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ESG disclosure and controversy incidence: evidence from global energy firms

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Abstract

Purpose – The global energy sector is central to the low-carbon transition but remains structurally exposed to Environmental, Social, and Governance (ESG) controversies. This study aims to examine whether greater ESG transparency mitigates – or instead, amplifies – observed controversy risk, and how national institutional quality shapes this relationship across countries.

Design/methodology/approach – Using an unbalanced panel of 141 listed energy firms (2018–2022), the study estimates dynamic two-step System generalized method of moments (GMM) models to account for persistence and potential endogeneity in controversy outcomes. The study tests whether ESG performance, disclosure modalities – sustainability reporting (SR), integrated reporting (IR) and external assurance – and disclosure standardisation (Global Reporting Initiative [GRI] alignment) are associated with ESG controversies, controlling for country-level governance, legal origin and culture.

Findings – SR is positively associated with observed controversies, consistent with a transparency–detection mechanism whereby disclosure increases visibility and stakeholder scrutiny. By contrast, disclosure standardisation – particularly GRI-aligned reporting – is associated with lower controversy incidence. Governance indicators linked to monitoring capacity strengthen the positive disclosure–controversy association, whereas stronger control of corruption is associated with fewer controversies.

Research limitations/implications – Controversy indicators capture only events that are detected and recorded and may therefore understate incidents in less transparent settings. Although the System GMM approach addresses important endogeneity concerns, some pillar-specific models show weaker diagnostics and should be interpreted with caution. In addition, the study does not capture assurance quality in sufficient detail, which may affect the estimated role of assurance mechanisms.

Practical implications – For managers in carbon-intensive industries, ESG disclosure should be treated as a governance instrument rather than merely a compliance exercise. Expanding disclosure volume without improving its quality may heighten controversy exposure by increasing visibility without strengthening credibility. Firms should therefore prioritise structured, comparable and verifiable ESG reporting, particularly through recognised frameworks such as the GRI, supported by robust materiality assessment, traceable indicators, reliable internal controls and credible external assurance.

Social implications – The results indicate that ESG controversies are embedded in institutional and regulatory environments rather than being determined solely at the firm level. Regulatory quality, voice and accountability, and corruption control shape whether ESG-related misconduct is detected and publicly reported, which implies that disclosure regulation is effective only when supported by credible monitoring and enforcement.

Originality/value – The energy sector provides a salient setting given its carbon intensity, regulatory scrutiny and material ESG exposure. Yet prior research has not examined how disclosure quality and

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standardisation shape controversy incidence across institutional contexts. This study addresses that gap.

Keywords ESG, ESG controversies, Sustainability reporting, Integrated reporting, Legitimacy theory, Global reporting initiative

Paper type Research paper

1. Introduction

Energy underpins sustainable economic development and long-term industrial growth (Zhang *et al.*, 2025; Zhi-qiang *et al.*, 2024). Achieving sustainability targets requires a coordinated transition towards renewable energy systems, clean technologies and sustainable finance, supported by regulatory frameworks that are both credible and enforceable. In this setting, the energy sector plays a dual role: it remains a major contributor to global emissions while also operating at the centre of decarbonisation.

Against this backdrop, aligning energy corporations with sustainability imperatives has become a priority for regulators, investors and civil society. ESG disclosure is now a central mechanism through which stakeholders assess that alignment. Disclosure practices have become increasingly institutionalised in carbon-intensive industries facing heightened scrutiny and regulatory pressure (Berrêdo *et al.*, 2024; Garcia *et al.*, 2017; Bolton *et al.*, 2011).

Yet the expansion of ESG disclosure raises an unresolved question: does transparency primarily signal accountability, or can it also increase observed controversy events by intensifying scrutiny? Much of the literature implicitly treats ESG controversies as direct consequences of weak ESG performance. However, controversies are not simply behavioural failures; they are detected, publicised and classified events. Whether misconduct is publicly recorded as a controversy depends not only on underlying conduct but also on disclosure-induced visibility, monitoring capacity and enforcement strength in the firm's institutional environment. This distinction between misconduct and observability remains undertheorised, particularly in carbon-intensive sectors. Moreover, growing evidence suggests that disclosure volume can diverge from substantive ESG performance, thereby enabling strategic narrative construction and legitimacy management (Curran, 2017; Hoffmann and Kristensen, 2017; Blanco-Zaitegi *et al.*, 2024).

This tension is particularly acute in the energy sector. Characterised by carbon-intensive operations and substantial environmental externalities, the industry is structurally susceptible to ESG controversies, ranging from environmental disasters to complex social conflicts. Heightened media scrutiny further amplifies this vulnerability, increasing the likelihood that corporate transgressions are detected and publicly disseminated (Cai *et al.*, 2015; Aouadi and Marsat, 2018). The consequences of such controversies are economically and reputationally significant, including intensified market uncertainty, reputational damage, higher capital costs and firm-value erosion (Wu *et al.*, 2023; Al-Hiyari, 2024). However, extant research seldom links ESG disclosure quality systematically to controversy incidence in global energy firms, and cross-country evidence remains limited (Simnett *et al.*, 2009; Shakil, 2021; Beckmann and Rogmann, 2024; Erragragui *et al.*, 2023; Mallidis *et al.*, 2024).

This study advances the literature in three main ways. Firstly, it reconceptualises ESG controversies as detection outcomes shaped by disclosure intensity and institutional transparency. Secondly, it distinguishes between disclosure quantity and disclosure standardisation, showing that structured frameworks – such as the Global Reporting Initiative (GRI) (GRI, 2021) – relate differently to observed controversy incidence than less structured forms of reporting. Thirdly, by employing a dynamic System GMM estimation, the analysis addresses persistence, simultaneity and endogeneity in the disclosure–controversy nexus.

The remainder of the paper is structured as follows: Section 2 develops the conceptual framework, and Section 3 provides the background literature. Section 4 describes the methodology, and Section 5 presents the empirical results. Section 6 discusses the findings, while Sections 7 and 8 outline the theoretical, managerial and policy implications and conclude the paper.

2. Conceptual model

This study develops a multilevel framework grounded in legitimacy and institutional theory to explain observed ESG controversy incidence in the global energy sector. The framework emphasises two complementary mechanisms that jointly shape whether ESG-related incidents are detected and publicly classified as controversies.

From a legitimacy perspective, disclosure intensity – such as the issuance of a standalone sustainability reporting (SR) – enhances visibility, reduces stakeholder information gaps, and strengthens stakeholder oversight. This theory posits that firms seek alignment between corporate conduct, disclosures and prevailing societal norms to maintain their social licence to operate (Dowling and Pfeffer, 1975; Suchman, 1995; Deegan *et al.*, 2002). ESG disclosure can therefore function as a strategic mechanism through which firms manage stakeholder perceptions and reinforce their implicit social contract (Cho and Patten, 2007; Deegan *et al.*, 2002; Michelon *et al.*, 2019). Because legitimacy is dynamic and requires continuous maintenance (Suchman, 1995), ESG controversies may arise not only from substantive performance failures but also from heightened visibility combined with insufficient transparency (Brown and Deegan, 1998; Bebbington *et al.*, 2008; Bel-Oms, 2025).

In highly visible firms, particularly large corporations with strong ESG scores, controversies may reflect inconsistencies between communicated commitments, actual practices and information quality rather than weak performance *per se* (Cho *et al.*, 2015; Marquis *et al.*, 2016; Testa *et al.*, 2018). Prior research further indicates that ESG performance is linked to firms' risk profiles (Shakil, 2021). However, when strong ESG scores coexist with a higher probability of controversy, risk dynamics may reflect salience and scrutiny rather than deteriorating fundamentals. This distinction underscores the importance of separating underlying ESG quality from the mechanisms through which controversies become publicly observable (Kölbel *et al.*, 2017; Cho *et al.*, 2015).

Disclosure quality refers to the extent to which ESG information is produced in accordance with common reporting formats and recognised standards and is subject to systematic assurance.

Institutional theory complements this firm-level perspective by emphasising that organisational practices are embedded within broader regulatory and socio-cultural environments (Meyer and Rowan, 1977; DiMaggio and Powell, 1991; Scott, 2008; Suchman, 1995). Firms adapt to coercive, normative and mimetic pressures to secure legitimacy and social acceptance (DiMaggio and Powell, 1991; Scott, 2008). Accordingly, ESG disclosure practices – including SR and integrated reporting (IR) – reflect both strategic firm-level choices and country-specific institutional constraints and incentives (Beckmann and Rogmann, 2024).

National characteristics may function as important contextual determinants of ESG controversy incidence. Legal origin, regulatory stringency, governance quality, government effectiveness and cultural dimensions shape monitoring capacity, enforcement credibility, disclosure incentives and stakeholder scrutiny (Arena *et al.*, 2015; Luo *et al.*, 2015; Beckmann and Rogmann, 2024). Observed controversy incidence thus reflects the interaction between firm conduct, disclosure intensity and quality, and institutional detection capacity.

ESG controversies are conceptualised as materially relevant incidents that (i) carry reputational or normative significance, (ii) are detected and (iii) are publicly recorded in archival or regulatory sources in a manner that permits systematic retrieval for empirical

analysis. Observed ESG controversy incidence is therefore conceptualised as the outcome of firm-level ESG performance, disclosure intensity and quality, and country-level institutional environments that shape detection, scrutiny and public recording. Drawing on legitimacy and institutional theory, we posit that controversy propensity is shaped by ESG disclosure, ESG performance, and the national institutional environment in which firms operate, including legal frameworks, governance quality and culture (Figure 1).

3. Background

Prior research on ESG disclosure and controversies spans five interrelated strands: information quality and transparency; ESG controversies and reputational risk; disclosure within stakeholder theory; institutional theory and national governance; and energy-sector-specific ESG research. Together, these literatures motivate our research questions and frame the analysis of how disclosure intensity, credibility and standardisation relate to observed controversy probability in energy-sector firms.

A substantial body of research conceptualises ESG disclosure as a mechanism for enhancing transparency and reducing information asymmetry between firms and stakeholders (Healy and Palepu, 2001). SR, financial reporting and IR constitute the principal channels through which firms communicate ESG-related information and signal commitment to responsible corporate conduct (Busco *et al.*, 2013). From a legitimacy perspective, these reports serve both informational and symbolic functions by signalling conformity with socially accepted norms and expectations, thereby supporting organisational legitimacy (Dowling and Pfeffer, 1975; Elsbach and Sutton, 1992; Suchman, 1995).

The scope and quality of ESG disclosure are strongly associated with stakeholder attention and public scrutiny (Cho and Patten, 2007). ESG scores, the publication of sustainability reports and IR, and the adoption of external assurance are commonly employed as proxies for disclosure credibility and transparency (Simnett *et al.*, 2009). Although enhanced disclosure is generally expected to reduce information asymmetry, it may also intensify scrutiny, particularly in industries characterised by high environmental and social salience (Cormier and Magnan, 2015). Complementing this disclosure literature, research on ESG controversies documents their reputational and economic

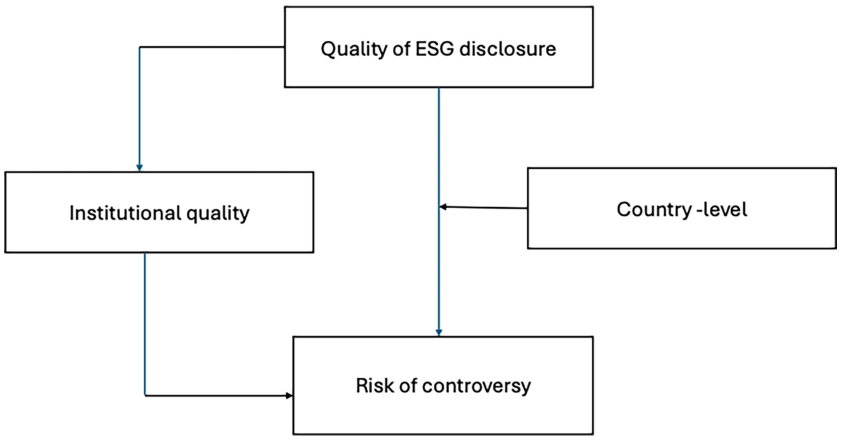

Figure 1. Roadmap of the research

consequences (Aouadi and Marsat, 2018). ESG controversies typically arise from environmental incidents, social misconduct or governance failures and can elicit adverse reactions from investors, regulators and other stakeholders.

This creates a theoretical tension: more extensive ESG disclosure may coincide with lower information gaps but greater exposure to examination. Increased salience raises the likelihood that ESG-related shortcomings are detected, publicised and classified as controversies, including in environmentally sensitive industries such as energy (Cho and Patten, 2007). This tension motivates the first research question (RQ):

RQ1. Is greater ESG disclosure intensity associated with higher observed ESG controversy incidence in the energy sector?

Empirical evidence underscores the importance of national context in shaping ESG controversies. Although prior research has examined ESG ratings at the country level (Gillan *et al.*, 2021; Roncalli, 2022), empirical studies explicitly focusing on ESG controversies remain comparatively scarce. Moreover, while country-level ESG ratings have been shown to have broader macroeconomic effects (Filippou and Taylor, 2021), they do not fully capture firm-level dynamics associated with the likelihood of controversy.

Institutional characteristics appear to play a significant role. Firms operating within civil law systems, for example, tend to experience stronger stock market reactions to ESG controversies (Erragragui *et al.*, 2023). Similarly, Mallidis *et al.* (2024) show that national corruption levels influence the relationship between ESG controversies and firm participation in international initiatives such as the UN Global Compact and ISO standards. These findings suggest that institutional environments shape both disclosure incentives and stakeholder responses to ESG-related misconduct.

Because ESG regulation and enforcement mechanisms are largely determined at the national level, legal origin and governance quality are likely to influence observed ESG controversy incidence. Variation in investor protection, regulatory enforcement, transparency requirements and judicial effectiveness may influence the probability that ESG-related incidents are detected and publicly disclosed. Accordingly, we formulate the following RQs:

RQ2. Is legal origin associated with observed ESG controversy incidence in energy-sector corporations?

RQ3. Is national governance quality associated with observed ESG controversy incidence in energy-sector corporations?

Beyond formal institutional arrangements, cultural characteristics may further shape ESG-related behaviour and stakeholder reactions. DasGupta (2022) argues that cultural attributes influence the incidence of ESG controversies. Cultural dimensions such as individualism, power distance, uncertainty avoidance and long-term orientation (Hofstede, 2011) have been shown to influence investor behaviour and risk perception, particularly during periods of uncertainty (Galariotis and Karagiannis, 2021). Moreover, firm-level cultural norms may diverge from national legal frameworks, particularly in jurisdictions where societal expectations exceed formal regulatory requirements (Erragragui *et al.*, 2023). In the energy sector – where ESG failures are highly visible and politically sensitive – cultural factors may therefore shape stakeholder expectations, scrutiny, and the public salience of ESG-related incidents.

Accordingly, we formulate the final RQ:

RQ4. Are cultural dimensions associated with observed ESG controversy incidence in energy-sector corporations?

Existing studies of greenwashing and ESG controversies suggest a potential divergence between disclosure and outcomes, but few examine the link between disclosure quality and controversy risk in a systematic, multi-country setting.

Greenwashing is often conceptualised as extensive ESG disclosure despite weak substantive performance (Kölbel *et al.*, 2017), whereas controversy data sets capture realised negative events that may not align directly with reported metrics (Cho and Patten, 2007; Aouadi and Marsat, 2018). Despite this conceptual tension, extant research rarely examines disclosure quality as a driver of controversy risk in energy firms. In particular, systematic cross-country analyses using dynamic methods (such as System GMM) remain uncommon in this context (Simnett *et al.*, 2009; Shakil, 2021; Beckmann and Rogmann, 2024; Erragragui *et al.*, 2023; Mallidis *et al.*, 2024). This methodological gap underscores the need for research that links disclosure quality and controversy outcomes across national institutional environments.

4. Methodology

4.1 Model

We specify the following empirical model to capture the principal determinants of ESG controversies:

$$\begin{aligned} ESGControversies &= \propto_0 + \propto_1 \sum ESG\ performance + \propto_2 \sum Availability\ of\ information \\ &+ \propto_3 \sum Subsector + \propto_4 \sum Specific\ characteristics\ of\ the\ country\ origin \\ &+ \propto_5 CONTROL + \varepsilon \end{aligned}$$

We estimate a dynamic panel model in which observed ESG controversy incidence depends on its own lag, disclosure variables, ESG performance, firm controls, subsector affiliation and country-level institutional factors. Variable definitions and sources are provided in Section 4.3 and Table 1.

The empirical specification includes standard firm-level controls for size and profitability, together with year fixed effects, to absorb common shocks and time-varying sector conditions. Because ESG disclosure and controversy incidence may be jointly determined by reverse causality, simultaneity and unobserved time-varying firm characteristics, static estimators may be biased. We therefore estimate a dynamic panel model using two-step System GMM in differences and levels to capture persistence in ESG controversies and address endogeneity between disclosure and controversy outcomes.

ESG performance and disclosure variables are treated as endogenous or predetermined, as appropriate, and instrumented with internal lags. In the baseline models, GMM-style instruments are collapsed and limited to lags 1 and 2 to reduce instrument proliferation, while the instrument count remains well below the number of firms. Diagnostic tests indicate that the preferred specifications satisfy standard dynamic-panel criteria, including the Arellano–Bond tests for serial correlation and the Hansen test of overidentifying restrictions, supplemented where available by Difference-in-Hansen tests for instrument-subset exogeneity. Two-step standard errors are reported with the Windmeijer finite-sample correction (Arellano and Bond, 1991; Blundell and Bond, 1998).

Table 1. Definition of the variables. The first column reports the variable name, the second column its acronym, and the third column its definition

Variable	Acronym	Interpretation
ESG controversies	*ESGcont*	Events or ongoing situations in which a firm's operations and/or products generate negative environmental, social and/or governance impact
Environmental controversies	*Econt*	Events or ongoing situations in which company operations and/or products generate negative environmental impact
Social controversies	*Scont*	Events or ongoing situations in which company operations and/or products generate negative social impact
Governance controversies	*Gcont*	Events or ongoing situations in which company operations and/or products generate negative governance impact
ESG performance	*esg*	Composite score provided by Eikon database (range: 0–100)
Environmental performance	*env*	Includes resource use, emissions, and innovation
Social performance	*soc*	Includes workforce, human rights, community, and product responsibility
Governance performance	*gov*	Includes management, shareholders, and CSR strategy.
Sustainability information	*sr*	1.If the firm discloses a sustainability report. 0. If the firm does not provide a sustainability report
Integrated report	*ir*	1.The corporation disclosed the integrated report. 0. Otherwise
Assurance of sustainability information	*srass*	1.If the sustainability report has been assured. 0. Otherwise
Assurance	*ass*	0.If the integrated report does not include an assurance report. 1. If the integrated report includes an assurance report
Auditors	*aud*	1.Assurance provided by a Big Four audit firm. 2. Assurance provided by other audit firms or consultants
Framework	*frmw*	1.ISAE 3000 2.GRI 3.AA1000 4.Others
Firm-specific variables		
Subsector	*sub*	Energy subsectors: (1) Electricity (2) Gas (3) Oil (4) Diversified
Board size	*board*	Number of directors on the board
Gender diversity	*divers*	Percentage of women on the board of directors
Country-specific variables		
Legal system	*leg*	1.Common law countries. 2.Germanic civil law countries. 3.Scandinavian civil law countries. 4. French civil law countries. 5.Others
Rule of law	*rol*	Quality of the country's legal environment, measured by the WJP rule of law index.
Power distance	*pd*	The extent to which less powerful members of society accept and expect unequal power distribution.
Masculinity	*mas*	Preference for assertiveness and competitiveness, whereas feminity emphasizes modesty and care-oriented values

(*continued*)

Table 1. Continued

Variable	Acronym	Interpretation
Uncertainty avoidance	*ua*	Captures a society's tolerance for uncertainty and ambiguity
Long-term orientation	*lto*	Degree to which a culture prioritizes long-term goals over short-term outcomes
Individualism	*idv*	The degree to which individuals are integrated into groups
Indulgence	*ind*	The extent to which people can freely satisfy their desires and impulses, reflecting indulgence versus restraint
Country governance indicators		
Voice and accountability	*va*	Captures perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media
Political stability	*ps*	Perceptions of the likelihood of political instability and/or politically motivated violence
Government effectiveness	*ge*	Perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies
Regulatory quality	*rq*	Perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development
Control of corruption	*cc*	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption
Corruption perception	*cp*	Perceived levels of public-sector corruption, based on expert assessments and business surveys. It uses a scale of zero to 100, where zero is highly corrupt and 100 is clean
BRIC	*bric*	1.BRICS grouping (Brazil, Russia, India, China, South Africa, Egypt, Ethiopia, Indonesia, Iran, and the United Arab Emirates). 0.Otherwise
Control variables		
Total assets	*ta*	Log (total assets)
ROA	*ROA*	Return on assets

4.2 Sample selection

The initial sample consisted of energy companies included in the S&P Top 250 Global Energy Company Rankings (S&P Global Commodity Insights, 2022). After excluding firms with incomplete data and duplicate corporate-group entities, the final sample comprises 141 corporations, yielding 705 firm-year observations for 2018–2022.

For each firm, we collected information on SR, IR, assurance characteristics and assurance frameworks. ESG data were obtained from Refinitiv Eikon, while country-level institutional, legal, cultural and governance indicators were obtained from Hofstede Insights, the World Justice Project, the World Bank and Transparency International.

4.3 Selection of variables

ESG controversies are measured using the Refinitiv/LSEG controversies module. We define *ESGcont* as the annual count of recorded controversy events for each firm-year, both overall and, for robustness analyses, by pillar: environmental (*Econt*), social (*Scont*) and governance (*Gcont*), as reported in Table 1. Consistent with Capelle-Blancard and Petit (2019) and Liang and Renneboog (2017), this measure is based on publicly available information sources and captures both underlying ESG-related incidents and their detection through public reporting.

Disclosure variables capture the adoption of *sr* and *ir*, both of which are associated with greater transparency and higher reporting quality (Adams, 2015; Beck *et al.*, 2017). To reflect the credibility of non-financial disclosure, we also include indicators for sustainability report assurance (*srass*), integrated report assurance (*ass*) and Big Four participation in assurance engagements (*aud*) (Michelon *et al.*, 2019; Ghani *et al.*, 2018; Rivera-Arrubla *et al.*, 2017), although prior evidence remains mixed (Chouaibi and Hichri, 2020). In addition, we consider structured reporting and assurance frameworks (*frmw*) – including ISAE 3000 [International Auditing and Assurance Standards Board (IAASB), 2013], the GRI (GRI, 2021), AA1000 (AccountAbility, 2020) and national standards – to capture heterogeneity in reporting practices and their potential moderating effect on ESG controversy incidence.

We further control for industry subsector (*sub*), distinguishing electricity, gas, oil and diversified energy firms, and for board characteristics, namely, board size (*board*) and gender diversity (*divers*), which are widely examined in the ESG literature, although the evidence on their association with ESG controversies is mixed (Agnese *et al.*, 2023; Vitolla *et al.*, 2019; Treepongkaruna *et al.*, 2024; Al-Hiyari, 2024; Issa, 2023).

Table 2. Descriptive results. Column (N) reports the number of observations; average reports the sample average; median reports the median value; and SD reports the standard deviation

Variable	N	Average	Median	SD
divers	560	0.262	0.25	0.558
board	561	11.38	11	3.26
pd	705	53.95	49	17.88
idv	705	55.10	60	16.43
mas	705	59.12	62	15.13
ua	705	57.36	46	20.61
lto	705	53.63	50	19.22
ind	700	49.54	56	19.71
rol	690	0.671	0.71	0.122
esg	606	61.05	65	46.02
env	525	65.91	69	19.44
soc	525	66.47	70	18.91
gov	525	63.76	69	21.76
ta	690	17.23	17.45	1.632
rev	687	16.56	16.63	1.876
empl	650	9.62	9.60	1.612
ps	705	51.12	52.36	20.35
rq	705	75.30	87.14	21.76
cc	705	77.38	82.55	69.03
cp	705	60.36	67	15.87
va	705	66.11	68	30.70
ge	705	59.57	67	26.27

Consistent with institutional theory, the model also incorporates country-level factors, including legal origin (*leg*), rule of law (*rol*) and Hofstede's cultural dimensions – power distance (*pd*), masculinity (*mas*), uncertainty avoidance (*ua*), long-term orientation (*lto*), individualism (*idv*) and indulgence (*ind*) – together with World Bank governance indicators for voice and accountability (*va*), political stability (*ps*), government effectiveness (*ge*), regulatory quality (*rq*), and control of corruption (*cc*), the Corruption Perceptions Index (*cp*), and a BRIC indicator distinguishing between BRIC and non-BRIC countries (Vitolla *et al.*, 2019; Sibt-e-Ali *et al.*, 2025). Finally, we include firm-level controls for size, measured as the logarithm of total assets (*ta*), and profitability (*ROA*), in line with prior research (Deb *et al.*, 2019; Duque-Grisales and Aguilera-Caracuel, 2021; Shi and Veenstra, 2020; Hyusein and Cek, 2024; Chen and Xie, 2022). Table 1 summarises all variables and provides detailed definitions of the firm-level measures.

5. Findings

5.1 Descriptive analysis

Table 2 Indicates that the sample comprises large energy firms, as reflected in total assets (log median = 17.45) and revenues (log median = 16.63), consistent with the scale of the sector. ESG performance is moderately high, with mean and median scores ranging from 60 to 70 on a 0–100 scale. Among the Three pillars, the social dimension records the highest median score (70). Boards comprise, on average, 11 directors, and women represent 26% of board members.

Table 3 Shows that 35% of firm-year observations correspond to firms headquartered in the americas (*cont*), while 51% operate under common-law systems (*leg*). The subsector composition (s*ub)* is relatively balanced: diversified energy firms account for 29% of the sample, and oil is the largest single subsector (27%). the median board size (*board*) is 11 members, and the median proportion of women (*divers*) is 25%.

In terms of transparency practices, 53% of firms issue SR (*sr*), whereas 41% publish IR (*ir*). Third-party assurance is obtained for 30% of SR reports (*srass*) and 18% of IR reports (*ass*). ISAE 3000 (IAASB, 2013) is the most frequently adopted assurance standard, used in

Table 3. Categorical variables (percentages)

Categorical variables	*cont*	*leg*	*sub*	*sr*	*ir*	*srass*	*ass*	*aud*
Europe	29.55							
America	35.65							
Africa	5.68							
Asia	26.28							
Australia	2.84							
Common law		51.14						
Germanic civil law		32.53						
Scandinavian civil law		2.84						
French civil law		9.94						
Others		3.55						
Electricity			26.14					
Gas			14.91					
Oil			27.7					
Diversified			29.12					
Coal			2.13					
Yes				53.47	41.70	30.35	18.15	44.09
No				46.53	58.30	69.65	81.85	55.91

40.34% of assured reports (*frmw*). Assurance is provided mainly by non–Big Four firms (55.91%).

The correlation matrix (Table A1 Appendix) shows that ESG controversies are positively associated with board size (0.09), individualism (0.19), indulgence (0.14), rule of law (0.11), regulatory quality (0.12) and ESG performance across all pillars (env = 0.20; soc = 0.23; gov = 0.16; esg = 0.25). By contrast, ESG controversies are negatively correlated with power distance (−0.08) and masculinity (−0.22), suggesting fewer reported controversies in such cultural settings.

5.2 Determinants of ESG controversies in the energy sector

Table 4 Reports the baseline system GMM estimates. The lagged dependent variable is small and only intermittently significant, indicating limited short-run persistence in recorded ESG controversies once firm-level and institutional controls are introduced

Sustainability information is the most robust disclosure-related determinant. Across the better-specified models, issuing a standalone SR is positively associated with observed controversies, consistent with a detection-based interpretation: greater disclosure increases visibility and raises the probability that underlying incidents are detected and formally classified as controversies. By contrast, IR and assurance variables show no robust association in the baseline models.

Specifically, SR is positive and significant in Model (1) (0.891, $p = 0.012$), Model (5) (3.13, $p = 0.001$), Model (7) (0.984, $p = 0.03$) and Model (10) (0.825, $p = 0.05$). The consistency of sign and significance indicates that disclosure intensity increases detectability rather than necessarily reflecting greater misconduct. Firms operating in more transparent regulatory environments also tend to show higher recorded controversy levels, consistent with stronger supervisory capacity.

Reporting frameworks display differentiated effects. In Model (5), GRI-based reporting (*frmw* = 2) is negative and significant (−0.909), and national frameworks (*frmw* = 4) are also negative and significant (−1.056), suggesting that more structured reporting standards are associated with lower controversy incidence.

These results provide partial support for RQ1. SR is positively associated with ESG controversy incidence, whereas IR is not statistically significant. Likewise, neither IR assurance (*ass*) nor SR assurance (*srass*) shows a significant effect. However, the reporting framework – especially GRI – appears to be relevant, suggesting that disclosure standardisation is associated with lower observed controversy incidence.

With respect to legal origin (RQ2), we find no evidence of a systematic association with ESG controversy incidence. The relevant coefficients are not statistically significant, and the corresponding specifications do not meet standard System GMM diagnostic criteria; accordingly, inference on RQ2 should be treated with caution.

Governance indicators also shape controversy outcomes. Rule of law (*rol*) is not significant in Model (8), but voice and accountability (*va*) is positive and significant (0.019, $p = 0.05$), and regulatory quality (*rq*) is positive and significant (0.045, $p = 0.017$), indicating that stronger governance may intensify oversight rather than misconduct itself. By contrast, control of corruption (*cp*) is negative and highly significant (−0.117, $p = 0.001$), suggesting that stronger anti-corruption systems are associated with fewer ESG controversies. These findings support RQ3 by indicating that specific dimensions of governance quality are associated with ESG controversy incidence. In particular, stronger voice and accountability and higher regulatory quality are linked to higher recorded controversy levels, whereas stronger control of corruption is associated with fewer controversies.

Table 4. Model regression analysis of ESG controversies. Each model is identified by an arabic number: (1) Model with *sr*; (2) model with *ir*; (3) model with *srass*; (4) model with *ass*; (5) model with the *frmw*; (6) model with *sub*; (7) model with *leg*; (8) model with *rol*; (9) model with cultural variables; (10) model with world bank variables; (11) model with BRIC countries. Models are estimated using Two-step system GMM with Windmeijer-corrected standard errors. GMM-style instruments are collapsed and restricted to lags 1–2

	ESG controversies				
Variable	(1)	(2)	(3)	(4)	(5)
ESG (lagged)	0.026* (0.047)	0.018 (0.200)	0.005 (0.803)	0.009 (0.332)	0.007 (0.661)
sr	0.891** (0.012)				3.13** (0.001)
srass			0.441 (0.403)		
ir		−0.353 (0.378)			
ass				0.242 (0.448)	
frmw					
2.					−0.909* (0.04)
3.					−0.509 (0.303)
4.					−1.056** (0.001)
ta (lagged)	0.316 (0.224)	0.181 (0.439)	0.302 (0.501)	0.142 (0.462)	0.002 (0.987)
ROA (lagged)	0.099 (0.094)	0.057 (0.558)	−1.254 (0.399)	−0.018 (0.552)	−0.012 (0.822)
Constant	−6.776 (0.121)	−3.46 (0.339)	−4.911 (0.480)	−2.597 (0.419)	0.523 (0.855)
AR(1) *p*-value	0.010**	0.023*	0.048*	0.130	0.186
AR(2) *p*-value	0.310	0.379	0.082	0.820	0.026*
Hansen test *p*-value	0.262	0.026	0.012	0.23	0.229
Number of instruments	8	10	10	10	12
Number of firms	113	118	76	57	57
Number of observations	406	387	226	173	63

(*continued*)

Table 4. Continued

	ESG controversies					
Variable	(6)	(7)	(8)	(9)	(10)	(11)
ESG (lagged)	0.240* (0.07)	0.008 (0.64)	−0.057 (0.251)	0.013 (0.433)	0.021 (0.095)	−0.059 (0.254)
sr	1.542 (0.318)	0.984* (0.03)	−0.626 (0.677)	0.580 (0.242)	0.825* (0.05)	−0.927 (0.583)
sub						
2.	0.560 (0.675)					
3.	0.831 (0.568)					
4.	0.067 (0.963)					
5.	1.196 (0.789)					
leg						
2.		−0.062 (0.887)				
3.		−0.557 (0.276)				
4.		1.876 (0.083)				
5.		−0.945 (0.121)				
rol			−0.444 (0.916)			
pd					0.027 (0.311)	
idv					0.024 (0.287)	
mas					−0.023 (0.271)	
ua					0.001 (0.983)	
lto					0.001 (0.963)	
ind					0.031 (0.114)	
va				0.019* (0.05)		
ps				−0.006 (0.778)		
ge				0.0312 (0.127)		
rq				0.045* (0.017)		
cc				−0.0006 (0.674)		
cp				−0.117** (0.001)		
bric						−24.824 (0.088)
ta (lagged)	−0.389 (0.562)	0.082 (0.851)	2.744* (0.007)	−0.068 (0.382)		0.524 (0.442)
ROA (lagged)	−0.075 (0.495)	0.087 (0.380)	0.147 (0.412)	−0.068 (0.367)		−0.163 (0.442)
Constant	−9 (0.238)	−1.449 (0.843)	0.147 (0.205)	−5.542 (0.474)	−11.971 (0.043)	68.352 (0.164)
AR(1) p-value	0.015*	0.0136*	0.0774	0.020*	0.035*	0.017*
AR(2) p-value	0.107	0.199	0.496	0.324	0.311	0.197
Hansen test p-value	0.095	0.0737	0.000*	0.180	0.350	0.983
Number of instruments	10	12	12	11	14	15
Number of firms	111	111	108	108	110	111
Number of observations	358	358	349	358	354	349

Cultural variables in Model (10) are not statistically significant; therefore, we do not find support for RQ4. Likewise, BRIC status in Model (11) is not significant in the aggregate specification.

Diagnostic tests indicate that the preferred specifications satisfy standard dynamic panel criteria: AR (1) is generally present, as expected, in first differences; AR (2) is not significant in the retained models; and the Hansen test does not reject the null of instrument validity. In addition, the number of instruments (reported as total moment conditions) remains modest relative to the number of firms because the instrument matrix is collapsed, and lag depth is restricted to 1–2. We therefore base interpretation on specifications that combine coefficient stability with acceptable diagnostic performance. Models with weaker or borderline diagnostics are reported for completeness but are not emphasised in the discussion.

5.3 Extended models

To assess whether the baseline pattern extends across pillars, we estimate separate models for environmental and social controversies.

For environmental controversies (Table A2 in Appendix), interpretation is restricted to models that satisfy standard GMM diagnostics. Dynamic persistence is significant only in selected specifications: the lagged dependent variable is positive and significant in Model (3) (0.007, $p = 0.004$) and Model (9) (0.012, $p = 0.01$), although the effect remains economically small.

SR is positively associated with *Econt* in Model (1) (0.284, $p = 0.048$), Model (8) (0.334, $p = 0.05$), and Model (11) (0.332, $p = 0.035$), reinforcing the transparency-based interpretation. IR shows a distinct pattern in this pillar: in Model (2), it is negative and significant (−0.388, $p = 0.017$), suggesting that firms adopting IR may experience fewer reported environmental controversies. GRI-based reporting is also negative and significant in Model (5) (−0.348), again indicating that structured standards may mitigate environmental controversy incidence.

Sectoral heterogeneity is more pronounced for *Econt*. Gas firms report significantly more environmental controversies than electricity firms (0.395 in Model 6). Profitability is positive and significant in Model (9) (0.07, $p = 0.01$), implying that more profitable firms may attract greater environmental scrutiny.

Institutional effects are also stronger in this pillar. Rule of law (*rol*) is positive and significant in Model (8) (1.233, $p = 0.05$), consistent with stronger legal enforcement increasing controversy detection. Cultural factors are relevant as well: uncertainty avoidance (*ua*) is negative (−0.009, $p = 0.035$), while indulgence (ind) is positive (0.016, $p = 0.007$). Legal origin also matters, with Germanic civil-law systems (−0.392) and other legal traditions (−0.196) reporting fewer environmental controversies than common-law countries. BRIC status is negative and significant (−0.289, $p = 0.01$), indicating lower reported environmental controversies in those jurisdictions.

For social controversies (Table A3 in Appendix), the more reliable results are concentrated in Models (6)–(11). *Scont* exhibit stronger dynamic persistence than *ECont*. The lagged dependent variable is positive and significant in Model (1) (0.012, $p = 0.01$), Model (2) (0.010, $p = 0.01$), Model (3) (0.016, $p = 0.05$), and Model (8) (0.012, $p = 0.014$), indicating modest but consistent short-run persistence.

SR remains a robust positive determinant of social controversies. It is significant in Model (1) (0.397, $p = 0.05$), rises substantially in Model (5) (2.416, $p < 0.01$), and remains significant in Models (7), (8), (9) and (11). This pattern again supports the interpretation that more extensive disclosure increases observed controversy incidence through greater visibility and scrutiny. Firm size is also positively associated with social controversies across

several specifications, indicating that larger firms face greater stakeholder exposure. Profitability is significant only in Model (5) (−0.039, $p = 0.049$).

Among the institutional variables, only government effectiveness (*ge*) is positive and weakly significant in Model (9) (0.043, $p = 0.05$), consistent with stronger monitoring capacity. Other governance indicators and BRIC status are not significant in this pillar. Diagnostic tests indicate no second-order serial correlation and generally acceptable instrument validity.

5.4 Robustness analyses

Robustness tests introduce interaction terms (Table A4 in Appendix) between SR and legal context (*sr* × *leg*) and between SR and subsector (*sr* × *sub*). The results indicate that the positive association between SR and ESG controversies varies by context, although some interaction effects are sensitive to specification. In the well-specified models, however, the direction and magnitude of the main effects remain stable.

The interaction between SR and legal system category 2 is positive and significant (2.929, $p = 0.05$), while the interaction with category 3 is stronger and highly significant (4.600, $p = 0.01$). This suggests that the disclosure–controversy relationship is amplified in specific legal systems. Likewise, the interaction between SR and the gas subsector is positive and highly significant (5.075, $p < 0.01$), indicating that disclosure effects are especially pronounced in higher-risk energy segments. By contrast, interactions involving ESG performance with legal origin (esg × leg) and subsector (esg × sub) are not statistically significant.

A regional split is then used to distinguish between (1) EU countries, which share a more harmonised ESG regulatory framework, and (2) the rest of the world, excluding China and the USA to reduce the influence of those two large jurisdictions (Table A5 in Appendix). The subsample results confirm economically meaningful effects of SR in both groups.

In the EU subsample, SR is strongly positive and significant (3.300, $p = 0.001$). In the rest-of-the-world subsample, the coefficient remains positive and significant (1.287, $p = 0.001$), although smaller in magnitude. Within the EU, GRI-based reporting (−1.461, $p = 0.001$) and Framework 4 (−1.713, $p = 0.001$) are associated with fewer ESG controversies. In the rest of the world subsample, legal category 5 is negative and significant (−2.354, $p = 0.05$).

6. Discussion

The findings suggest that, in the energy sector, ESG controversies should not be read solely as signs of weak corporate responsibility. Rather, they reflect the interaction between disclosure-driven visibility and institutional oversight. Greater institutional monitoring intensifies scrutiny, while stronger institutional quality shapes whether such scrutiny translates into formal controversy classification.

Our results show that energy firms with stronger ESG positioning and broader disclosure tend to exhibit higher levels of observed controversy, consistent with a visibility and detection mechanism. ESG scores and SR appear to increase stakeholder attention and public visibility, making controversies more likely to be identified and reported. At the same time, SR aligned with the GRI framework is associated with fewer recorded controversies, suggesting that more structured reporting may improve transparency while reducing exposure. Governance quality is also associated with controversy incidence, whereas the role of the national legal system is weaker and less robust across specifications.

These findings extend the institutional perspective in the energy literature. While Wang *et al.* (2025) show that institutional quality shapes environmental performance through energy and innovation channels, our results indicate that institutional conditions also

influence the informational environment through which corporate conduct becomes visible and sanctionable. Prior research has linked information asymmetry to tax planning, governance and cost of capital (Chen and Lin, 2017; Cai *et al.*, 2015; Khatali, 2020) and has examined the determinants of ESG performance (Kim and Park, 2022; Bilyay-Erdogan *et al.*, 2024), but evidence on how stakeholder information gaps affect observed ESG controversy incidence in energy firms remains limited. In this respect, our findings suggest that disclosure can increase scrutiny while also providing a form of reputational insurance when controversies arise (Amel-Zadeh and Serafeim, 2018; Zhang *et al.*, 2025).

The results are broadly consistent with studies showing that controversies can stimulate subsequent disclosure (Heflin and Wallace, 2017; Hummel *et al.*, 2019) and influence investor behaviour and sustainable investment allocation (Xue *et al.*, 2023). Our contribution is to identify the complementary mechanism: disclosure itself is associated with a higher probability of observed controversy, consistent with greater informational salience rather than necessarily poorer underlying performance. This interpretation aligns with evidence that ESG reporting reduces information asymmetry (Dhaliwal *et al.*, 2012; Schiemann and Sakhel, 2019), although we do not find comparable support for IR. The negative association between GRI-based reporting and controversy incidence is also consistent with Mallidis *et al.* (2024). At the institutional level, our findings align with cross-country evidence reported by Erragragui *et al.* (2023) and Passas *et al.* (2022).

At the same time, the results differ from studies suggesting that greater ESG information mitigates controversy severity (Schiemann and Tietmeyer, 2022; Kölbel *et al.*, 2017). This divergence indicates that, in the energy sector, disclosure may function less as a shield and more as a mechanism of detectability. Likewise, we do not find support for the expected effect of IR suggested by Bernardi and Stark (2018), implying that IR effects may be context specific. By contrast, the finding that GRI-aligned reporting is associated with fewer controversies differs from Altendorfer *et al.* (2025) but may reflect the accountability benefits of more standardised reporting in a high-scrutiny sector such as energy.

The absence of significant cultural effects should be interpreted cautiously. The limited adoption of IR and external assurance may reduce statistical power, despite their relevance in prior research (e.g. DasGupta, 2022). In addition, the lack of more granular assurance data may attenuate observable effects.

Overall, the findings are broadly consistent with Chen and Xie (2022) and Hyusein and Cek (2024) in showing that ESG effects vary across dimensions. Although those studies focus on financial performance rather than controversies, together they suggest that, in the energy sector, ESG outcomes are shaped by sector-specific dynamics linked to visibility, institutional quality and stakeholder pressure.

7. Implications

7.1 Theoretical implications

This study advances legitimacy theory by showing that disclosure quantity and disclosure quality should not be treated as equivalent. While broader ESG disclosure may increase public visibility, disclosure aligned with standardised frameworks – particularly the GRI – is associated with lower controversy risk, suggesting that legitimacy depends less on disclosure expansion alone than on comparability, structure and credibility.

The findings also extend institutional theory by showing that governance quality conditions how ESG controversies are detected and publicly recorded. In stronger regulatory environments, transparency is more likely to reinforce accountability, whereas in weaker governance settings symbolic compliance may persist with limited sanctions.

More broadly, the study contributes to the ESG literature by conceptualising controversy risk as a joint product of corporate conduct, disclosure attributes and country-level governance structures rather than as a simple outcome of weak ESG performance alone.

Methodologically, by combining firm-level disclosure characteristics with cross-country institutional variables in a dynamic GMM framework, the analysis offers a more integrated explanation of controversy incidence in carbon-intensive industries than that offered by prior single-country or static studies.

7.2 Managerial implications

For managers in carbon-intensive industries, ESG disclosure should be treated as a governance instrument rather than merely a compliance exercise. Expanding disclosure volume without improving its quality may heighten controversy exposure by increasing visibility without strengthening credibility. Firms should therefore prioritise structured, comparable and verifiable ESG reporting, particularly through recognised frameworks such as the GRI, supported by robust materiality assessment, traceable indicators, reliable internal controls and credible external assurance.

Disclosure strategy should also reflect institutional context: in jurisdictions with stronger regulatory quality and greater transparency, firms should expect more intensive scrutiny and ensure that reporting is matched by substantive performance improvements and effective remediation capacity.

For multinational energy firms, this requires maintaining global reporting coherence while remaining responsive to differences in local governance and enforcement conditions. More generally, managers should recognise that controversy exposure is partly driven by visibility, so effective ESG management depends on aligning transparency with operational substance and institutional conditions.

7.3 Policy implications

The results indicate that ESG controversies are embedded in institutional and regulatory environments rather than being determined solely at the firm level. Regulatory quality, voice and accountability, and corruption control shape whether ESG-related misconduct is detected and publicly reported, which implies that disclosure regulation is effective only when supported by credible monitoring and enforcement.

The negative association between standardised reporting and controversy risk supports ongoing efforts to harmonise SR and improve cross-country comparability, but harmonisation alone is not sufficient. Disclosure requirements must be accompanied by stable regulation, effective surveillance and consistent enforcement if disclosed information is to constrain corporate conduct.

In the energy sector, where environmental exposure and decarbonisation pressures are especially high, this makes sustained policy attention particularly important. In stronger-governance contexts, policy should focus on enhancing the consistency, comparability and credibility of ESG disclosure through stronger standards, more credible assurance and closer supervisory coordination. In weaker-governance contexts, the priority is to reinforce the institutional foundations that make disclosure effective, particularly enforcement capacity, corruption control and minimum verification mechanisms.

8. Conclusions

The study shows that, in the global energy sector, greater ESG disclosure intensity – particularly through SR – is associated with higher observed ESG controversy incidence. Rather than indicating that disclosure worsens corporate conduct, this pattern is more

consistent with a transparency–detection effect: expanded reporting increases stakeholder scrutiny and, consequently, the likelihood that ESG-related incidents are identified and publicly recorded.

The findings also indicate that disclosure quality matters. Reporting based on structured and widely recognised frameworks, especially the GRI, is linked to lower controversy incidence, suggesting that standardised disclosure may strengthen credibility, improve comparability, and limit opportunistic or ambiguous reporting practices. In addition, institutional quality shapes these outcomes. Governance dimensions associated with supervisory effectiveness, such as voice and accountability and regulatory quality, are linked to higher reported controversy levels, while stronger corruption control is associated with fewer controversies, consistent with lower opportunism and stronger compliance incentives.

Further analysis shows that these relationships vary across ESG pillars, particularly in the environmental and social dimensions, indicating that controversy patterns are not uniform and should be interpreted in light of the specific type of incident examined. Overall, the study contributes to the ESG literature by reframing controversies not simply as indicators of poor ESG performance, but as outcomes influenced by both corporate conduct and the institutional conditions that govern detection and reporting.

From a practical perspective, the results suggest that firms should not regard greater disclosure as an automatic safeguard against reputational risk. Instead, they should emphasise high-quality, standardised reporting supported by genuine improvements in sustainability performance. For policymakers, the evidence implies that disclosure requirements are most effective when combined with credible enforcement and strong governance institutions.

Some limitations should be noted. Controversy indicators capture only events that are detected and recorded and may therefore understate incidents in less transparent settings. Although the System GMM approach addresses important endogeneity concerns, some pillar-specific models show weaker diagnostics and should be interpreted with caution. In addition, the study does not capture assurance quality in sufficient detail, which may affect the estimated role of assurance mechanisms.

Future research could build on this framework by incorporating more refined measures of assurance quality and stakeholder attention, extending the analysis to other carbon-intensive sectors, and combining quantitative evidence with qualitative analysis to distinguish more clearly between the occurrence of misconduct and the intensity of external detection.

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Appendix

Table A1. Pearson correlation index of the variables

Variable	Divers	board	Pd	Idv	mas	ua	lto	ind	Rol	env	soc	gov	esg
Divers	1												
Board	0.0173	1											
Pd	−0.089*	−0.0556	1										
Idv	0.0752	0.0881*	−0.6676**	1									
Mas	0.0413	0.0147	−0.109**	−0.0482	1								
Ua	−0.0161	0.1151**	0.2191**	0.1211**	−0.0431	1							
Lto	0.0435	−0.0419	−0.0305	0.303**	0.4356**	−0.0412	1						
Ind	0.064	−0.0097	−0.8031**	0.4374**	0.0442	−0.2664**	−0.1614**	1					
Rol	0.0825	0.0104	−0.8393**	0.8258**	0.0517	0.0908*	0.2775**	0.5644**	1				
Env	0.0537	0.2239**	−0.0304	0.1186**	−0.1068*	0.2309**	0.0437	−0.0659	0.081	1			
Soc	0.0065	0.2637**	−0.0534	0.0271	−0.1729**	0.1454**	−0.2302**	0.0182	−0.0213	0.6435**	1		
Gov	0.097*	−0.1079*	−0.2619**	0.273**	−0.0464	−0.0842	−0.0692	0.2202**	0.219**	0.2695**	0.3194**	1	
Esg	0.0641	0.1929**	−0.1268**	0.1664**	−0.147**	0.1505**	−0.1035*	0.051	0.1031*	0.853**	0.8572**	0.6117**	1
Ps	0.08	0.0161	−0.6138**	0.7285**	0.1767**	0.3055**	0.4153**	0.3137**	0.8502**	0.1329**	−0.0096	0.1331**	0.1067**
Rq	0.0672	0.0236	−0.852**	0.7627**	0.1306**	−0.0265	0.2588**	0.6484**	0.9342**	0.0043	−0.0403	0.1748**	0.0422
Cc	0.0335	−0.0273	−0.3215**	0.3171**	0.0142	−0.0635	0.112**	0.2439**	0.3733**	0.0003	−0.0074	0.0493	0.0118
ESGcont	0.022	0.0905*	−0.1082**	0.1956**	−0.2297**	−0.03	−0.0556	0.14**	0.1166**	0.2024**	0.2344**	0.1632**	0.2569**
Cp	0.076	0.002	−0.8316**	0.8107**	0.0954*	−0.0542	0.3086**	0.5801**	0.9514**	0.0027	−0.1133**	0.2014**	0.0184
Va	0.0904*	0.0596	−0.7041**	0.7004**	0.105**	−0.0157	0.2674**	0.4914**	0.773**	0.1223**	0.1045**	0.1996**	0.1767**
Ge	0.0731	−0.0192	−0.7017**	0.7426**	0.1098**	−0.1386**	0.5053**	0.4671**	0.8486**	0.0033	−0.196**	0.1371**	−0.0394
Logta	0.0242	0.0941*	−0.0281	−0.0876*	−0.117**	−0.1302**	−0.1738**	0.041	−0.0966*	0.2262**	0.2114**	0.1852**	0.2664**
Logrev	0.0252	0.0372	0.032	−0.0559	−0.0927	−0.0141	−0.1105**	−0.0385	−0.0887*	0.2199**	0.1951**	0.1987**	0.2658**
Logempl	−0.0257	0.2182**	0.4005**	−0.1242**	0.0143	0.0912*	0.1018**	−0.3016**	−0.3044**	0.253**	0.1387**	−0.0431	0.1572**
ROA	0.0068	0.0862*	0.0344	0.074	0.0712	0.1875**	0.097**	−0.0864**	0.0391	0.2098**	0.161**	0.02	0.1727**

Note(s): * $p < 0.05$; ** $p < 0.01$ (Two-tailed test)

(*continued*)

Table A1. Continued

Variable	ps	rq	cc	ESGcont	cp	va	ge	logta	logrev	logempl	ROA
Divers											
Board											
Pd											
Idv											
Mas											
Ua											
Lto											
Ind											
Rol											
Env											
Soc											
Gov											
Esg											
Ps	1										
Rq	0.7837**	1									
Cc	0.3321**	0.3686**	1								
ESGcont	0.0389	0.1225**	0.0424	1							
Cp	0.8044**	0.939**	0.3679**	0.111**	1						
Va	0.6782**	0.7004**	0.3425**	0.0926*	0.728**	1					
Ge	0.7832**	0.8713**	0.3803**	0*	0.901**	0.625**	1				
Logta	−0.1737**	−0.116**	−0.0918*	0.2219**	−0.1222**	−0.0839*	−0.1532**	1			
Logrev	−0.097*	−0.1139**	−0.0743	0.2339**	−0.1166**	−0.079*	−0.1659**	0.8535**	1		
Logempl	−0.2348**	−0.3104**	−0.1061**	0.3037**	−0.289**	−0.2759**	−0.2143**	0.1215**	0.1197**	1	
ROA	0.1**	0.0231	−0.0048	0.0233	0.0251	0.0325	0.0078	0.0211	0.0009	−0.0033	1

Table A2. Model regression analysis of environmental controversies. Each model is identified by an arabic number: (1) Model with *sr*; (2) model with *ir*; (3) model with *srass*; (4) model with *ass*; (5) model with the *frmw*; (6) model with *sub*; (7) model with *leg*; (8) model with *rol*; (9) model with cultural variables; (10) model with world bank variables; (11) model with BRIC countries

	Environmental controversies				
Variable	(1)	(2)	(3)	(4)	(5)
Env (lagged)	0.004 (0.278)	0.004 (0.333)	0.007** (0.004)	0.001 (0.817)	0.004 (0.691)
sr	0.284* (0.048)				0.309 (0.521)
srass			−0.156 (0.492)		
ir		−0.388* (0.017)			
ass				0.104 (0.254)	
frmw					
2.					−0.348** (0.01)
3.					0.007 (0.986)
4.					−0.424 (0.095)
ta (lagged)	−0.003 (0.963)	0.044 (0.594)	0.025 (0.833)	0.108 (0.177)	0.259** (0.004)
ROA (lagged)	0.041 (0.364)	0.0439 (0.370)	−1.284** (0.006)	−0.001 (0.787)	−0.003 (0.887)
Constant	−0.193 (0.887)	−0.647 (0.633)	−0.407 (0.830)	−1.844 (0.170)	−3.812* (0.050)
AR(1) *p*-value	0.125	0.127	0.688	0.222	0.120
AR(2) *p*-value	0.116	0.093	0.085	0.304	0.273
Hansen-test *p*-value	0.007**	0.024*	0.030*	0.075	0.737
Number of instruments	32	32	32	32	35
Number of firms	111	118	76	57	57
Number of observations	358	387	226	173	163

	Environmental controversies					
Variable	(6)	(7)	(8)	(9)	(10)	(11)
Env (lagged)	0.004 (0.077)	0.004 (0.469)	0.002 (0.658)	0.012** (0.01)	0.009 (0.259)	0.003 (0.547)
Sr	0.131 (0.351)	0.189 (0.232)	0.334* (0.05)	0.05 (0.730)	−0.009 (0.978)	0.332* (0.035)
sub						
2.	0.395* (0.04)					
3.	0.457 (0.116)					
4.	0.175 (0.145)					

(*continued*)

Table A2. Continued

Variable	Environmental controversies (6)	(7)	(8)	(9)	(10)	(11)
5.	−0.062 (0.743)					
leg						
2.		−0.392* (0.014)				
3.		−0.374 (0.339)				
4.		−0.126 (0.758)				
5.		−0.196* (0.501)				
rol			1.233* (0.05)			
Pd				0.004 (0.549)		
Idv				0.006 (0.398)		
Mas				−0.008 (0.255)		
Ua				−0.009* (0.035)		
Lto				0.002 (0.644)		
Ind				0.016** (0.007)		
Va					0.002 (0.912)	
Ps					−0.034 (0.147)	
Ge					0.010 (0.517)	
Rq					0.011 (0.804)	
Cc					−0.0003 (0.934)	
Cp					0.033 (0.625)	
Bric						−0.289** (0.01)
ta (lagged)	0.043 (0.597)	0.027 (0.742)	0.031 (0.763)	0.103 (0.176)	0.053 (0.697)	0.008 (0.928)
ROA (lagged)	0.040 (0.323)	0.048 (0.159)	0.041 (0.342)	0.07** (0.01)	0.033 (0.356)	0.039 (0.387)
Constant	−1.059 (0.462)	−0.467 (0.735)	−1.540 (0.406)	−2.78 (0.143)	−3.065 (0.348)	−0.282 (0.839)
AR(1) *p*-value	0.120	0.112	0.126	0.070	0.124	0.128
AR(2) *p*-value	0.105	0.092	0.117	0.030*	0.135	0.116
Hansen test *p*-value	0.013*	0.005**	0.013*	0.920	0.015*	0.013*
Number of instruments	36	36	33	33	14	32
Number of firms	111	111	108	110	111	111
Number of observations	358	358	349	354	358	358

Note(s): * $p < 0.05$; ** $p < 0.01$ (Two-tailed test)

Table A3. Model regression analysis of social controversies. Each model is identified by an arabic number: (1) Model with *sr*; (2) model with *ir*; (3) model with *srass*; (4) model with *ass*; (5) model with the *frmw*; (6) model with *Sub*; (7) model with *leg*; (8) model with *rol*; (9) model with cultural variables; (10) model with world bank variables; (11) model with BRIC countries

	Social controversies				
Variable	(1)	(2)	(3)	(4)	(5)
soc (lagged)	0.012** (0.01)	0.010** (0.01)	0.016* (0.05)	0.009 (0.116)	0.003 (0.738)
sr	0.397* (0.05)				2.416** (0.00)
srass			0.187 (0.516)		
aud					
ir		−0.235 (0.272)			
ass				−0.199 (0.475)	
frmw					
2.					−0.139 (0.687)
3.					−0.186 (0.713)
4.					−0.401 (0.142)
ta (lagged)	0.188* (0.03)	0.165 (0.111)	0.355 (0.112)	0.137 (0.257)	−0.077 (0.619)
ROA (lagged)	−0.005 (0.468)	−0.004 (0.724)	0.582 (0.351)	−0.0337 (0.250)	−0.039* (0.049)
Constant	−3.815** (0.01)	−2.996 (0.085)	−6.96 (0.079)	−2.462 (0.198)	1.540 (0.469)
AR(1) *p*-value	0.001**	0.002**	0.005**	0.073*	0.264
AR(2) *p*-value	0.379	0.488	0.262	0.808	0.263
Hansen test *p*-value	0.023*	0.030*	0.019*	0.024*	0.263
Number of instruments	32	32	32	32	35
Number of firms	111	111	76	57	57
Number of observations	358	358	226	173	163

	Social controversies					
Variable	(6)	(7)	(8)	(9)	(10)	(11)
soc (lagged)	0.010* (0.04)	0.010* (0.02)	0.012* (0.014)	0.019 (0.072)	0.017 (0.165)	0.012** (0.01)
sr	0.235 (0.396)	0.399* (0.037)	0.404* (0.05)	0.937** (0.006)	0.366 (0.47)	0.386* (0.05)
sub						
2.	0.417* (0.05)					
3.	0.534 (0.119)					
4.	0.428 (0.08)					

(*continued*)

Table A3. Continued

Variable	Social controversies (6)	(7)	(8)	(9)	(10)	(11)
leg						
2.		−0.028 (0.881)				
3.		−0.273 (0.150)				
4.		0.009 (0.988)				
5.		−0.127 (0.682)				
rol			0.007 (0.994)			
pd				0.0139 (0.511)		
idv				0.107 (0.463)		
mas				−0.005 (0.605)		
ua				0.0104 (0.203)		
lto				−0.006 (0.457)		
ind				0.003 (0.803)		
va					0.028 (0.180)	
ps					−0.036 (0.300)	
ge					0.043* (0.05)	
rq					0.021 (0.760)	
cc					−0.001 (0.475)	
cp					−0.064 (0.585)	
bric						0.108 (0.702)
ta (lagged)	0.203* (0.049)	0.217* (0.038)	0.192* (0.050)	0.257* (0.04)	0.175 (0.313)	0.174* (0.047)
ROA (lagged)	−0.008 (0.660)	−0.005 (0.412)	−0.006 (0.440)	0.202 (0.619)	0.016 (0.699)	−0.007 (0.397)
Constant	−4.208* (0.022)	−4.231 (0.018)	−3.89* (0.05)	−6.606 (0.096)	−3.589 (0.518)	−3.604* (0.018)
AR(1) *p*-value	0.001**	0.001**	0.0015**	0.001**	0.002**	0.001**
AR(2) *p*-value	0.374	0.382	0.377	0.404	0.354	0.377
Hansen test *p*-value	0.031*	0.031*	0.034*	0.106	0.020*	0.023*
Number of instruments	36	36	36	33	14	32
Number of firms	111	111	108	110	111	111
Number of observations	358	358	349	354	358	358

Table A4. Significant model regression analysis with interaction terms (1) model with *sr x leg*; (2) model with *sr x sub*; (3) model with *esg x leg*; (4) model with *esg x sub*

	ESG controversies			
	(1)	(2)	(3)	(4)
Variable	*sr x leg*	*sr x sub*	*esg x leg*	*esg x sub*
ESG lagged	−0.41 (0.170)	0.015 (0.696)		
ESGleg x lagged			0.001 (0.836)	
ESGsub x lagged				0.002 (0.491)
sr x sub				
1.		0.639 (0.810)		
2.		5.075** (0.00)		
3.		1.683 (0.464)		
sr x leg				
2.	2.929* (0.05)			
3.	4.6** (0.01)			
4.	3.241 (0.076)			
frmw				
2	−0.547 (0.406)	−0.502 (0.541)	−0.751 (0.220)	−0.472 (0.394)
3			−0.629 (0.312)	−0.635 (0.257)
4	−1.280 (0.076)	−0.528 (0.547)	−0.873 (0.097)	−0.672 (0.247)
va	0.019 (0.467)	0.019 (0.317)	0.014 (0.635)	−0.0047 (0.769)
rq	0.029 (0.451)	0.009 (0.792)	−0.038 (0.537)	0.008 (0.771)
cp	−0.078 (0.384)	−0.049 (0.455)	−0.018 (0.848)	0.0024 (0.951)
ta (lagged)	0.360 (0.280)	−0.187 (0.731)	0.575 (0.113)	0.369 (0.227)
ROA (lagged)	−0.011 (0.807)	−0.022 (0.655)	−0.028 (0.577)	−0.065 (0.293)
Constant	−1.574 (0.782)	3.638 (0.623)	−8.244 (0.195)	−5.936 (0.249)
AR(1) *p*-value	0.299	0.343	0.433	0.359
AR(2) *p*-value	0.267	0.244	0.322	0.2158
Hansen test *p*-value	0.737	0.737	0.1848	0.087
Number of instruments	39	39	34	19
Number of firms	22	22	30	30
Number of observations	163	163	177	177

Table A5. Model regression with the subsamples of the European Union and the rest of the world (except China and the USA). (1) model with the subsample of the European Union; (2) model with the subsample of the rest of the world (except China and the USA)

	ESG controversies	
Variable	EU	Rest of the world
ESG lagged	−0.05 (0.783)	−0.021 (0.428)
sr	3.30** (0.001)	1.287 (0.001)
frmw		
2.	−1.461** (0.001)	
3.	−3.063 (0.368)	
4.	−1.713** (0.001)	
leg		
2.		0.221 (0.669)
3.		−5.773 (0.608)
4.		−1.101 (0.087)
5.		−2.354* (0.05)
ta (lagged)	−0.097 (0564)	0.467 (0.451)
ROA (lagged)	0.132* (0.01)	−0.117 (0.277)
Constant	3.134 (0.102)	−6.11 (0.536)
AR(1) *p*-value	0.953	0.274
AR(2) *p*-value	0.284	0.399
Hasen test *p*-value	0.023*	0.305
Number of instruments	13	12
Number of firms	13	47
Number of observations	138	147

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