Commitment and Resource Availability. *Business Strategy and the Environment*, *27*(1), 52–69. https://doi.org/10.1002/bse.1983