From disclosure to decarbonization: the role of international governance in value-chain emissions[1][2]

Received 9th December 2025
Revised 18th May 2026
Accepted 19th May 2026

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Abstract

Frame of the research: *As corporate climate accountability expands beyond organizational boundaries, companies are increasingly expected to disclose and manage Scope 3 emissions across complex global value chains. However, transparency and decarbonization follow different organizational logics: disclosure aligns with reporting norms and legitimacy needs, while emissions performance depends on coordinating with suppliers, customers, and internal units. In this context, international governance offers a valuable perspective for understanding how boards, management teams, and ownership structures influence firms' engagement with value-chain emissions.*

Purpose of the paper: *This paper examines how international governance structures are associated with firms' transparency and decarbonization outcomes in global value chains. Specifically, we analyse whether board foreignness, managerial cultural diversity, and firms' international ownership configurations influence Scope 3 emissions disclosure and emissions performance.*

Methodology: *We analyse an original dataset of 112 Italian listed companies (2012-2024) that combines data from Eikon ESG, Datastream financial information and the AIDA database. Using a linear probability model with high-dimensional fixed effects, we model Scope 3 disclosure and emissions intensity as functions of governance composition, ownership configurations, and international exposure, controlling for size, profitability, and management governance indicators.*

Findings: *The results document systematic differences in how governance characteristics are related to disclosure versus emissions performance outcomes, a*

[2] *Attribution of Individual Paragraphs*
The manuscript is the result of a joint effort by the authors. For academic purposes, the contribution of each author can be specified as follows: Marino, Alba: Sections 2, 3, 4. Cinici, Maria Cristina: Sections 1, 2, 5. Baglieri, Daniela: Sections 1, 5.

Acknowledgements
This study was part of the project "TRansition IndicatorS for Circular Economy in gLobal Ecosystems - TRISCELE" (CUP D13C22002160001). This research was funded by the European Union -NextGenerationEU, Mission 4, Component 2, within the framework of the GRINS - Growing Resilient, INclusive and Sustainable (PE00000018 - CUP J43C24000270002). The views and opinions expressed are solely those of the authors and do not necessarily reflect those of the European Union, nor can the European Union be held responsible for them.

Conflict of Interest Statement
The authors declare no conflict of interest.

pattern suggestive of a disclosure-performance gap. Firms with more internationally composed boards are significantly more likely to disclose Scope 3 emissions across value chain segments, in line with greater responsiveness to global transparency norms and stakeholder expectations. However, these governance characteristics are less consistently associated with improvements in emissions performance. In contrast, managerial cultural diversity shows weak or negative associations with both disclosure and emissions performance, which is indicative of coordination challenges that may arise in managing complex value chain emissions.

Research limits: *This study focuses on Italian listed firms operating within a specific regulatory and institutional context and relies on disclosure-based and emissions intensity measures from secondary databases. While appropriate for identifying patterns in Scope 3 transparency and performance, this design does not directly observe firms' internal decarbonization practices, supplier engagement processes, or the organizational and socio-cognitive capabilities through which governance structures may influence value chain emissions management.*

Practical implications: *The findings highlight the need for governance architectures that combine international board expertise with effective reporting infrastructures, internal coordination mechanisms, and supplier engagement capabilities to improve transparency regarding value chain emissions and to reduce the gap between sustainability "talk" and operational "walk".*

Originality of the paper: *This study contributes to sustainable corporate governance research by documenting differential associations between international governance characteristics and sustainability transparency versus operational decarbonization. By analytically separating Scope 3 disclosure from emissions performance, this paper provides evidence consistent with the view that international governance is associated with firms' engagement with value chain decarbonization.*

Keywords: *international governance; sustainable corporate governance; Scope 3 emissions; multinational enterprises; value chain decarbonization; sustainability.*

1. Introduction

Global efforts to mitigate climate change are placing increasing pressure on firms to account for and reduce their environmental impacts. As governments, investors, and stakeholders demand greater transparency and accountability, sustainability considerations have become central to corporate strategy and governance, particularly for multinational enterprises operating across complex global value chains (Kolk and Pinkse, 2008; Pastore and Ugolini, 2020). Recent regulatory initiatives-such as the EU Corporate Sustainability Reporting Directive (CSRD)-require companies to disclose detailed and decision-useful information on sustainability risks, environmental impacts, and value chain due diligence (Christensen *et al.*, 2021; Albitar *et al.*, 2023). These regulations substantially expand the scope of corporate accountability, stimulating firms to demonstrate credible and comparable environmental performance across networks of suppliers, partners, and customers (Aguilera *et al.*, 2018; Goergen, 2022).

This shift is particularly consequential for Scope 3 emissions, which arise from upstream and downstream activities in firms' value chains and often represent the largest share of corporate carbon footprints-frequently exceeding 80 percent of total emissions in sectors such as automotive, electronics, and food (Cherel-Bonnemaison *et al.*, 2021). Managing these emissions requires coordination across diverse actors, organizations, and jurisdictions, making governance mechanisms increasingly important for overseeing environmental strategies and for supporting firm-level decarbonization pathways (Baglieri, 2024; Hettler and Graf-Vlachy, 2024). In this context, recent research on sustainable corporate governance (SCG) highlights the role of boards, executives, and shareholders in shaping firms' responses to sustainability pressures by influencing strategic priorities, monitoring environmental performance, and aligning organizational decisions with long-term ESG objectives (Walls *et al.*, 2012; Collevecchio *et al.*, 2025).

Despite growing interest in this subject, we still lack a clear understanding of how governance composition affects two key outcomes of value chain decarbonization, namely, Scope 3 disclosure and Scope 3 emissions performance. Distinguishing between these outcomes is theoretically important. Scope 3 disclosure primarily reflects transparency and legitimacy concerns, as firms respond to reporting standards, stakeholder expectations, and reputational pressures (Christensen *et al.*, 2021; Albitar *et al.*, 2023). Therefore, firms may disclose value chain emissions to signal accountability even when internal systems for measuring and managing such emissions remain incomplete (Haque and Ntim, 2018). In contrast, Scope 3 emissions performance reflects firms' ability to implement decarbonization initiatives across complex interorganizational relationships that often extend beyond their direct control (Hettler and Graf-Vlachy, 2024). These processes differ substantially in their organizational requirements, time horizons, and operational complexity. As a result, disclosure and performance frequently diverge, generating a persistent "talk-walk" gap in environmental governance (Bromley and Powell, 2012; Crilly *et al.*, 2012).

Against this backdrop, international governance-defined here as the international composition of corporate leadership at both the board and top management levels-has become increasingly relevant for sustainability outcomes (Aguilera *et al.*, 2019; Strange *et al.*, 2009). At the board level, the presence of foreign directors exposes firms to global ESG standards, transnational regulatory expectations, and international investor pressures, potentially increasing the incentives to disclose environmental information (Oxelheim *et al.*, 2013; Frijns *et al.*, 2016; Naciti, 2019). At the executive level, cultural diversity within top management-defined here as heterogeneity in managers' national backgrounds-may broaden managerial perspectives and enhance the interpretation of complex sustainability challenges (Strange, 2023). However, such diversity can also generate coordination frictions, divergent priorities, and integration costs when firms operate across heterogeneous institutional environments (Hambrick *et al.*, 1996; Hutzschenreuter *et al.*, 2016).

These dynamics reflect the broader challenges that multinational firms face in navigating institutional multiplicity, where differing regulatory

expectations, stakeholder norms, and governance practices complicate the implementation of coherent environmental strategies (Kostova and Zaheer, 1999; Benito and Meyer, 2024). To capture these organizational constraints, we complement leadership characteristics with firms' international ownership configurations, as corporate group position shapes both the locus of environmental accountability and the degree of organizational autonomy available to implement value chain decarbonization initiatives. In multinational networks, the responsibility for environmental reporting and emissions management may be distributed across different organizational units, potentially affecting both transparency practices and the implementation of decarbonization strategies.

Although different streams of research address parts of this puzzle, they remain insufficiently integrated. Studies on sustainable corporate governance emphasize the role of governance oversight in shaping environmental engagement but rarely distinguish between how governance structures affect disclosure and how governance structures affect emissions performance (Ferrero-Ferrero *et al.*, 2023). Research on international governance examines the strategic implications of heterogeneous boards and top management teams but seldom connects these insights to environmental outcomes or value chain decarbonization. Meanwhile, the literature on sustainability and global value chains highlights the interdependencies between upstream and downstream actors in decarbonization processes (De Marchi, 2012; De Marchi and Gereffi, 2023), but it pays limited attention to the governance architectures through which firms coordinate these interdependencies. As a result, we still lack a coherent explanation of how international governance structures influence firms' Scope 3 disclosure and emissions performance-and why their effects may differ.

To address this gap, this study explores the following research question: How do international governance characteristics and ownership configurations influence firms' engagement with Scope 3 value chain decarbonization in terms of disclosure practices and emissions performance?

We address this question using an original panel dataset of 112 Italian listed companies observed between 2012 and 2024, combining Scope 3 disclosure and emissions data from LSEG Refinitiv Workspace with financial information from Datastream and governance attributes from the AIDA database.

This study makes both theoretical and practical contributions. From a theoretical perspective, it contributes to SCG research by documenting systematic differences in how international governance characteristics are associated with sustainability transparency versus operational decarbonization outcomes. In particular, this study provides novel empirical evidence on asymmetrical associations between international governance characteristics and Scope 3 disclosure and performance, offering patterns that are consistent with the emerging literature on value chain emissions. By doing so, this study highlights the organizational limits of governance-driven decarbonization and emphasizes the role of reporting infrastructures, coordination mechanisms, and organizational capabilities

in translating transparency into effective emissions reductions across global value chains. From a practical perspective, the findings offer insights for boards and policy-makers by identifying governance configurations that are empirically associated with greater transparency regarding value chain emissions while also indicating the organizational investments that appear necessary for effective Scope 3 management.

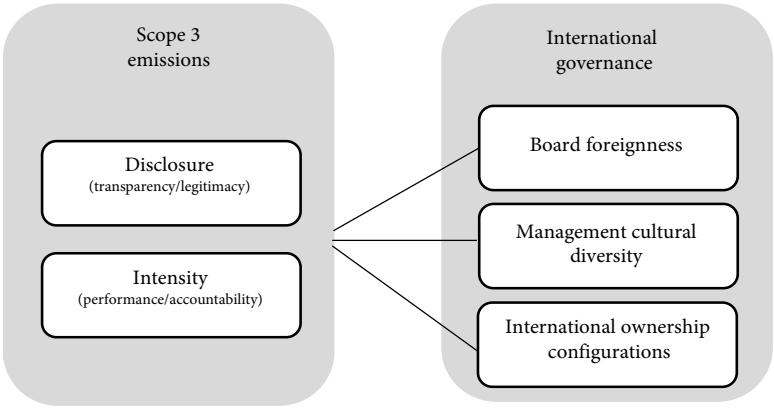
2. Theoretical framework

Focusing on Scope 3 emissions transforms climate strategy into a multifaceted organizational challenge involving both information governance and interorganizational coordination. Because these emissions originate with upstream suppliers and downstream product-use and end-of-life stages, firms disclose emissions that they do not directly observe and attempt to reduce emissions that they do not fully control (GHG Protocol, 2011; De Marchi and Gereffi, 2023). Producing credible information requires designing standardized measurement routines, integrating heterogeneous data sources, and maintaining continuous engagement with internal departments and value chain partners (Christensen *et al.*, 2021; Albitar *et al.*, 2023). In contrast, reducing Scope 3 emissions demands the alignment of purchasing, logistics, design, and user practices, activities that are characterized by asymmetric information, divergent incentives, and fragmented capabilities (Van Assche and Narula, 2023; Asmussen *et al.*, 2023).

A substantial body of research has shown that corporate governance strongly affects environmental disclosure, including climate-related reporting. Board structure, independence, and oversight quality increase participation in voluntary disclosure initiatives and enhance carbon transparency (Ben-Amar and McIlkenny, 2015; Ben-Amar *et al.*, 2017; Liao *et al.*, 2015; Post *et al.*, 2011; Bui *et al.*, 2020; Moussa *et al.*, 2019). At the same time, governance-driven disclosure may not immediately translate into improved emissions outcomes: regulatory shocks and stakeholder scrutiny often elicit symbolic compliance or incremental reporting, with limited effects on underlying carbon performance (Haque and Deegan, 2010; Haque *et al.*, 2016; Haque and Ntim, 2018). This distinction underscores the need to differentiate between Scope 3 disclosure, which is largely shaped by transparency and legitimacy pressures (Lyon and Maxwell, 2011; Cho *et al.*, 2015), and actual emissions reductions, which require deeper organizational and relational capabilities across value chains (Busch and Hoffmann, 2011). Understanding how firms respond to these distinct challenges requires an examination of the governance structures through which environmental strategies are interpreted and implemented. The conceptual framework guiding our analysis is presented in Figure 1, which illustrates how international governance characteristics and ownership structure may be associated with how firms perceive and respond to global sustainability pressures. The following subsections examine three governance-related dimensions that may influence firms' engagement with Scope 3 emissions: board foreignness, managers' cultural diversity within

top management teams, and firms' ownership configurations within multinational structures.

Fig. 1: International governance, ownership structure and value-chain decarbonization. A conceptual framework



Source: Authors' own elaboration.

2.1 International governance and value chain decarbonization

2.1.1 The role of board foreignness

While prior research shows that corporate governance influences firms' environmental disclosures and climate strategies (Liao *et al.*, 2015), companies increasingly operate within globally interconnected institutional environments (Aguilera *et al.*, 2019). In these settings, corporate boards play a central role in interpreting sustainability pressures originating from diverse international stakeholders and regulatory regimes. As a result, boards are increasingly exposed to transnational norms, regulatory expectations, and stakeholder demands that shape how sustainability challenges are understood and addressed (Strange *et al.*, 2009). Within this stream of research, international business scholarship emphasizes that the international composition of boards can influence how firms respond to such global institutional pressures (Aguilera *et al.*, 2019).

In particular, board foreignness represents an important dimension of international governance. The presence of foreign directors exposes boards to transnational norms, regulatory expectations, and global capital market pressures. A robust body of evidence shows that foreign directors bring familiarity with international ESG frameworks and reporting standards (Frijns *et al.*, 2016); enhance board monitoring quality through diverse cognitive lenses and reduced groupthink (Rao and Tilt, 2015); heighten sensitivity to legitimacy demands from global investors and international watchdogs (Aguilera *et al.*, 2018; Ellimäki *et al.*, 2023); and mobilize transnational professional networks that are useful for disclosure infrastructures, assurance, and data validation (Aguilera *et al.*, 2019). These mechanisms suggest that board foreignness should primarily

influence firms' Scope 3 disclosure practices, which are shaped by global reporting norms and cross-country institutional pressures (Christensen *et al.*, 2021; Goerzen *et al.*, 2025). The influence of board foreignness on Scope 3 performance is conceptually weaker. Boards may steer target-setting and supplier engagement priorities, but operational improvements depend on organizational routines and inter-firm cooperation that boards only indirectly shape (Albitar *et al.*, 2023; Van Assche and Narula, 2023). Existing studies on board environmental experience show similar patterns: strong effects on reporting and weaker effects on emissions reduction (Walls *et al.*, 2012; Collevecchio *et al.*, 2025).

Overall, these arguments suggest that board foreignness is likely to exhibit a stronger association with Scope 3 disclosure-which is more directly shaped by reporting norms and legitimacy pressures-than with Scope 3 emissions performance, which depends on deeper organizational capabilities, operational implementation, and inter-firm coordination.

Based on these arguments, we propose the following hypotheses:

H1a (Board foreignness and disclosure). Board foreignness is positively associated with firms' voluntary Scope 3 disclosure.

H1b (Board foreignness and performance). Board foreignness is negatively associated with firms' Scope 3 emissions intensity.

2.1.2 Managers' cultural diversity

Cultural diversity within management teams introduces variation in values, institutional backgrounds, and cognitive styles that shape how leaders interpret and act upon complex organizational challenges (Kostova and Zaheer, 1999; Hutzschenreuter *et al.*, 2016). In contrast to board foreignness, which primarily influences oversight and strategic orientation, managerial diversity affects how sustainability initiatives are interpreted and implemented within a firm's internal decision-making processes. This heterogeneity is widely understood as a "double-edged sword" in upper echelons theory (Hambrick and Mason, 1984) and has also been applied as a behavioural foundation for the role of governance in sustainability (Weerasinghe *et al.*, 2023; Popli *et al.*, 2022). On the one hand, diverse managerial teams may enrich a firm's strategic perspective: they draw on broader experiential repertoires, exhibit greater sensitivity to global signals, and can identify patterns or risks that might remain invisible to more homogeneous groups (Strange, 2009). These benefits are particularly salient in sustainability domains where regulatory expectations, stakeholder pressures, and technological trajectories vary across national and institutional contexts (Rao and Tilt, 2015). Studies show that culturally diverse executives tend to interpret complex challenges more holistically, propose more innovative responses, and mobilize non-local knowledge to address them (Hambrick *et al.*, 1996; Watson *et al.*, 1998). In global value chains, where decarbonization requires coordination across countries and actors, such boundary-spanning cognitive capabilities can be advantageous (Marino and Quatraro, 2023).

At the same time, cultural diversity also incurs organizational costs that become more pronounced in ambiguous and cross-functional

contexts. Diverse managerial groups may face communication barriers and interpretive differences that slow decision-making or lead to an inconsistent prioritization of sustainability issues (Westphal and Milton, 2000; Nielsen, 2010). The literature indicates that heterogeneity can undermine group cohesion, reduce trust, and create divides between "in-groups" and "out-groups," all of which complicate coordinated action (Frijns *et al.*, 2016). Moreover, executives who are exposed to different home-country institutional logics may diverge in their understanding of materiality, the acceptable stringency of environmental targets, and the balance between transparency and operational feasibility (Kostova and Zaheer, 1999).

These frictions tend to surface most acutely when teams must jointly develop shared metrics, consistent reporting boundaries, or integrated engagement routines, which are precisely the conditions underlying Scope 3 disclosure and decarbonization initiatives (Hettler and Graf-Vlachy, 2024). Based on these arguments, we propose the following hypotheses.

H2a (Managerial cultural diversity and disclosure). Management cultural diversity is negatively associated with voluntary Scope 3 disclosure.

H2b (Managerial cultural diversity and performance). Top management cultural diversity is positively associated with firms' Scope 3 emissions intensity.

2.2 International complexity, ownership configurations and environmental accountability

International governance also relies on the broader organizational context in which firms operate. Beyond leadership composition, firms' ownership configurations and cross-border organizational structures influence how environmental accountability is distributed and how sustainability initiatives are coordinated across multinational networks (Strange *et al.*, 2009; Goergen, 2022). Operating within multiple institutional environments exposes multinational enterprises to diverse regulatory expectations, stakeholder demands, and reporting standards (Schena *et al.*, 2025; Zhang *et al.*, 2024).

A recurring insight in international business research is that international exposure can both enable and destabilize environmental engagement. On the one hand, multinational groups often benefit from access to advanced environmental knowledge, global best practices, and cross-border learning mechanisms that support stronger disclosure and more sophisticated environmental management systems (Singhania and Saini, 2021; Amer, 2023). Participation in global value chains can also reinforce expectations for transparency and carbon accounting, as leading firms increasingly cascade sustainability requirements across suppliers and affiliates (Asmussen *et al.*, 2023).

On the other hand, international operations also create institutional multiplicity-that is, the coexistence of divergent norms, reporting standards, and regulatory demands across countries-which can fragment environmental responsibilities and complicate internal coordination (Kostova and Zaheer, 1999; Berry *et al.*, 2021). Subsidiaries may face dual

pressures from parent companies and host-country regulators but lack autonomy over procurement, logistics, or product design-which are all critical levers of Scope 3 emissions (Van Assche and Narula, 2023). This situation can lead to a diffusion of responsibility, in which subsidiary units play limited roles in shaping disclosure choices or decarbonization strategies, despite being accountable for emissions outcomes (Wang and Li, 2019; Goerzen *et al.*, 2025). In this context, an international ownership configuration becomes a central component of international governance architecture. Independent domestic and multinational firms tend to retain clearer lines of accountability and greater operational discretion, enabling more consistent disclosure practices and stronger control over supply chain decisions. In contrast, domestic affiliates and foreign subsidiaries that are embedded within larger corporate groups may experience constrained autonomy and centralized reporting requirements, leading to more selective disclosure practices and potentially weaker engagement with Scope 3 emissions management. In particular, centralized reporting systems may reduce subsidiaries' incentives or discretion to voluntarily disclose value chain emissions, especially when sustainability reporting is coordinated at headquarters. However, the implications for emissions performance are likely to be more heterogeneous. Although limited local autonomy may constrain subsidiaries' ability to independently shape decarbonization strategies, operational emissions reductions can still be driven through headquarters-led mandates, shared reporting infrastructures, or group-level sustainability programmes. This asymmetry between reporting autonomy and operational control may partly explain why ownership configurations are more consistently associated with disclosure outcomes than with emissions intensity. These dynamics echo broader findings that international presence alone does not guarantee superior environmental outcomes; rather, only firms with robust internal governance can translate international exposure into substantive decarbonization progress (Aragón-Correa *et al.*, 2016; Benito and Meyer, 2024).

Following our line of discussion, we finally argue the following:

H3 (Ownership structure). Compared with independent multinationals, group-affiliated firms facing stronger external control mechanisms are likely to exhibit lower Scope 3 disclosure and may face greater constraints in improving Scope 3 emissions performance because of accountability asymmetries and reduced local discretion over reporting systems and decarbonization strategies.

3. Methodology

3.1 Research design

To develop our research design, we gather information on active Italian listed private companies that have reported on sustainability over the past two decades. These inclusion criteria improve institutional and regulatory comparability by focusing on firms that are subject to the Non-Financial Reporting Directive (2014/98/EU). By analysing companies operating

under similar reporting requirements, we reduce the variability in disclosure obligations and institutional pressures across firms. Additionally, reporting on value chain emissions remained largely voluntary during our study period, despite broader ESG disclosure requirements. While this approach does not eliminate potential self-selection bias, the empirical setting allows us to explore how governance characteristics are related to differences in Scope 3 disclosure and emissions performance within a fairly consistent institutional environment. Existing research indicates that disclosing Scope 3 information largely depends on governance mechanisms and organizational transparency because of their voluntary nature and the difficulty of monitoring value chain emissions (Albitar *et al.*, 2023; Hettler and Graf-Vlachy, 2024).

We derive ESG measures, GHG emissions and financial company information from LSEG Refinitiv Workspace, a commercial database that collects data from publicly available sources, including company websites, annual reports, corporate social responsibility reports, and data contributed by firms. Then, we cross-reference this sample with Moody's AIDA database to reconstruct the structure of corporate groups, ownership linkages, and details on top management team members. Ultimately, our final sample comprises 112 companies operating between 2012 and 2024[3].

Consistent with our theoretical framework, we estimate whether international governance structures-defined by board foreignness, managerial cultural diversity and international ownership configurations (OWN)-are associated with i) increased emissions disclosure and ii) better performance, capturing distinct dimensions of value chain decarbonization. We specify our main regression model as a linear probability model with high-dimensional fixed effects at the 2-digit industry sector and year levels[4] and robust standard errors.

$$Yit = \beta_0 + \beta_1 \, BoDForeignnessi + \beta_2 \, CulturalDiversityi + \varphi OWN_i + X_{i,t-1} + \mu_t + \lambda_s + \epsilon_{its}$$

As an established practice in the corporate governance and sustainability reporting literature (i.e., Ioannou and Serafeim, 2012; Dhaliwal *et al.*, 2011; Reid and Toffel, 2009; Ben-Amar and McIlkenny, 2015), we include one-year lagged normalized control variables that may affect firms' commitment to decarbonization to reduce concerns about reverse causality and facilitate comparisons across different scales[5]. More detailed information on the variables is included in the following section.

[3] For a detailed description of the distribution of our sample, see Figure A1 in the Appendix.

[4] The choice of a linear probability model is motivated by the presence of a high-dimensional fixed effects model, categorical explanatory variables (ownership types), and limited within-firm variation due to a moderately short unbalanced panel, which raises concerns over potential incidental parameter bias in non-linear regressors (Correia and Constantine, 2014; Guimaraes and Portugal, 2010).

[5] To assess potential multicollinearity among the explanatory variables, we calculated variance inflation factors (VIFs). All values are below the conventional threshold, indicating that multicollinearity should not be a concern in our models.

3.2 Variable description

In our empirical exercise, we operationalize our dependent variables along two outcome dimensions. Disclosure is captured through dichotomous indicators coded 1 if the firm reports emissions information in the relevant category and 0 otherwise. Emissions performance is measured as CO_2-equivalent emissions intensity per revenue (tons per € million). Following the GHG Protocol Corporate Accounting and Reporting Standard, we further distinguish among increasing levels of specificity in Scope 3 reporting:

a) Scope 3: aggregated information on overall indirect GHG emissions that occur in the reporting company's value chain, excluding those associated with purchased energy.
b) Upstream: indicating whether the firm reports Scope 3 emissions mapped to suppliers and other upstream actors in the company's value chain.
c) Downstream: category-based reporting of indirect emissions arising from the company's downstream activities.

Finally, we define value chain detailed (VCD) disclosure as a binary indicator equal to 1 when the firm provides disaggregated components for Scope 3 emissions-without explicitly separating upstream from downstream activities-and 0 otherwise. The descriptive and summary statistics of our dependent variables are reported in Table 1.

Tab. 1: Dependent variables. Descriptive statistics and polychoric correlations

		Obs.	Mean	Std. Dev.	Min.	Max.	Correlation coefficients						
							(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	Scope 3 disclosure	732	0.51	0.50	0	1	1.00						
(2)	Value-chain disclosure	733	0.34	0.47	0	1	0.76	1.00					
(3)	Downstream disclosure	732	0.16	0.37	0	1	0.82	1.00	1.00				
(4)	Upstream disclosure	733	0.33	0.47	0	1	0.77	-	0.94	1.00			
(5)	Scope 3 est. to rev.	658	3.84	7.16	0	100	0.08	-0.04	0.05	-0.03	1.00		
(6)	Downstream est. to rev.	658	5.97	8.85	0	100	0.12	0.06	0.29	0.06	0.19	1.00	
(7)	Upstream est. to rev.	658	3.59	7.22	0	100	0.08	-0.04	0.03	-0.04	1.00	0.12	1.00

Missing coefficients refer to the impossibility to calculate numerical derivatives due to missing values encountered

Source: Authors' own elaboration.

Our main explanatory variables include indicators of internationalization and cultural diversity in top management teams as well as ownership and control-based measures for cross-border activities. In detail, we consider the following:

Board foreignness. This variable is an indicator of board composition based on the percentage of foreign non-Italian directors appointed based on their primary nationality, as is similarly and extensively done for other dimensions in the CSR literature (see Rao and Tilt, 2015).

Managers' cultural diversity. This variable is measured by the heterogeneity of the top management team using Blau's index, which is

based on the citizenship of team members, as is commonly used in the upper echelons literature, for example, Weerasinghe *et al.* (2023). The index equals zero when all members of the top management team share the same nationality and increases as the heterogeneity within the team rises.

International ownership configurations (OWN). This categorical variable classifies the company based on its independence score[6], the geographical location of its ultimate owner and the structure of ownership and control over companies worldwide. Here, a multinational Italian company serves as the reference baseline category[7], followed by a domestic company, an Italian affiliate, and a foreign subsidiary.

Following the literature on the topic, we also control for total assets, return on equity, and the leverage ratio because larger firms with low growth potential, more financial slack, higher profits, and greater revenues tend to allocate more resources to enhance corporate environmental performance (see, for example, Maksimov *et al.*, 2022, Naciti *et al.*, 2021). We further control for the LSEG ESG Management Score to isolate the relations with the board as a normalized measure of the commitment and effectiveness of corporate governance principles, such as independence, diversity, committees, and compensation. Table 2 contains the descriptive and summary statistics of our regressor variables.

Tab. 2: Explanatory variables and controls. Descriptive statistics and polychoric correlations

		Obs.	Mean	Std. Dev.	Min.	Max.	Correlation coefficients							
							(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	BoD foreignness	1332	9.43	11.59	0	55.56	1.00							
(2)	TMT diversity	1344	14.97	22.07	0	72.74	0.41	1.00						
(3)	Int'l governance	1344	2.20	1.03	1	4	-0.18	-0.10	1.00					
(4)	Management Score	738	52.24	28.72	0.36	99.64	0.15	0.12	-0.17	1.00				
(5)	Total assets	1217	3.39	12.22	0	100	0.30	0.34	-0.51	0.27	1.00			
(6)	Return on assets	959	31.68	5.59	0	100	0.04	-0.10	0.06	-0.02	-0.15	1.00		
(7)	Free cash flow	1009	98.10	3.80	0	100	-0.04	0.03	0.02	0.09	0.02	0.05	1.00	
(8)	Market capitalization	1016	5.29	12.27	0	100	0.30	0.28	-0.54	0.41	0.67	-0.08	0.03	0.30

Source: Authors' own elaboration.

4. Results

This section examines how international governance characteristics and ownership configurations are associated with firms' engagement with Scope 3 emissions. We first analyse disclosure-based outcomes, distinguishing between aggregate Scope 3 disclosure and more granular value chain disclosure (Tables 3 and 4). We then examine emissions

[6] According to Moody's AIDA database, we classify affiliates/subsidiaries as companies with an independence score of C or lower. In other words, these companies have a recorded non-collective shareholder with a total or a calculated total ownership over 50%.

[7] Following the OECD Benchmark Definition of Foreign Direct Investment (4th Edition, 2008), we identify a company as "multinational" if it owns more than 10% of the stocks of other entities in countries besides its headquarters.

intensity as a proxy for Scope 3 emissions performance (Table 5) and identify potential asymmetries in empirical patterns. Finally, we explore whether these associations vary across sectoral contexts (Tables 6 and 7).

Because our empirical design is observational and does not depend on an exogenous source of variation, the estimated coefficients should be understood as conditional associations rather than causal link effects. Similarly, we interpret the results as evidence that aligns with the proposed arguments developed in the theoretical framework rather than as direct empirical tests of the underlying mechanisms.

4.1 Emissions disclosure

Focusing on emissions disclosure, our results suggest a modest but consistent pattern linking international governance mechanisms to the likelihood of voluntary reporting of Scope 3-related information at different levels of granularity. The most robust results concern board foreignness, whose coefficient is positive and statistically significant, which is consistent with Hypothesis H1a. More foreign-oriented boards are more likely to disclose information on Scope 3 emissions, both as an aggregate (Table 3, mods. 1-2) and as value chain details by GHG component (Table 3, mods. 3-4). Based on a back-of-the-envelope computation, the coefficients suggest that each percentage-point increase in board foreignness is associated with an approximately 0.4-0.7 percentage-point increase in the likelihood of reporting Scope 3 categories, being larger and more consistently significant for upstream disclosure.

In contrast, managers' cultural diversity is negatively associated with Scope 3 disclosure and value chain-detailed reporting, as argued in Hypothesis H2a. The results suggest that, on average, more culturally diverse management teams are less likely to disclose Scope 3-related information. While the results hold for upstream disclosure, the coefficient for downstream disclosure is not statistically significant (Table 4).

Finally, ownership configurations play a crucial role in disclosure, although the patterns vary across different dimensions, with only partial support for Hypothesis H3. Foreign subsidiaries and Italian affiliates are, on average, less likely to voluntarily disclose aggregated Scope 3 emissions than multinational companies are (Table 3, mod. 1-2), while independent domestic firms are significantly more likely to disclose segmentation along the value chain (Table 3, mod. 3-4). When we focus on the direction of value chain emissions, the likelihood of disclosure is consistently higher for independent Italian firms, while Italian affiliates are negatively and significantly associated with only downstream emissions disclosure (Table 4, mod. 5-6).

Tab. 3: Main results. Disclosure-based commitment to decarbonization

	Scope 3 disclosure		Value-chain detailed disclosure	
	(1)	(2)	(3)	(4)
BoD foreignness	0.0062***	0.0062***	0.0063***	0.0074***
	(0.001)	(0.004)	(0.000)	(0.001)
Managers' diversity	-0.0014	-0.0062**	-0.0046*	-0.0077***
	(0.639)	(0.026)	(0.061)	(0.004)
Int'l Ownership				
(ref.cat. MNE)				
Domestic company	-0.0026	0.1185	0.1539**	0.2046*
	(0.973)	(0.177)	(0.038)	(0.051)
Italian affiliate	-0.1411***	-0.0880*	-0.0620	-0.0432
	(0.003)	(0.093)	(0.157)	(0.427)
Foreign subsidiary	-0.3179***	-0.3484***	-0.0924	-0.0988
	(0.000)	(0.010)	(0.269)	(0.397)
Constant	0.6856**	3.7862**	0.7412***	4.3436***
	(0.013)	(0.041)	(0.001)	(0.001)
Controls	No	Yes	No	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Adjusted R2	0.308	0.360	0.366	0.364
Observations	758	520	759	521
Std.Err	robust	robust	robust	robust

P-values in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Authors' own elaboration.

Tab. 4: Main results. Disclosure-based commitment to decarbonization

	Downstream disclosure		Upstream disclosure	
	(5)	(6)	(7)	(8)
BoD foreignness	0.0024*	0.0041**	0.0062***	0.0072***
	(0.070)	(0.029)	(0.000)	(0.001)
Managers' diversity	-0.0015	-0.0013	-0.0041*	-0.0072***
	(0.447)	(0.563)	(0.089)	(0.006)
Int'l Ownership				
(ref.cat. MNE)				
Domestic company	0.0911	0.2216**	0.1563**	0.2108**
	(0.237)	(0.045)	(0.035)	(0.044)
Italian affiliate	-0.0959***	-0.1274***	-0.0522	-0.0257
	(0.006)	(0.005)	(0.231)	(0.633)
Foreign subsidiary	0.0270	0.0335	-0.0700	-0.0828
	(0.688)	(0.714)	(0.404)	(0.494)
Constant	0.3129*	-0.9145	0.6880***	4.2913***
	(0.082)	(0.623)	(0.002)	(0.001)
Controls	No	Yes	No	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Adjusted R2	0.279	0.333	0.361	0.359
Observations	758	520	759	521
Std.Err	robust	robust	robust	robust

P-values in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Authors' own elaboration.

Overall, the disclosure results offer the most robust and consistent evidence supporting Hypothesis H1a, with more limited support for Hypotheses H2a and H3. Board foreignness is consistently correlated with increased Scope 3 transparency, whereas managerial cultural diversity

tends to reduce disclosure, particularly for upstream emissions. Ownership configurations mainly influence overall and specific value chain disclosure outcomes.

4.2 Emissions intensity

Table 5 reports the results for Scope 3 emissions intensity, measured as estimated emissions relative to revenues. Since lower values indicate lower emissions intensity, negative coefficients correspond to better emissions performance, whereas positive coefficients indicate higher emissions intensity.

Board foreignness is negatively and significantly associated with emissions intensity, indicating that boards with a higher proportion of international directors are associated with lower relative emissions and, thus, better performance. This relationship, which confirms Hypothesis H1b, holds even when downstream and upstream emissions are considered separately.

Managerial cultural diversity shows a different pattern, being positively and significantly correlated with Scope 3 and upstream emissions intensity (Table 5, mod. 1 and 3). In line with Hypothesis H2b, this finding further suggests limited alignment between diverse managerial structures and operational decarbonization outcomes. However, the international ownership structure does not significantly correlate with differences in emissions performance across model specifications; thus, Hypothesis H3 is not supported.

Tab. 5: Main results. Value-chain emissions' intensity

	Scope 3 est. to revenues	Downstream est. to revenues	Upstream est. to revenues
	(1)	(2)	(3)
BoD foreignness	-0.0837***	-0.0877**	-0.0804***
	(0.004)	(0.035)	(0.007)
Managers' diversity	0.1405**	-0.0670	0.1468**
	(0.023)	(0.218)	(0.019)
Int'l Ownership			
(ref.cat. MNE)			
Domestic company	1.2044	-0.0295	1.2282
	(0.565)	(0.982)	(0.563)
Italian affiliate	0.2513	0.0831	0.2513
	(0.782)	(0.933)	(0.783)
Foreign subsidiary	0.6313	-0.3935	0.6645
	(0.516)	(0.839)	(0.480)
Constant	-54.6965	33.9502	-57.5484
	(0.144)	(0.159)	(0.131)
Controls	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes
Adjusted R2	0.168	0.354	0.174
Observations	469	469	469
Std.Err	robust	robust	robust

P-values in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' own elaboration.

The comparison between Tables 3-4 and Table 5 provides an important additional insight. International governance characteristics are associated with both disclosure and emissions intensity but not always in the same way. Board foreignness shows relatively consistent associations across both types of outcomes. Managerial cultural diversity is negatively associated with disclosure and positively associated with emissions intensity, especially upstream. However, ownership configurations are associated with disclosure but not with emissions performance.

These outcome asymmetries support the argument that Scope 3 disclosure and Scope 3 emissions performance capture distinct dimensions of firms' engagement with value chain decarbonization.

4.3 Heterogeneity across sectors

Previous research has indicated that firms' Scope 3 disclosure and emissions management depend on sector-specific organizational capabilities for reporting infrastructure. Therefore, we examine whether our primary international governance patterns are stable across different industrial sectors, namely, manufacturing and materials (M&M) and services and ICT[8]. The results should be interpreted as exploratory because the sectoral subsamples are smaller and are thus more sensitive to statistical power and influential observations.

Table 6 reports the sectoral results for aggregate Scope 3 disclosure and emissions intensity. Board foreignness is associated with disclosure primarily in manufacturing-related sectors, while its association with lower emissions intensity appears stronger in services. Managerial cultural diversity is negatively associated with Scope 3 disclosure in manufacturing firms but positively correlated with emissions intensity in the service sector. Ownership configurations also vary by sector, highlighting patterns in both disclosure and intensity that discourage generalizing the results without further investigation.

Table 7 extends the sectoral analysis to downstream and upstream outcomes, emphasizing even greater heterogeneity than in the baseline results. For manufacturing firms, board foreignness is significantly associated with lower downstream emissions intensity and greater upstream disclosure. However, managerial cultural diversity tends to exhibit less consistent associations across specifications, thereby discouraging the identification of any potential patterns. Ownership configurations provide the most salient evidence of disclosure-performance divergence. Compared with multinational companies, domestic manufacturing companies are associated with higher disclosure probabilities and lower upstream emissions. Foreign subsidiaries are also correlated with higher disclosure in the M&M sector, but they are associated with higher emissions, on average, both upstream and downstream. In the services and ICT sector, Italian affiliates and foreign subsidiaries are associated with a lower probability of disclosure and emissions relative to MNEs.

[8] A third category (trade and distribution) is not included in our results because its small subsample (≈35 observations) implies low power and greater sensitivity to influential observations.

Tab. 6. Scope 3 emissions and sectoral heterogeneity (a. Manufacturing & Materials; b. Services & ICT)

	Scope 3 disclosure		Scope 3 est. to rev.	
	M&M	Services	M&M	Services
	(1)	(2)	(3)	(4)
BoD foreignness	0.0105***	0.0017	-0.0440	-0.1125**
	(0.000)	(0.616)	(0.116)	(0.026)
Managers' diversity	-0.0085*	-0.0008	0.0795	0.1473*
	(0.052)	(0.793)	(0.383)	(0.055)
Int'l Ownership				
(ref.cat. MNE)				
Domestic company	0.0777	0.1266	-2.1664**	2.3653
	(0.303)	(0.375)	(0.032)	(0.504)
Italian affiliate	-0.2164***	0.0561	0.6670	-1.1313
	(0.001)	(0.534)	(0.529)	(0.418)
Foreign subsidiary	0.0869	-0.7722***	2.8477**	-5.2191***
	(0.438)	(0.000)	(0.030)	(0.004)
Constant	-47.1081***	3.6365**	-559.1067**	-52.3732
	(0.007)	(0.022)	(0.030)	(0.230)
Controls	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes
Adjusted R2	0.426	0.439	0.139	0.223
Observations	306	176	279	155
Std.Err	robust	robust	robust	robust

P-values in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Authors' own elaboration.

Tab. 7. Value-chain detailed emissions and sectoral heterogeneity (a. Manufacturing & Materials; b. Services & ICT)

	Downstream disclosure		Downstream est. to rev.		Upstream disclosure		Upstream est. to rev.	
	M&M	Services	M&M	Services	M&M	Services	M&M	Services
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BoD foreignness	0.0031	0.0004	-0.2171***	0.0036	0.0126***	0.0009	-0.0329	-0.1147**
	(0.274)	(0.865)	(0.004)	(0.563)	(0.000)	(0.769)	(0.232)	(0.025)
Managers' diversity	-0.0051	0.0083***	-0.1151	-0.0120*	-0.0048	-0.0010	0.0873	0.1506*
	(0.225)	(0.002)	(0.501)	(0.072)	(0.278)	(0.775)	(0.333)	(0.054)
Int'l Ownership								
(ref.cat. MNE)								
Domestic company	0.6381***	-0.2039	-3.6437	0.0239	0.5141***	0.0647	-2.0065**	2.4074
	(0.000)	(0.194)	(0.110)	(0.933)	(0.000)	(0.652)	(0.042)	(0.504)
Italian affiliate	-0.0700	-0.1561*	2.2156	-0.8032*	-0.0982	0.0407	0.5579	-1.1080
	(0.274)	(0.065)	(0.118)	(0.057)	(0.139)	(0.677)	(0.600)	(0.436)
Foreign subsidiary	0.2572**	-0.1936	7.6961***	-7.3685***	0.2694**	-0.4896***	2.4783*	-4.9111***
	(0.037)	(0.109)	(0.004)	(0.000)	(0.031)	(0.001)	(0.056)	(0.007)
Constant	17.6574	-2.1442	1595.3142***	-1.0457	1.4636	3.7643***	-656.7600***	-53.2649
	(0.308)	(0.162)	(0.000)	(0.729)	(0.932)	(0.007)	(0.010)	(0.232)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.363	0.292	0.214	0.822	0.420	0.413	0.142	0.229
Observations	306	176	279	155	307	176	279	155
Std.Err	robust	robust	robust	robust	robust	robust	robust	robust

P-values in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.
Source: Authors' own elaboration.

Overall, the sectoral results reinforce the main finding that emissions disclosure and intensity are distinct dimensions of Scope 3 engagement. However, they also reveal important differences in how international governance characteristics are related to each dimension separately across industries. Specifically, the disclosure-related patterns are more visible in carbon-intensive industries-namely, the M&M sector-whereas the association between governance characteristics and emissions performance is more heterogeneous and context dependent.

5. Discussion

Scope 3 emissions pose distinctive governance challenges because they originate largely outside firms' organizational boundaries and depend on coordination across complex value chains and multiple organizational actors (Greenhouse Gas Protocol, 2011; De Marchi and Gereffi, 2023; Busch *et al.*, 2022). Building on the perspectives of sustainable corporate governance (SCG) and international business, this study examined how international governance is related to firms' engagement with Scope 3 emissions.

Overall, three main findings emerge. First, board foreignness is the most consistent correlate of Scope 3 engagement: it is positively associated with disclosure and negatively associated with emissions intensity. Second, managerial cultural diversity shows a less favourable and more selective pattern; that is, it is negatively associated with disclosure, particularly upstream, and positively associated with Scope 3 and upstream emissions intensity. Third, ownership configurations are more clearly associated with disclosure than with emissions performance: group-affiliated firms are generally less likely to disclose aggregate Scope 3 emissions, whereas ownership differences are not significant in the baseline emissions intensity models.

Taken together, these findings align with the view that international governance characteristics influence transparency outcomes (Scope 3 disclosure) more strongly than operational decarbonization outcomes (Scope 3 emissions performance). This empirical asymmetry is consistent with several plausible explanations that do not necessarily imply opportunistic or symbolic behaviour. From a sustainable corporate governance perspective, the most immediate interpretation is that disclosure and emissions performance are governed by fundamentally different organizational logics and time horizons. Governance structures, particularly internationally composed boards, may effectively channel transparency expectations into reporting decisions but lack a direct influence on the operational and relational processes required for Scope 3 decarbonization. These processes involve redesigning procurement practices, engaging suppliers across multi-tier value chains, and building measurement infrastructures that extend well beyond a firm's organizational boundaries (Hettler and Graf-Vlachy, 2024; Van Assche and Narula, 2023). A second plausible explanation is related to organizational capability gaps: firms may disclose Scope 3 emissions before developing the internal

routines, data systems, and supplier engagement mechanisms necessary to reduce them. In this reading, the disclosure-performance asymmetry reflects a developmental lag rather than deliberate decoupling. A third explanation concerns the nature of institutional pressures themselves: regulatory and stakeholder demands primarily target transparency, as reflected in frameworks such as the CSRD and GHG Protocol, while largely leaving operational decarbonization to firms' discretion and capacity. This regulatory asymmetry may reinforce the gap between what firms report and what they achieve. While the possibility of symbolic compliance or greenwashing cannot be entirely ruled out, our empirical design does not allow us to distinguish between these competing explanations, and therefore, we refrain from privileging any single interpretation. Subsector specifications also reinforce this perspective, showing more pronounced disclosure-performance asymmetries among carbon-intensive firms, which face greater organizational complexity in monitoring emissions across the value chain. Therefore, our results suggest that international governance may strengthen firms' responsiveness to transparency expectations, while the translation of disclosure into substantive decarbonization depends on the development of organizational capabilities and value chain coordination mechanisms (Hettler and Graf-Vlachy, 2024; Van Assche and Narula, 2023).

While our theoretical framework draws on mechanisms such as legitimacy pressures, coordination frictions, and cognitive diversity, they are not directly tested in the empirical design. Accordingly, the remainder of this section explores how our findings are consistent with these interpretative lenses while building on existing research.

First, this study offers evidence that advances research on sustainable corporate governance by documenting systematic differences between international governance characteristics that influence sustainability transparency and those that shape operational environmental performance. Prior studies often treat environmental disclosure and emissions outcomes as closely related indicators of sustainability engagement (Ben-Amar and McIlkenny, 2015; Liao *et al.*, 2015; Walls *et al.*, 2012). However, recent research suggests that transparency and decarbonization may be driven by different organizational mechanisms (Christensen *et al.*, 2021; Downar *et al.*, 2021). In line with this view, our findings document patterns that are consistent with the idea that board foreignness is associated with stronger Scope 3 disclosure but has a weaker relationship with emissions reductions. Foreign directors expose boards to transnational ESG norms, global reporting standards, and international investor expectations (Aguilera *et al.*, 2019; Oxelheim *et al.*, 2013), which are associated with increasing firms' responsiveness to transparency pressures surrounding value chain emissions. However, translating disclosure into measurable emissions reductions requires organizational capabilities that extend beyond board oversight. Scope 3 decarbonization requires firms to engage suppliers, redesign procurement practices, and coordinate environmental initiatives across global value chains (De Marchi and Gereffi, 2023; Van Assche and Narula, 2023). Recent research highlights that effective Scope 3 reporting requires dedicated organizational structures, standardized measurement

routines, and data infrastructures that are capable of integrating emissions information across multiple organizational units and external partners (Hettler and Graf-Vlachy, 2024). Therefore, governance mechanisms may facilitate the adoption of reporting practices, while the effectiveness of decarbonization initiatives ultimately depends on firms' underlying organizational capabilities.

Notably, these findings also partly diverge from prior expectations in the literature. While board foreignness is associated with lower emissions intensity, a result consistent with Hypothesis H1b, the effect size is modest and does not unambiguously establish that internationalized boards drive operational decarbonization. These nuances are reflected in SCG research, which tends to portray governance oversight as a general-purpose driver of both transparency and performance (Walls *et al.*, 2012; Ben-Amar and McIlkenny, 2015). Differently, our results suggest that the governance-sustainability relationship may be decoupled, with foreign board composition shaping disclosure more reliably than emissions outcomes. This distinction matters for how SCG research interprets governance effectiveness and for how policy-makers calibrate expectations from governance reform.

Second, the findings offer evidence that is broadly consistent with the perspectives of upper echelons theory on how international governance within top management teams, reflected in managers' cultural diversity, may shape firms' responses to complex sustainability challenges. Research in upper echelons theory suggests that executives interpret strategic issues through the lens of their experiences and values (Hambrick and Mason, 1984; Hambrick, 2007). From this perspective, culturally diverse management teams may provide broader cognitive resources and greater sensitivity to heterogeneous institutional environments (Nielsen, 2010; Nielsen and Nielsen, 2013; Boone and Hendriks, 2009). At the same time, a substantial body of research highlights that diversity may generate coordination costs when decision-making requires high levels of integration across organizational units (Stahl *et al.*, 2010; Dahlin *et al.*, 2005). Our findings align with these coordination challenges in the context of Scope 3 governance. Managing value chain emissions requires firms to establish shared reporting routines, harmonize internal data systems, and coordinate sustainability practices across multiple organizational units and supply chain partners. These processes involve substantial coordination efforts and heavily depend on the availability and comparability of emissions data (Hettler and Graf-Vlachy, 2024). Moreover, the organizational effort required to implement Scope 3 reporting varies with firms' prior experience with environmental reporting infrastructure. Firms operating in energy-intensive sectors often possess established systems for managing energy-related data and can therefore adapt existing reporting structures more easily. In contrast, firms in less energy-intensive sectors may need to establish entirely new reporting processes and organizational routines (Tang and Demeritt, 2018; Hettler and Graf-Vlachy, 2024). In such contexts, managers' cultural diversity may be associated with increased complexity in building the shared interpretive frameworks and coordinated decision processes required for effective Scope 3 disclosure and decarbonization.

These findings also refine upper echelons theory. While optimistic accounts emphasize the informational benefits of diversity for strategic responsiveness (Nielsen and Nielsen, 2013; Marino and Quatraro, 2023), our evidence suggests that, in the specific context of Scope 3 governance, which demands coordinated measurement, reporting, and inter-firm engagement rather than purely strategic deliberation, diversity may introduce frictions that outweigh the benefits of cognitive breadth. This finding is consistent with the "double-edged sword" characterization of diversity in research in upper echelons theory (Hambrick *et al.*, 1996; Stahl *et al.*, 2010) and highlights the importance of specifying the type of task for which diversity is expected to be beneficial.

Third, this study provides evidence in line with international business perspectives on how corporate structures shape environmental accountability within multinational enterprises. Multinational firms operate in conditions of institutional multiplicity, in which subsidiaries must respond simultaneously to host-country regulations and headquarters' strategic priorities (Kostova and Zaheer, 1999; Aguilera *et al.*, 2019). Our findings are associated with the view that engagement with Scope 3 emissions is influenced by the organizational locus of accountability within corporate hierarchies. Independent multinational headquarters display stronger Scope 3 disclosure than do affiliates and foreign subsidiaries embedded within complex corporate groups. This pattern suggests that sustainability engagement depends on not only leadership composition but also where reporting responsibilities and strategic decision authority are located within multinational networks (Asmussen *et al.*, 2023; Goerzen *et al.*, 2025). Importantly, however, ownership configurations do not significantly predict emissions intensity across model specifications, a result that partially diverges from Hypothesis H3 and from theories that emphasize the operational implications of group-affiliated structures (Wang and Li, 2019; Goerzen *et al.*, 2025). This finding may suggest that while the locus of accountability shapes disclosure choices, as subordinate units defer to headquarters reporting decisions, it does not necessarily translate into differential emissions outcomes at the firm level. The sectoral specifications offer additional nuance. In manufacturing contexts, domestic independent firms show both a higher disclosure probability and lower upstream emissions than do their multinational counterparts, suggesting that clearer accountability structures may reinforce both transparency and operational decarbonization in carbon-intensive settings. In contrast, foreign subsidiaries in the M&M sector display higher disclosure alongside higher emissions, a pattern that is consistent with the view that group-affiliated units face structural pressure to signal compliance through reporting while retaining limited control over upstream decarbonization levers. In service sectors, where Scope 3 emissions are more concentrated in standardized upstream categories-such as purchased energy and business travel-the organizational barriers to both disclosure and performance are lower, and the ownership-related differentials are correspondingly attenuated. Whether this reflects a genuine convergence in operational practices across ownership types or, rather, a limitation of emissions intensity measures in capturing subsidiary-level decarbonization remains an open question for future research.

6. Conclusion

The findings of this study have important implications for managers and policy-makers seeking to accelerate corporate decarbonization. For corporate leaders, the results suggest that strengthening international governance, particularly by including foreign directors, may increase firms' responsiveness to global sustainability expectations and improve transparency regarding value chain emissions. However, governance reforms alone are unlikely to generate substantial reductions in Scope 3 emissions. Firms must also develop the organizational capabilities required to manage value chain emissions effectively, including data infrastructures, cross-functional coordination mechanisms, and supplier engagement practices. Implementing Scope 3 reporting may require substantial organizational effort, especially for firms with limited prior experience in environmental reporting (Tang and Demeritt, 2018).

For policy-makers, the findings highlight the importance of complementing disclosure regulations with policies that support the development of corporate decarbonization capabilities. While expanding Scope 3 reporting requirements can enhance transparency, effective emissions reductions require institutional frameworks that facilitate supply chain collaboration, improve the availability of emissions data, and support firms in building the organizational infrastructures necessary for value chain decarbonization.

This study is subject to several limitations that open avenues for future research. First, the analysis focuses on Italian listed firms operating within a specific institutional and regulatory environment. This setting offers a relatively coherent context for examining Scope 3 disclosure and emissions performance, but it may also limit the generalizability of the findings. Future research could examine whether similar governance dynamics emerge in other national contexts characterized by different corporate governance regimes and sustainability regulations. Second, this study relies on secondary ESG and emissions data. Although these data are widely used in sustainability and corporate governance research, they inevitably introduce measurement limitations because of heterogeneity in reporting practices, disclosure boundaries, data availability, assurance procedures, and methodological choices across firms and over time. Furthermore, Scope 3 emissions are particularly vulnerable to estimation bias, as they originate largely outside the focal firm's organizational boundaries and often depend on supplier data, product-use assumptions, emission factors, and model-based estimates. As a result, our indicators may partly capture noise arising from firms' reporting capacity and transparency infrastructure rather than only their underlying environmental commitment, which means that it is unlikely to be entirely random. Future studies could complement the secondary data noted above with more granular information on supplier engagement practices, environmental investments, or internal decarbonization initiatives. Third, while the theoretical framework emphasizes mechanisms such as legitimacy pressures, coordination frictions, cognitive diversity, and organizational capabilities, these mechanisms are not directly observed in the empirical

analysis. Rather, we build upon the most recent literature (Pinkse *et al.*, 2024; Hettler and Graf-Vlachy, 2024) to interpret the potential role of organizational and socio-cognitive capabilities in enabling value chain decarbonization. Future research could further explore these types of combinations in greater detail. Finally, the distinction between Scope 3 disclosure and emissions performance should be interpreted with caution. This paper shows that governance characteristics are not uniformly associated with disclosure and emissions intensity, which suggests that transparency and emissions performance capture distinct dimensions of firms' engagement with value chain decarbonization. However, this study does not fully model the organizational conditions under which disclosure and performance diverge. Future research could address this limitation by more directly examining how international governance structures translate into the Scope 3 disclosure-emissions gap.

As corporate accountability increasingly extends to value chain emissions, understanding how governance structures shape firms' responses to Scope 3 challenges becomes essential. This study shows that international governance plays an important role in promoting transparency around value chain emissions, but it also reveals the organizational limits of governance-driven decarbonization. Bridging the gap between sustainability disclosure and substantive emissions reductions will require governance structures complemented by the organizational capabilities needed to coordinate decarbonization efforts across global value chains.

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Appendix

Sample description and stylized facts

Figure A1 shows the distribution of firms across sectors and types of international governance. Italian affiliates and multinational enterprises are mainly concentrated in the "Manufacturing" and "Finance and Real Estate" sectors, emphasizing the importance of international presence in capital- and knowledge-intensive industries. In contrast, domestic firms are almost fully limited to "Finance and Real Estate", indicating a narrow sectoral scope. Foreign subsidiaries have a modest presence, particularly in "Manufacturing" and "Energy, Technology, and Transportation". These trends align with the notion that international governance structures are more prevalent in industries with higher levels of global integration or strategic significance.

In Table A1, descriptive statistics indicate that 52% of firms in the sample disclose Scope 3 emissions, while only 48% report actual reductions. This confirms the expected gap between commitment and performance, consistent with prior literature that distinguishes between "green talk" and "green walk". Disclosure of finer-grained GHG categories involves 33% of firms in the sample, with a wider percentage for upstream activities. Governance variables display wide heterogeneity (see Tab. 3): foreign directors represent only 4.3% of board members, while managerial diversity averages 94.4 points on a 0-100 Herfindahl-based index,

suggesting relatively homogeneous top management teams despite limited foreign participation.

Table A2 highlights that manufacturing firms exhibit higher emission estimation and upstream engagement, while Services show stronger reduction performance relative to their commitments. These results are likely due to operational decarbonization measures-such as enhancing energy efficiency and mobility-are easier to implement in the Services sector, contrary to material- and energy-intensive profiles of the first group. "Trade & distribution" reveals the weakest disclosure intensity, consistent with the fragmented nature of supply-chain emissions accounting.

Tables and Figures

Figure A1. Distribution of companies based on ownership structure and industry

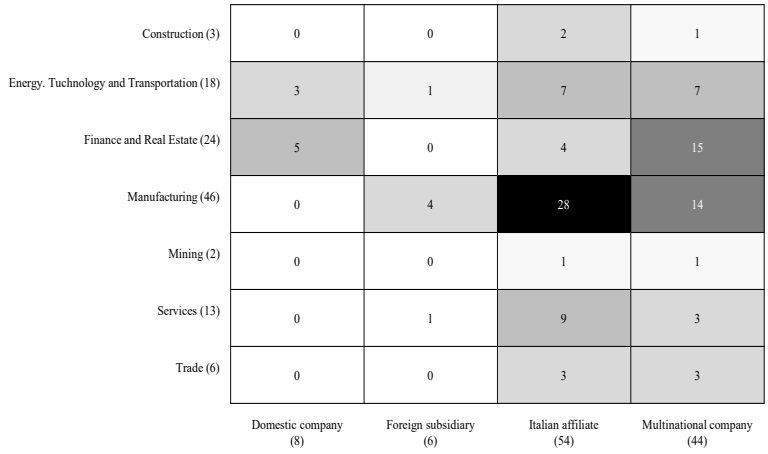

Table A1. Dependent variables. Descriptive statistics

	Obs.	Mean	Std. Dev.	Min.	Max.
Scope 3 Disclosure	759	0.52	0.50	0.00	1.00
Value-chain Disclosure	760	0.33	0.47	0.00	1.00
Downstream Disclosure	759	0.16	0.36	0.00	1.00
Upstream Disclosure	760	0.32	0.47	0.00	1.00
Scope 3 estimated to revenues	658	3.84	7.16	0.00	100.00
Downstream estimated to revenues	658	5.97	8.85	0.00	100.00
Upstream estimated to revenues	658	3.59	7.22	0.00	100.00

Table A2. Heterogeneity across industries

Variable	Manufacturing & Materials	Services & ICT	Trade & Distribution	Overall Mean
Scope 3 Disclosure	0.49 (0.50)	0.55 (0.50)	0.32 (0.47)	0.46
Value-chain Disclosure	0.31 (0.46)	0.33 (0.47)	0.28 (0.45)	0.31
Upstream Disclosure	0.31 (0.46)	0.33 (0.47)	0.28 (0.45)	0.31
Downstream Disclosure	0.10 (0.30)	0.20 (0.40)	0.19 (0.39)	0.16
Scope 3 est. to Rev.	4.63 (6.60)	3.67 (7.85)	3.66 (9.10)	3.99
Upstream est. to Rev.	4.66 (6.75)	3.22 (7.83)	3.25 (9.09)	3.71
Downstream est. to Rev.	1.19 (2.45)	9.70 (10.27)	8.93 (8.53)	6.61

Notes: Mean (standard deviation). Values refer to firm-year observations.
Estimation variables represent emissions normalized to revenues.

sinergie
italian journal of management

ISSN print 0393-5108
ISSN online 2785-549X
DOI 10.7433/s130.2026.06
pp. 127-157

FONDAZIONE CUEIM

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