

RESEARCH ARTICLE

Board of Directors' characteristics and environmental SDGs adoption: an international study

Jonathan Tagliatela¹  | Kevin Pirazzi Maffiola² | Roberto Barontini² |
Francesco Testa² 

¹School of Management, Politecnico di Milano, Milan, Italy

²Institute of Management, Scuola Superiore Sant'Anna, Pisa, Italy

Correspondence

Francesco Testa, Institute of Management, Scuola Superiore Sant'Anna, Piazza Martiri della libertà 33, Pisa, Italy.

Email: francesco.testa@santannapisa.it

Abstract

Drivers of environmentally conscious firm behaviour have gained increasing attention over past decades. The Board of Directors holds a central role in corporate decision-making, and previous empirical evidence suggests that its characteristics could influence corporate environmental performance. This paper contributes to the literature with the first evidence of the influence certain board characteristics have on whether a firm ultimately supports one or more environmental SDGs. Our focus is on board size, gender diversity, board independence and CEO duality. Logistic and fractional regressions on 4417 globally listed firms highlight that board size, the share of female directors, and the share of independent directors are significant drivers of support for environmental SDGs. The results and insights revealed in this study should be helpful to policymakers, investors and corporations in evaluating the effectiveness of corporate governance characteristics and fostering corporate contributions to the 2030 Agenda.

KEYWORDS

Board size, CEO duality, Corporate governance, Gender diversity, Independent directors, Resource-dependence theory, SDGs

1 | INTRODUCTION

The global challenges economic systems must face in the following decades call for a growing contribution and commitment from all economic actors (Bansal et al., 2021; United Nations, 2015). To guide society's transition to a more sustainable way of living, in 2015 the United Nations released the sustainable development goals (SDGs) as part of its Agenda 2030. Since then, the SDGs have assumed an increasingly prevalent role in sustainability strategies implemented by companies (Alda, 2019; Greenwood et al., 2011). Indeed, humanity expects the corporate sector to substantially contribute to achieving these objectives, in light of the 'blended value proposition' concept, where firms are accountable to their shareholders and broader stakeholder groups (Richardson, 2009).

To understand how and why companies integrate sustainability themes into their resource allocation decisions (Emerson, 2003), one

stream of research has focused on the role played by the top of the organisational pyramid, that is the Board of Directors (BoD), for it is the board that is accountable for a firm's strategic orientation and performance (Kaplan, 2001). Since BoDs are involved in designing strategies for firms and establishing their organisational agendas, board policies and practices can significantly influence corporate behaviour (Campbell, 2007), including whether or not they adopt responsible practices (Terjesen et al., 2015). BoDs are the principal governance mechanisms in giving firms their strategic direction, with evidence suggesting that their characteristics can profoundly impact a firm's environmental performance (Aguilera et al., 2021).

Embedding sustainability principles into strategy and operations is a complex process that is characterised by potentially conflicting objectives between sustainability goals and firm profitability (Bianchi & Testa, 2022; Hahn et al., 2018; Ivory & Brooks, 2018). This

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2023 The Authors. *Corporate Social Responsibility and Environmental Management* published by ERP Environment and John Wiley & Sons Ltd.

process must be driven by top management, but, as recently emphasised in several studies (Bianchi et al., 2022; Dahlmann & Grosvold, 2017; Slawinski et al., 2017), firms can only adopt environmental practices if they do not trigger excessive tension in terms of economic and financial sustainability. For instance, companies can be incentivised to reduce water, energy consumption or greenhouse gas emissions to improve their legitimacy and economic efficiency while neglecting any objectives that are not adequately linked to their core activities. This leads to future environmental practices relating less to future global challenges, such as losses in biodiversity. Therefore, understanding the role of governance in guiding strategic choices is essential to policy planning and making informed investment choices.

Several empirical studies show that some board characteristics have a positive impact on SDG disclosure. However, this evidence tends to rely on information gathered from expert panels and is often focused on specific geographical locations (Diaz-Sarachaga, 2021; Jizi, 2017; Martinez-Ferrero & Garcia-Meca, 2020; Pizzi et al., 2021; Poddar et al., 2019; Sekarlangit & Wardhani, 2021; Zampone et al., 2022). In addition, the SDGs are often considered in terms of a single, homogeneous objective to which firms should aim, which overlooks the multidimensionality of the SDGs. Also, empirical results drawn from large international samples are still lacking, suggesting a gap in the literature.

From a policy perspective, recent evidence shows that corporate involvement in SDGs is still limited (Silva, 2021; van der Waal & Thijssens, 2020). This suggests that further research is needed on the factors that can trigger a firm to support the SDGs. Starting from this premise, this study aims to thoroughly explore the characteristics, if any, that drive BoDs to implement actions in support of the seven environmental SDGs. More specifically, our objective is to answer the following research questions: Do the board characteristics of size, gender diversity, independence, and CEO duality: (i) influence the probability of implementing actions that support the environmental SDGs? and (ii) Do these characteristics have different impacts on the likelihood of supporting of a specific SDG?

To answer these questions, we analysed 4417 firms drawn from the global cross-sectional database Refinitiv-Asset4 for 2020. The dependent variables are corporate support for each environmental SDG, while the independent and control variables span the characteristics of the board and firm.

We find that a board's characteristics are generally linked to support for specific environmental SDGs, but with a few important differences. First, these characteristics only seem to affect an organisation's actions in supporting environmental SDGs where win-win solutions are more likely to be achieved, that is where that support might also result in better financial returns. By contrast, we found no significant effects for the environmental SDGs that relate more to practices that go beyond the core activities of the typical corporation. Second, BoD size and composition are correlated to SDG support, confirming that diverse and independent perspectives have a positive impact on a firm's decisions to implement environmental policies. Third, the results for CEO duality do not confirm that a power concentration has a negative effect on ESG practices, at least in terms of support for the seven environmental SDGs.

This paper makes three main contributions to the literature. First, it contributes to the current research on board features and environmental sustainability by providing the first granular evidence on which BoD characteristics drive firms to support specific environmental SDGs. This is complemented by a discussion on the different priorities corporations seem to place on the specific SDGs in terms of their externalities and the potential internal benefits to be gained from supporting a specific SDG. Second, through the multifaceted concept of the SDGs, our analysis reveals that environmental issues are not monolithic and that boards mainly support environmental challenges where the win-win dynamics are most manifest. Third, the study contributes to the emerging debate on business and biodiversity (Panwar et al., 2022), highlighting that the biodiversity challenge deserves special attention, as evidenced by the weak relationship between biodiversity-related SDGs and board characteristics.

The structure of this paper is as follows. The next section presents an overview of existing literature and develops the hypotheses. Section 3 describes the methodology and Section 4 presents the empirical results. Section 5 discusses the evidence revealed and its limitations, while Section 6 articulates the conclusions, integrating our findings into the literature and highlighting future research avenues.

2 | THEORETICAL FOUNDATION

This study takes the perspective of resource-dependence theory to analyse the relationship between board characteristics and support for the environmental SDGs. This theoretical framework is particularly suitable for explaining one of the main functions attributed to BoDs, that is providing resources (Bolourian et al., 2021; Moussa et al., 2020; Shaukat et al., 2016). Hillman and Dalziel (2003) list several activities that can be included in this function, such as providing legitimacy and bolstering the firm's public image; bringing expertise, advice, and counsel; helping the firm access capital; building external relations; and so on. Such activities can be linked with adopting environmental practices, and there are several board characteristics that can be identified as their determinants (Michelon & Parbonetti, 2012). The next sections will introduce the state-of-the-art thinking on the relationship between BoDs and environmental practices, placing particular focus on the corporate governance determinants of supporting the SDGs through the lens of resource-dependence theory.

2.1 | Board of Directors and the SDGs

Corporate governance mechanisms and, more specifically, BoDs have been subject to deep scrutiny by academic researchers. One of the many themes researched is whether BoDs can help lead a firm to greater sustainability (Bezemer et al., 2022; Enciso-Alfaro & García-Sánchez, 2022; Pandey et al., 2022). Scholars have examined several board characteristics for their effects on environmental outcomes, including board size, the presence of sustainability committees, board



independence, board diversity and lack of separation between the CEO and the chair (CEO duality) with mixed results (Aguilera et al., 2021; Chams & García-Blandón, 2019; de Abreu et al., 2022; Naciti et al., 2021; Prado-Lorenzo & García-Sánchez, 2010). However, to date, this growing attention by sustainability and management scholars has been strictly driven by the potential for the SDGs to impact value creation when firms integrate efforts to solve them into their strategies (Adams, 2017). Further, the studies are mainly limited to sectors that are particularly environmentally sensitive (Monteiro et al., 2019; Musavengane, 2019). So, despite a greater number of studies focusing on environmental and social performance, empirical analyses explicitly focused on the SDGs are still limited in number and extent.

Over time, the environmental challenges to which firms are being called to help solve are becoming more complex, and, similarly, environmental practices are subject to constant evolution. SDGs are pre-determined objectives, defined outside of the firm, that can require direct strategies, and therefore specific efforts, if one is to contribute effectively to them. Existing evidence shows that an increasing number of firms are realising that they should put strategies in place to contribute to meeting the SDGs (Silva, 2021). At the same time, academic researchers have started to investigate how SDGs can be integrated into corporate strategies and how they relate to several aspects of corporations (Pizzi et al., 2020). For example, one stream of research focuses on the factors that lead firms to disclose their contributions to the SDGs (García-Sánchez et al., 2020; Nicolò et al., 2022; Raimo et al., 2022; Rosati & Faria, 2019a). Generally, these studies find that institutional investors and national efforts to implement sustainability policies are significant drivers of these types of disclosures. Evidence also shows that the level to which organisations engage with the SDGs can vary from a simple integration to a substantial effort (Heras-Saizarbitoria et al., 2021; Silva, 2021). However, speeding up the shift to a sustainable society will likely pivot on whether we can identify the factors that trigger a firm's support for the objectives outlined in Agenda 2030.

In this paper, we argue that the advice provided by expert directors is essential for coping with such an ever-changing regulatory and societal context. More specifically, when global initiatives to fight climate change and pollution are implemented, firms need to meet the social expectation that they will contribute to solving these challenges. The BoD must guide and prioritise which of such initiatives will be implemented, in line with recent evidence showing that a board's characteristics can impact the firm's practices and disclosures (Cuadrado-Ballesteros et al., 2017). Indeed, the literature suggests that it is in the board's best interests to legitimise the firm and showcase its contribution to global challenges (Chan et al., 2014; Michelin & Parbonetti, 2012).

However, not all boards approach sustainable practices and objectives equally. Studies highlight that the boards that favour sustainability tend to be more gender diverse, and that this applies to both financial (Orazalin, 2019) and non-financial corporations (Nicolò et al., 2021). There is also evidence to suggest that certain board characteristics, including diversity and independence, increase the

likelihood of risk disclosure in integrated reporting (Raimo et al., 2022). However, this evidence is often focused on specific countries (Pizzi et al., 2021; Sekarlangit & Wardhani, 2021) and the few recent international studies are mostly based on GRI reporting data (Martinez-Ferrero & Garcia-Meca, 2020; Nicolò et al., 2022; Zampone et al., 2022). Our aim is to contribute to this debate by highlighting some of the conflicting findings and to provide new evidence by way of a comprehensive analysis of the relationship between four board characteristics and the implementation of measures designed to support seven specific environmental SDGs. The four characteristics are board size, gender diversity, independence and CEO duality. To develop the hypotheses to be tested, we drew on resource-dependence theory.

2.2 | Board size and SDG support

Resource-dependence theory suggests that a higher number of directors increases the likelihood of providing a more comprehensive view of the business activities, risks, and issues to which the firm is exposed. More board members might contribute to a board's decisions with a broader set of perspectives on the issues relevant to the firm, including efforts to set environmental strategies and initiatives to support globally agreed goals (Chams & García-Blandón, 2019). In addition, larger boards are more likely to include directors with environmental expertise, which is essential to giving meaning to sustainability committees and to guide the board's decisions toward environmentally conscious choices (Cosma et al., 2021). As a result, a larger board might converge towards supporting globally accepted standards, leading it to support some of the SDGs related to the environment.

Despite the great body of literature focused on the role of board size in relation to environmental performance, evidence on any links between board characteristics and the SDGs is very limited. Further, to the best of our knowledge, there have been no significant findings from a statistical perspective (García-Sánchez et al., 2020; Pizzi et al., 2021; Zampone et al., 2022).

Therefore, in line with resource-dependence theory and empirical findings, we hypothesize that board size is a positive and significant determinant of support for the environmental SDGs:

H1. *Board size is positively correlated to support for the environmental SDGs.*

2.3 | Share of women on the board and SDG support

Gender diversity has been subject to a number of studies from a corporate governance perspective. Many of these studies have adopted various different theoretical frameworks to explain how more gender-diverse boards impact a firm's sustainability disclosures, including stakeholder theory, legitimacy theory and resource-dependence

theory—with most generally assuming a positive relationship (Nicolò et al., 2021). We take the perspective of resource-dependence theory, which suggests that women are more likely to be influential in the community and are more likely to use their networks to form sustainability-themed alliances (Hillman et al., 2002; Post et al., 2015). Women directors have also been found to be more attentive to stakeholders' needs and more participatory in their decision-making through inter-organisational interactions (Arayssi et al., 2016). Additionally, women tend to be significantly more interested in environmental topics than men (Davidson & Freudenburg, 1996), slightly more interested in social justice (Jaffee & Hyde, 2000), and slightly less likely to support unethical behaviour. In turn, this might increase a board's awareness of the importance of the global agenda for promoting sustainable development. As a result, it may be more likely that SDGs are incorporated into the board's discussions and strategy setting (Islam et al., 2022). In addition, women directors have been found to pay more attention to the ethical responsibilities of the firms they direct (Harjoto et al., 2015). The counselling and resources that women provide to companies can lead to the adoption of policies and programs that improve the firm's position in society (de Abreu et al., 2022). Therefore, from a theoretical perspective, we can expect that boards with a higher share of women are more likely to support SGD-related measures when setting strategic objectives for their firm.

From an empirical perspective, recent evidence by Zampone et al. (2022) on a sample of 526 companies over the period 2017–2020, shows that that more gender diverse boards lead to a positive impact on SDG disclosures. Rosati and Faria (2019b) analysed a sub-sample of 408 firms in 2016, showing that early supporters of the SDGs typically had boards with a higher share of female directors. Conversely, other scholars do not find any evidence of a significant impact of gender diversity on the SDG disclosures (Pizzi et al., 2021; Sekarlangit & Wardhani, 2021).

Therefore, although resource-dependence theory is straightforward in suggesting a positive relationship between the gender diversity of boards and support for the SDGs, there is scant and contrasting empirical evidence on this relationship. Informed by resource-dependence theory, we will then formulate the following hypothesis:

H2. *The share of women directors is positively correlated to support for the environmental SDGs.*

2.4 | Independent directors and SDG support

Resource-dependence theory suggests that independent directors bring legitimacy to a firm and increase a firm's public image (Hillman & Dalziel, 2003). Outsiders often occupy prestigious positions in non-government organisations (NGOs) or academic institutions, and therefore, when performing their duties, they put more weight on the reputational consequences of their actions and, therefore, on sustainability performance (Martinez-Ferrero & Garcia-Meca, 2020). Accordingly, the literature reports that a higher share of independent

directors increases the transparency of a firm's disclosures and the quality of their non-financial reports (García-Sánchez et al., 2019; Michelon & Parbonetti, 2012; Raimo et al., 2022). A greater number of independent directors is also linked with increased sustainability-related alliances (Post et al., 2015). Therefore, based on resource-dependence theory, we argue that independent directors provide expertise drawn from outside perspectives where insiders do not. These outside perspectives might positively value the potential of global initiatives and/or stress the reputational value of participating in global initiatives, such as supporting the SDGs.

From an empirical perspective, a few studies have investigated the relationship between board independence and the SDGs. Martinez-Ferrero and Garcia-Meca (2020) analysed 365 European firms in 2016 and 2017 to investigate whether CEO independence affects a firm's reporting against the SDGs in sustainability reports. The evidence suggests that having a more independent board acts as positive determinant of a firm's contribution to the 2030 Agenda. A positive result was also found by Pizzi et al. (2021), suggesting that independent boards positively affect SDG reporting scores. However, Sekarlangit and Wardhani (2021) found an insignificant relationship. Therefore, the overall results are mixed when it comes to our knowledge of whether board independence affects a firm's contribution to solving the SDGs. Therefore, in line with resource-dependence theory, we hypothesize that:

H3. *The share of independent directors is positively correlated to support for the environmental SDGs.*

2.5 | CEO duality and SDG support

Resource-dependence theory suggests that an independent chairperson brings expertise and outside counsel to a firm and improves the firm public image. In addition, if the chair is a non-executive, this might lead to increased board independence and, with it, increased legitimacy (Daily & Dalton, 1993; Michelon & Parbonetti, 2012). Another way to increase legitimacy and improve a firm's public image is to push forward a board agenda that sees the firm participate in globally-shared objectives, such as the SDGs. Conversely, we would expect that, in a firm where the same person is both the CEO and chair, the board would have access to a lower level of expertise and might be less aware of the reputational and financial risks attached to ignoring good environmental practice. The result may be a lower probability of supporting the environmental SDGs.

However, evidence on any relationship between CEO duality and SDG support is rather scant. Only Martinez-Ferrero and Garcia-Meca (2020) have analysed this connection, and their focus was on reporting against the SDGs in GRI-based sustainability reports. They found that separating the CEO from the chairperson is a positive determinant in a firm contributing to the SDGs. To our best knowledge, this is the only evidence of the role of CEO duality on SDG disclosures. We aim to provide a more comprehensive result. Hence, with resource-dependence theory in mind, our last hypothesis is formulated as:



H4. CEO duality is negatively correlated to support for the environmental SDGs.

3 | DATA AND METHODOLOGY

3.1 | Sample and data

The dataset for this study was collected from the Asset4 (Refinitiv, 2021a) and Worldscope (Refinitiv, 2021b) databases. These databases provide indicators on a firm's support for each SDG, various corporate governance variables, and financial data. Although the SDGs were introduced in 2015, the data suggest that corporate support for the SDGs has increased significantly since 2019. In this study, we focus on 2020 data since this was the first year where there is enough data to undertake a robust analysis. Starting with 8429 companies retrieved from the Asset4 database, we excluded 594 companies in the real estate sector and 1178 companies in the finance industry. This left us with a sample of 6657 firms. Within this sample, data pertaining to support for the SDGs was only available for 4657 firms, which decreased to 4417 firms once we accounted for missing values.

The dependent variables indicate a firm's support for different environmental SDGs. Refinitiv's analysts investigate whether a specific company has declared actions that support a specific SDG, assigning 1 to a dummy variable in case of support, and 0 otherwise. We selected SDGs from the Agenda 2030 framework, which highlights pollution, emissions, waste, and climate change as critical environmental challenges. In addition, the United Nations also highlights that intensive production activities and human installations are stressing ecosystems in terms of both biodiversity and animal species. A more specific indication is found in the report that measures each country's progress towards the 2030 Agenda. Here, SDGs are divided based on their goals: People, Planet, Prosperity, and Peace and Partnership. Namely, Agenda 2030 identifies the following goals in the Planet category: SDG 6 (Clean water and sanitation), SDG 12 (Responsible consumption and production), SDG 13 (Climate action), SDG 14 (Life below water), and 15 (Life on land). We decided to add SDGs 7 and 11, which relate to Affordable and Clean Energy and Sustainable Cities and Communities, respectively (OECD, 2019).

Our next step was to build an index to measure the aggregated level of support for each SDG, with the goal being to analyse corporate commitment to the SDGs on a global scale. With this index, we measured support related to production, emissions, energy generation, and biodiversity, in addition to the individual SDGs (OECD, 2019; United Nations, 2015). The Environmental SDG Index is a ratio between the number of SDGs a firm supports over the total number of environmental SDGs considered. It can therefore range from 0 to 1 depending on a firm's share of contribution towards the SDGs.

The independent variables were the BoD characteristics: board size (B_SIZE), the share of female board members (GENDER), the share of independent directors (INDEP), and CEO

duality (DUALITY)—a dummy taking the value 1 if the CEO is or has also been the chair in the past, and 0 otherwise.

We also included several firm-specific factors as control variables. These variables relate to firm profitability (ROA), market to book ratio (MTBV), the firm's financial risk (LEVERAGE), and firm size, proxied as the natural logarithm of total assets in Euros (F_SIZE). We also controlled for industry and country-specific fixed effects. Table 1 shows a description of all variables included in the statistical analysis.

3.2 | Methodology

We began with a fractional regression model of the Env_SDG Index values. This methodology is appropriate when a variable takes a value between 0 and 1, such as our index does (Papke & Wooldridge, 1996). We proceeded to focus on the specific SDGs through a set of Logit regressions, controlling for firm-specific factors in all models (Endrikat et al., 2014) along with industry and country-specific fixed effects. The independent variables were one year lagged.

Model 1 was estimated with fractional regression, while Model 2 was estimated with a Logit specification.

$$\text{Model 1: Environmental SDG Index}_i = \beta_0 + \beta_1 B_SIZE_i + \beta_2 GENDER_i + \beta_3 INDEP_i + \beta_4 DUALITY_i + \beta_5 ROA_i + \beta_6 MTBV_i + \beta_7 LEVERAG_i + \beta_8 F_SIZE_i + INDUSTRY_i + COUNTRY_i + \epsilon_i$$

$$\text{Model 2: Pr}(SDG_n \text{ Support} = 1) = \beta_0 + \beta_1 B_SIZE_i + \beta_2 GENDER_i + \beta_3 INDEP_i + \beta_4 DUALITY_i + \beta_5 ROA_i + \beta_6 MTBV_i + \beta_7 LEVERAGE_i + \beta_8 F_SIZE_i + INDUSTRY_i + COUNTRY_i + \epsilon_i$$

4 | RESULTS

4.1 | Descriptive statistics

Descriptive statistics of the variables are provided in Tables 2, and 3 shows the correlation matrix. To control for the presence of outliers, ROA, MTB, and leverage were winsorised at the 5th and 95th percentile levels.

The results suggest that SDGs 12 (Responsible consumption and production) and 13 (Climate Action) are the most considered by firms when deciding on which actions to support. Conversely, SDG 14 (Life below water) is much less frequently supported. In terms of absolute numbers, this might be related to the sectoral characteristics of the firms in the analysis. Not all industries have the potential to implement environmental practices that help to preserve marine and water ecosystems, leaving a number of companies that are structurally unable to contribute to this SDG.

In terms of the board's characteristics, Table 2 shows that the average board size was 9. We also observe that one-fifth of the board members are female, and more than half are classified as independent directors. Further, the CEO is also the chair in 34% of the sample firms. *T*-tests between SDG supporters and non-supporters (reported in the Appendix A; Tables A1–A3) suggest that SDG supporters tend to be larger, are often more indebted, and are more profitable

TABLE 1 Description of the variables.

Variable	Variable type	Variable description
Environmental SDG Index	Dependent	Percentage of identified environmental SDGs supported by a firm in the year 2020. This ratio has been constructed for the purposes of this research.
SDG 6	Dependent	Clean water and sanitation. A binary variable: 0 indicates a lack of support; 1 indicates support.
SDG 7	Dependent	Affordable and clean energy. A binary variable: 0 indicates a lack of support; 1 indicates support.
SDG 11	Dependent	Sustainable cities and communities. A binary variable: 0 indicates a lack of support; 1 indicates support.
SDG 12	Dependent	Responsible consumption and production. A binary variable: 0 indicates a lack of support; 1 indicates support.
SDG 13	Dependent	Climate action. A binary variable, whereas the value 0 indicates lack of support and 1 indicates support.
SDG 14	Dependent	Life below water. A binary variable: 0 indicates a lack of support; 1 indicates support.
SDG 15	Dependent	Life on land. A binary variable: 0 indicates a lack of support; 1 indicates support.
B_SIZE	Independent	Board size is measured as the total number of board members at the end of the fiscal year.
GENDER	Independent	Gender diversity is measured as the percentage of female board members as a share of total board members
INDEP	Independent	Independent board members is measured as the percentage of independent board members as a share of total board members
DUALITY	Independent	CEO duality equals 1 if the CEO simultaneously chairs the board or if the chair of the board has been CEO of the company in the past, and 0 otherwise.
ROA	Control	To control for a firm's profitability, we used return on asset, calculated as net income on total assets.
MTBV	Control	The market to book value is calculated as a firm's listed equity value divided by the firm's accounting book value.
LEVERAGE	Control	To control for a firm's financial risk, we employed leverage, calculated as total debt over total equity.
F_SIZE	Control	Firm size was calculated as the natural logarithm of total assets in Euros.
Sector Dummy Variable	Control	Firm sector was identified via the Refinitiv Database and excludes real estate and financial companies.
Country Dummy Variable	Control	Firm sector dummy variables as defined by the "Nation" field in Refinitiv are used to control for industry-specific fixed-effects.

compared to firms who do not implement practices aimed at supporting the SDGs. In addition, this preliminary evidence suggests that the boards of these firms are larger and have a significantly lower share of independent members.

The correlation table shows a strong relationship among all SDGs. The average correlation is 0.57, ranging from a minimum of 0.44 between SDG 11 (Sustainable cities and communities) and SDG 14 (Life below water) to a maximum of 0.80 between SDG 12 (Responsible consumption and production) and SDG 13 (Climate action). It is also worth noting the high correlation between board size and firm size, which was expected.

Before delving into the regression models, we explored the dataset to understand how support for these SDGs was distributed through our sample. Our sample is global, with around one-third of firms located in the United States. (Industry and country data are reported in the Appendix A.) Further, from Figure 1, which shows the share of support for specific SDGs by industry sector, we observed that the highest percentage of firms supporting these environmental SDGs is in utilities (47%) and chemicals (43%). Focusing on specific SDGs, we also observed the highest level of support for SDGs 12 (Responsible consumption and production) and 13 (Climate action) in the utility sector, at 69% and 73%, respectively.

Figure 2 shows the average number of firms declaring support for any SDG on a country basis. We observed that firms in the European

Union, Brazil, Mexico and South-East Asia exhibit a higher share of support for the SDGs than other areas of the world. Unexpectedly, we also see high levels of support for the SDGs by companies in the territory of Russia.

4.2 | Regression models

The results of the fractional and logistic regressions are reported in Table 4. The mean VIF values for all regressions are reported at the bottom of the table. These range from 2.60 and 4.45, which are all well below the recommended value of 10, suggesting that multicollinearity should not be an issue in our results (Tibiletti et al., 2021).

The findings show a picture consistent with the idea that board characteristics play a relevant role in whether or not a firm supports environmental SDGs (Column1). The results also suggest that board size, gender diversity, and board independence are all correlated to a higher likelihood of support for the environmental SDGs, whereas CEO duality is not statistically significant.

Among the control variables, only firm size (F_SIZE) and profitability (ROA) are statistically significant, and both are positively correlated with the likelihood of supporting the environmental SDGs. This confirms previous empirical evidence suggesting that the larger and more profitable firms, *ceteris paribus*, have more resources with which to

TABLE 2 Descriptive statistics.

Variable	Mean	Standard deviation	Min	Max	Observations
Env_SDG Index	0.25	0.34	0.00	1.00	4417
SDG 6	0.21	0.41	0.00	1.00	4417
SDG 7	0.27	0.45	0.00	1.00	4417
SDG 11	0.22	0.42	0.00	1.00	4417
SDG 12	0.35	0.48	0.00	1.00	4417
SDG 13	0.37	0.48	0.00	1.00	4417
SDG 14	0.14	0.35	0.00	1.00	4417
SDG 15	0.20	0.40	0.00	1.00	4417
B_SIZE	9.33	2.96	2.00	29.00	4417
GENDER	20.49	13.85	0.00	80.00	4417
INDEP	60.75	25.04	0.00	100.00	4417
DUALITY	0.33	0.47	0.00	1.00	4417
ROA	0.04	0.09	-0.25	0.18	4417
MTB	2.75	2.46	0.23	9.90	4417
LEVERAGE	0.93	1.03	0.00	3.56	4417
Log Total Assets	14.70	1.72	4.22	19.99	4417

Note: The performance and board-related variables are 1-year lagged.

implement environmental practices and that receive more external pressure to disclose the practices they do implement (Drempetic et al., 2020).

The Logit models shown in Table 4 suggest that board size is generally a positive and significant determinant of the support of environmental SDGs. This result was particularly strong for SDGs 11 (Sustainable cities and communities), 12 (Responsible consumption and production), and 13 (Climate action), (Columns 4–6). In coherence with the theoretical predictions of resource-dependence theory, these estimates support H1, confirming that larger boards provide firms with a broader set of perspectives, including the importance of establishing environmental strategies and participating in globally agreed goals. This finding is also in line with the previous literature documenting that board size has a positive effect on environmental disclosure and practices (Chams & García-Blandón, 2019; Frias-Aceituno et al., 2014; Nicolò et al., 2021; Ntim & Soobaroyen, 2013). It also extends the few results there are that focus on SDGs (García-Sánchez et al., 2020; Pizzi et al., 2021; Zampone et al., 2022).

The percentage of female directors is the board characteristic with the highest statistical significance for all the SDGs examined (excluding SDG 14 (Life below water), which has a positive but insignificant coefficient). This result suggests that more women on the board is associated with a higher probability of supporting the environmental SDGs, confirming hypothesis H2. This result is not only in line with our theoretical prediction, but it also strengthens the idea that women positively contribute to our transition to a sustainable society within the boardroom (Byron & Post, 2016; Post et al., 2015). These results also support the predictions of resource-dependence theory, highlighting the impact of board diversity on setting a firm's sustainability agenda. They also support previous evidence documenting that gender diversity has a positive impact on SDG support and disclosure (Pizzi et al., 2021; Zampone et al., 2022).

The share of independent directors is also positively correlated to support for the environmental SDGs since it significantly impacts the probability that a firm will support SDG 6 (Clean water and sanitation), SDG 7 (Affordable and clean energy), SDG 11 (Sustainable cities and communities), SDG 12 (Responsible consumption and production) and SDG 13 (Climate action). These results suggest that independent directors have a long-term perspective. They increase the effectiveness of monitoring and improve the firm's public image by increasing the firm's contribution to global environmental standards. Our results confirm our expectations as outlined in H3 and are in line with evidence that a higher share of independent directors is linked to increased sustainability-related alliances. Greater numbers of independent directors could be related to the selection of long-term value-creating projects (Burke & Logsdon, 1996; Post et al., 2015).

Last, H4 suggests a negative relationship between SDG support and CEO duality. However, the results in Table 4 show that CEO duality is not a significant determinant of support for the environmental SDGs overall nor for any single SDG. This evidence therefore does not support the notion that CEO duality increases conflict within the BoD, or that it leads to a lower likelihood of SDG support (Cerbioni & Parbonetti, 2007; Fama & Jensen, 1983). This finding adds evidence to the very limited literature on CEO duality and how concentrations of power impact corporate support for the SDGs (Martinez-Ferrero & Garcia-Meca, 2020).

5 | DISCUSSION

In this paper, we investigated the relevance of four board characteristics as drivers in a firm's decision to support any and all of seven environmental SDGs. Our results suggest that board size is a positive and significant determinant in such decisions and, more specifically, in



TABLE 3 Correlation matrix of variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
SDGs	(1) Env_SDG Index	1.000														
	(2) SDG 6	0.779*	1.000													
	(3) SDG 7	0.839*	0.629*	1.000												
	(4) SDG 11	0.754*	0.492*	0.600*	1.000											
	(5) SDG 12	0.846*	0.590*	0.659*	0.558*	1.000										
	(6) SDG 13	0.861*	0.573*	0.680*	0.595*	0.797*	1.000									
	(7) SDG 14	0.695*	0.483*	0.493*	0.442*	0.460*	0.491*	1.000								
	(8) SDG 15	0.793*	0.593*	0.584*	0.515*	0.569*	0.584*	0.633*	1.000							
Firm	(9) ROA	0.147*	0.117*	0.124*	0.098*	0.155*	0.152*	0.062*	0.094*	1.000						
	(10) MTB	-0.118*	-0.071*	-0.103*	-0.107*	-0.073*	-0.113*	-0.095*	-0.101*	0.102*	1.000					
	(11) LEVERAGE	0.062*	0.023	0.052*	0.060*	0.052*	0.063*	0.049*	0.044*	-0.096*	0.050*	1.000				
	(12) F_SIZE	0.412*	0.296*	0.358*	0.322*	0.348*	0.398*	0.260*	0.299*	0.289*	-0.198*	0.204*	1.000			
Board	(13) B_SIZE	0.291*	0.216*	0.249*	0.238*	0.252*	0.272*	0.175*	0.204*	0.123*	-0.079*	0.109*	0.511*	1.000		
	(14) GENDER	0.056*	0.022	0.021	0.011	0.097*	0.105*	0.008	0.029*	0.052*	0.090*	0.072*	0.054*	0.060*	1.000	
	(15) INDEP	-0.167*	-0.097*	-0.152*	-0.142*	-0.143*	-0.138*	-0.121*	-0.138*	-0.096*	0.142*	0.073*	-0.066*	-0.147*	0.309*	1.000
	(16) DUALITY	-0.060*	-0.021	-0.052*	-0.044*	-0.066*	-0.067*	-0.032*	-0.045*	0.023	0.073*	0.035*	0.070*	0.035*	0.130*	1.000

*p < 0.1, **p < 0.05, ***p < 0.01.

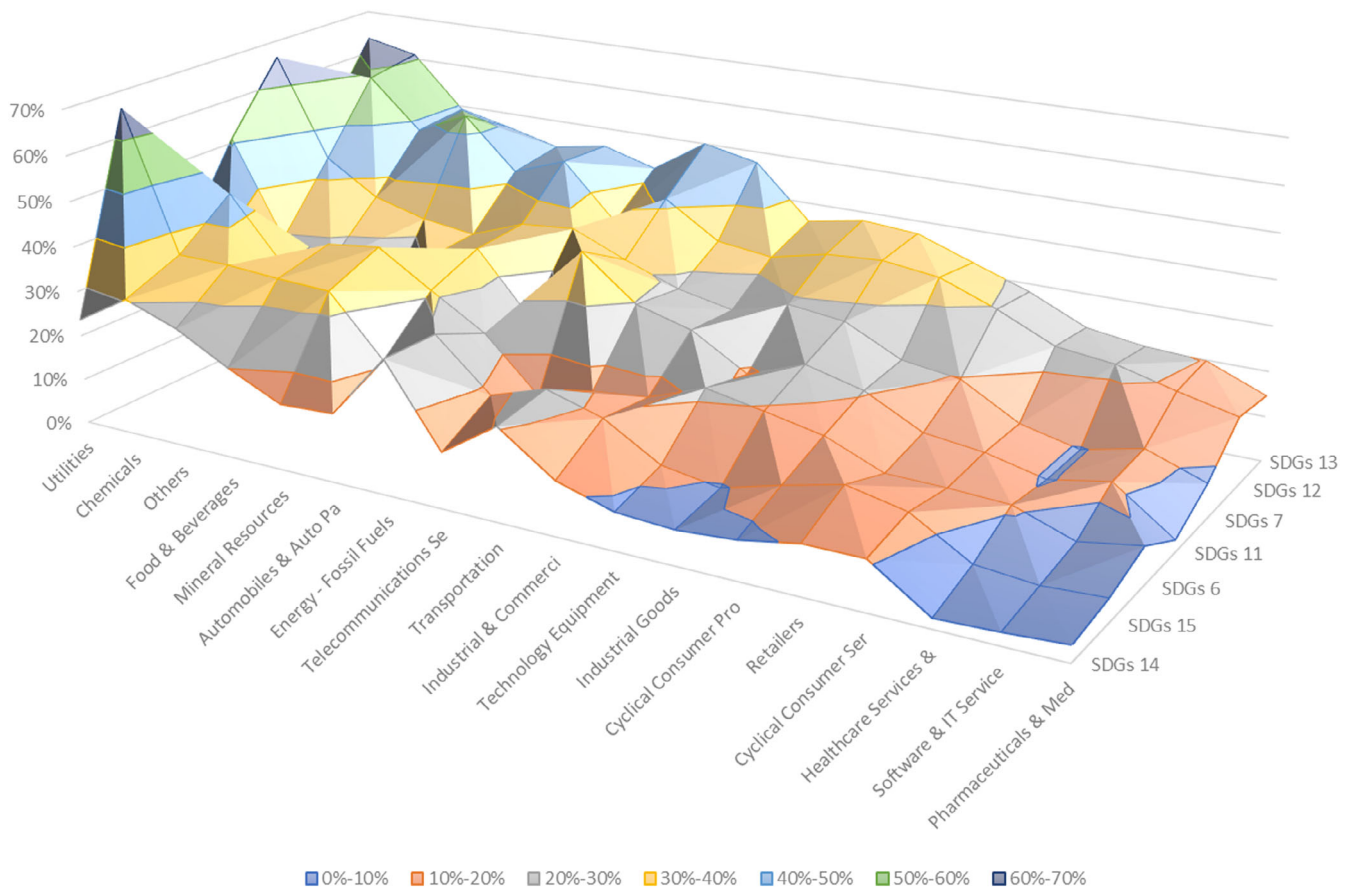


FIGURE 1 Percentage of support to specific SDGs, by sector.

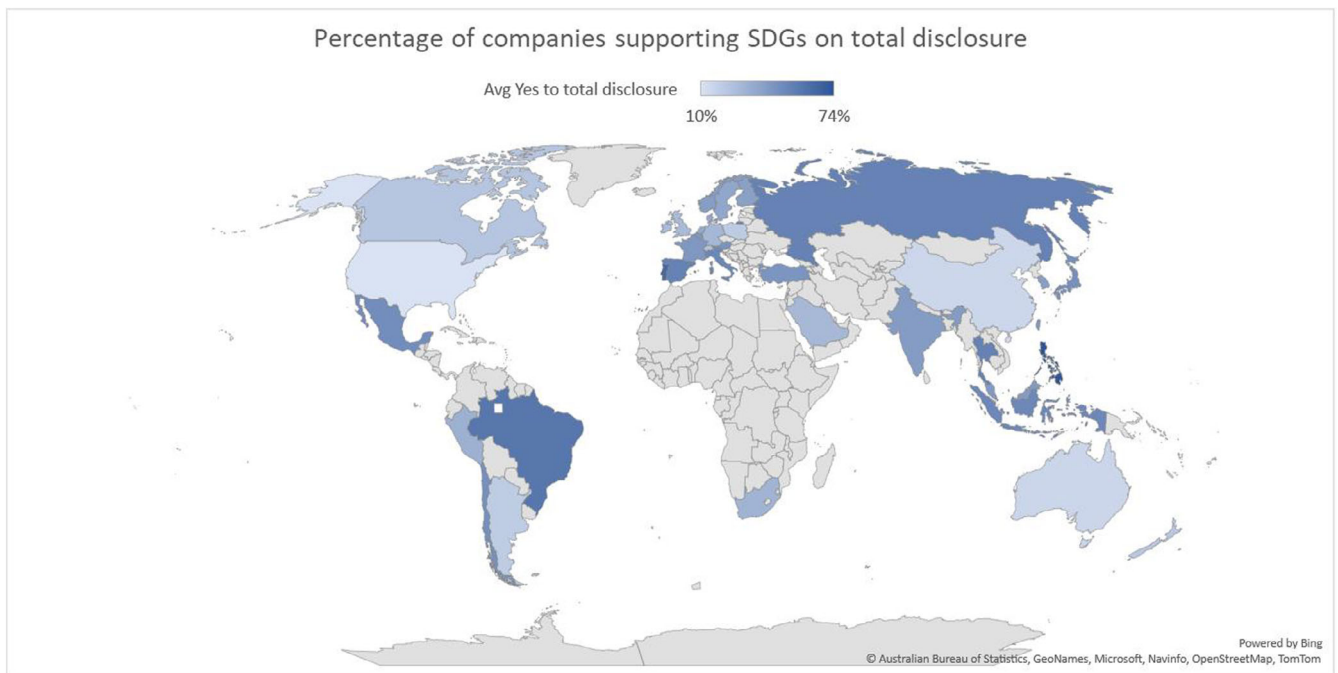


FIGURE 2 World distribution of the average support for SDGs on the total number of disclosing firms.

TABLE 4 Logistic and fractional regression.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Environmental SDG Index	SDG 6 Clean Water and Sanitation	SDG 7 Affordable and Clean Energy	SDG 11 Sustainable Cities and Communities	SDG 12 Responsible Consumption and Production	SDG 13 Climate Action	SDG 14 Life Below Water	SDG 15 Life on Lands
BSIZE	0.023* (0.012)	0.030* (0.018)	0.027 (0.017)	0.040** (0.018)	0.048*** (0.017)	0.047*** (0.017)	0.002 (0.020)	-0.013 (0.018)
GENDER	0.011*** (0.003)	0.011** (0.004)	0.011*** (0.004)	0.010** (0.004)	0.011*** (0.004)	0.015*** (0.004)	0.008 (0.005)	0.013*** (0.004)
INDEP	0.005*** (0.002)	0.006** (0.003)	0.005** (0.003)	0.007** (0.003)	0.006** (0.002)	0.008*** (0.002)	0.004 (0.003)	0.001 (0.003)
DUALITY	0.105 (0.069)	0.105 (0.103)	0.105 (0.100)	0.085 (0.103)	0.127 (0.094)	0.152 (0.095)	0.087 (0.121)	0.096 (0.109)
ROA	1.172** (0.494)	1.809** (0.769)	1.069 (0.727)	1.191 (0.794)	1.066* (0.626)	1.242* (0.655)	0.820 (0.950)	1.249 (0.820)
MTBV	0.025 (0.015)	0.033 (0.023)	0.038* (0.022)	0.020 (0.023)	0.037* (0.020)	0.025 (0.020)	-0.000 (0.029)	0.026 (0.025)
LEVERAGE	0.004 (0.033)	-0.021 (0.050)	-0.002 (0.048)	0.026 (0.049)	0.031 (0.044)	-0.021 (0.045)	0.019 (0.057)	-0.047 (0.052)
F_SIZE	0.485*** (0.026)	0.508*** (0.038)	0.551*** (0.037)	0.454*** (0.038)	0.555*** (0.036)	0.639*** (0.037)	0.476*** (0.044)	0.545*** (0.040)
Constant	-22.20*** (1.617)	-11.037*** (0.605)	-10.986*** (0.576)	-10.817*** (0.606)	-11.940*** (0.568)	-12.918*** (0.587)	-9.668*** (0.682)	-10.638*** (0.622)
Industry effect	Y	Y	Y	Y	Y	Y	Y	Y
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
N. of Observations	4417	4417	4417	4417	4417	4417	4417	4417
Pseudo R-squared	0.221	0.231	0.273	0.236	0.282	0.312	0.234	0.260
Mean VIF	4.45	2.57	2.55	2.60	2.60	2.60	2.58	2.57

Note: This table presents the results of fractional and logistic regression of the relationship between the support of environmental SDGs and a firm's corporate governance characteristics. Control variables Return on Assets, Market to Book Value, Leverage, and Natural Logarithm of Total Assets were included in all models runs. The notation *, ** and *** indicate statistical significance at 1% and 5%, and 10% levels, respectively. The standard errors are reported in parentheses below the coefficients of the respective independent variables. VIF stands for variance inflation factor.

terms of a board's decision to support SDGs 11 (Sustainable cities and communities), 12 (Responsible consumption and production), and 13 (Climate action). These results accord with resource-dependence theory in that larger boards have a more comprehensive set of viewpoints and, so, are likely to consider a broader set of external issues and stakeholder needs (Chams & García-Blandón, 2019).

We also find that gender diversity on a board is a significant determinant of a firm's support for the environmental SDGs overall and for each particular SDG we tested, except for SDG 14 (Life below water). Therefore, women seem particularly aware of the importance of their firms' contributions to the fight against climate change and to our transition towards a more sustainable society (Byron & Post, 2016). Our results suggest that their presence in the boardroom favours widespread support for the SDGs.

The share of independent directors is also positively and significantly correlated to a higher share of support for the environmental SDGs. This characteristic positively impacts the probability of

supporting SDGs 6 (Clean water and sanitation), 7 (Affordable and clean energy), 11 (Sustainable cities and communities), 12 (Responsible consumption and production), and 13 (Climate action). These findings are in line with resource-dependence theory and the idea that the independent position of non-executive directors leads them to be more sensitive to the importance of global initiatives and supporting globally agreed goals as a way of increasing the firm's reputational value.

Conversely, we do not find any evidence that CEO duality leads to a lower likelihood of SDG support.

An interesting pattern that emerged from our results is the concentration of board characteristics (e.g. board size, gender diversity, and independent directors) related to the support of SDGs 6 (Clean water and sanitation), 7 (Affordable and clean energy), 11 (Sustainable cities and communities), 12 (Responsible consumption and production) and 13 (Climate action). Conversely, SDGs 14 (Life below water) and 15 (Life on land) seem to be less correlated with board



characteristics. We argue that this is because these goals have less to do with business. That is, it may be rather difficult for companies to contribute to these SDGs through measures that also provide the company with short-term benefits, such as better efficiency or greater profitability. If we do not consider the occurrence that a firm is taking a 'box ticking' approach, it may not be easy to support an SDG because of the intrinsic nature of that SDG. Indeed, it is more likely the case that boards are more focused on implementing strategies that also provide immediate economic benefits. These five SDGs might offer win-win strategies that are easier to spot and, therefore, they become likely targets of a firm's strategies. For instance, some of these SDGs are linked to increased production or waste disposal efficiency, which provides an opportunity for firms to do good while doing well. Conversely, SDGs 14 (Life Below Water) and 15 (Life on Land) are more focused on dimensions that are external to the firm's core activities and might not offer desirable opportunities for reducing costs. For the company, any actions to support these goals is likely to mainly result in improvements to the external perceptions of the firm, not in reduced costs or higher profits.

Along these lines, it is noteworthy that, although the majority of studies tend to consider SDGs at an aggregate level (Martinez-Ferrero & Garcia-Meca, 2020), some differences persist in a few granular studies. Recent evidence suggests that, through managing the interactions between SDGs, firms can reduce their social and environmental impacts (van Zanten & van Tulder, 2021). In the specific case of SDGs 14 and 15, the descriptive and survey-based research findings highlight that support and expenditure for these SDGs is the lowest of all the environmental priorities (Diaz-Sarachaga, 2021; Izzo et al., 2020; Poddar et al., 2019). This observation has also been confirmed by other empirical studies that concentrate on the differences between the SDGs. The indication is that firms could, in fact, be more willing to invest in projects connected to specific SDGs (Poddar et al., 2019). Among these studies, Diaz-Sarachaga (2021) created a framework to select and weigh the most relevant SDG performance indicators from a company perspective. He highlights that a few SDG KPIs receive a substantially higher weight, especially climate change management and environmentally sound technologies. This is in contrast to the lower weights assigned to research on the aquatic environment. Similar conclusions have been reached by Manes-Rossi and Nicolo (2022), who investigated European companies operating in the energy sector. They find that companies devoted a higher level of attention to SDGs 7 (Affordable and clean energy), 12 (Responsible consumption and production) and 13 (Climate action), which are more pertinent to the specific business activities of these companies. On the other side of the coin, the SDGs with a more macroeconomic dimension are less likely to be supported by companies. Rather, companies tend to adopt a 'cherry picking' strategy (Heras-Saizarbitoria et al., 2021).

As a final note, we developed our theoretical framework based on resource-dependence theory, but it is important to highlight that different perspectives could be adopted. Among these, agency theory (Jensen, 1986) has often been used to look at these relationships. An agency perspective contrasts with the predictions dictated by resource-dependence theory in terms of board size but accords in

terms of board independence (Burke & Logsdon, 1996) and CEO duality (Cerbioni & Parbonetti, 2007; Fama & Jensen, 1983), with the former finding significant evidence in our sample.

6 | CONCLUSION

Worldwide, companies are subject to societal pressures to support our shift to a more sustainable way of living, and expectations are high that corporations should participate in the global initiatives launched to help make our world a better place. Among these initiatives, Agenda 2030 and the SDGs are playing a prominent role. However, to ensure the most effective involvement of these firms in this huge transformation process, it is imperative to identify the factors that increase support for the SDGs and what drives them to adopt sustainable practices generally. Since the SDGs include a variety of dimensions, we believe that valuable insights can be obtained by concentrating on specific thematic areas. In this paper, we chose to focus on the SDGs pertaining to the environment. To this literature, we contribute the first cross-sectional analysis of a large global sample of firms. Our dataset included information from the year 2020 on corporate contributions made to the seven environmental SDGs. While limiting in some respects, working with very recent data did provide us with the opportunity to produce the first evidence of some of the determinants of specific environmental SDGs.

We find that board size, gender diversity, and board independence are all significantly correlated to support for the environmental SDGs. However, we also observe some overall differences in corporate support for specific SDGs. Indeed, our results suggest that board characteristics mainly impact the SDGs related to practices that are closely connected to a firm's profitability and efficiency, such as clean energy production, climate change and sustainable development. Conversely, board characteristics are not related to the SDGs that are further away from the core activities corporations are typically associated with.

6.1 | Theoretical implications

The study contributes to the academic debate in several ways. First, our results provide new evidence that can strengthen how we look at board features through resource-dependence theory. Board size, gender diversity, and independence are all features that characterise boards. Larger boards, women and independent directors are all shown to be more aware of the importance of introducing environmental practices while at the same time bolstering the public image of the firm by supporting globally agreed standards. This is in line with previous findings that some of these characteristics are associated with an increased likelihood to disclose a firm's contribution to the SDGs (Martinez-Ferrero & Garcia-Meca, 2020; Nicolò et al., 2022; Orazalin, 2019; Raimo et al., 2022; Zampone et al., 2022)

Second, this study adds to the great body of research on integrating sustainability issues into organisations (Bianchi et al., 2022;

Naciti, 2019; Provasi & Harasheh, 2021), which have proven to be perhaps too simplistic in representing the dynamics behind including environmental issues in strategic decisions. Our study, which is based on the multifaceted concept of SDGs, offers a new lens on how board characteristics can support environmental issues within an organisation. Our analysis reveals that this positive relationship is only really confirmed for the environmental issues that are likely to generate a short-term benefit for the firm – for example, financial savings or enhancing the firm's reputation. We found no relevant effects for issues relating to the medium- to long-term benefits of preserving the environment. Thus, we conclude that supporting these environmental SDGs relates to greater profit or legitimacy dynamics or both. These temporal trade-offs (Slawinski et al., 2017) and tensions related to short- and long-term benefits (Kim et al., 2019; Slawinski & Bansal, 2015) emphasise that boards have not yet overcome a win-win logic. On the contrary, this is still an open issue.

Finally, this study sheds light on the peculiarity of the relationship between business and biodiversity, represented by SDGs 14 (Life below water) and 15 (Life on land), which is characterised by impact and dependence (Panwar et al., 2022; Winn & Pogutz, 2013). The evidence shows that the main relationship between board characteristics and the SDGs does not apply to the SDGs for biodiversity. This underlines that boards are not yet fully aware of how the issue of biodiversity can influence corporate operations. Nor it seems is this a salient issue for the institutional investors that influence strategic decisions.

6.2 | Practical implications

Our results also have several implications for investors, managers, and policymakers. Many firms have quickly recognised the need to participate in the global discourse on achieving a more sustainable world. Yet, operationalising this participation, in large part, requires implementing environmentally-sustainable practices, which, from a 'tone from the top' perspective, must necessarily be driven by board decisions. Investors and shareholders vote to elect board members and more and more of these voters are factoring in the contributions a firm has made towards meeting goals of sustainability. Hence, investors and shareholders need to consider that specific board characteristics are significantly linked to whether or not a firm actively contributes to meeting the environmental SDGs. Our results provide guidelines for voting on board compositions as a way for shareholders to help push forward society's transition to sustainability.

Further, policymakers in many countries have made sustainability one of the top priorities in their agenda. This is especially relevant when looking at corporate governance codes that provide guidelines to strengthen a board's functions by improving its diversity. The topic of gender diversity in board representation, for example, has been on the agenda of policymakers in the EU and other countries such as Australia for over a decade. Our analysis provides evidence that more women on a board likely translates to greater corporate support for the SDGs. Moreover, firms with better performance in sustainability have been generally found to experience reduced financial risk and

increased financial performance. Hence, promoting board regulations that support sustainability themes can benefit long-term investors and contribute to the well-being of society. Our results should inform policymakers that paths undertaken to increase diversity are potentially fruitful if the aim is to contribute to the environmental health of our planet.

However, our evidence also shows that more diverse or larger boards is not a straightforward path to unconditional contributions to the SDGs. We show that these characteristics only seem to only increase the likelihood of support for the SDGs that are either easily implemented or those that increase efficiency and/or profitability (Heras-Saizarbitoria et al., 2021; Manes-Rossi & Nicolo, 2022). This might be related to the nature of how SDGs are designed and to the internal incentives provided to board members, which tend to favour short-term gains. Either way, policymakers should take this into account and expectations over the firms' contributions should be adjusted accordingly. This leaves open the opportunity to redesign policy objectives where necessary.

6.3 | Limitations and future research

Our study has limitations and could be developed through further analysis. First, we have tried to explain the impact of the board on specific environmental SDGs, discussing their interconnectedness and investigating the relationships revealed from a granular perspective. However, future research might try to further investigate the SDGs with a more holistic view through an empirical analysis explicitly aimed at understanding if managers and directors are aware of the different environmental dimensions where their firms can have an impact. Or do they simply support the SDGs with the mere objective to 'tick boxes'? It could also be interesting to analyse the moderating effects of a firm's decision to support each SDG. Do the opinions of citizens or other stakeholders matter in terms of the priority with which the environmental SDGs are addressed? External pressure to support the SDGs could give rise to different decisions depending on the board's characteristics. Hence, it could be interesting to assess the conditions that induce boards to be more responsive to sustainability targets.

In addition, as suggested by recent evidence (Zampone et al., 2022), the board mechanisms and characteristics necessarily imply a certain level of interdependence that might impact the effectiveness of certain combination of board features. Therefore, future research might concentrate on investigating how different combinations of board features, for example larger and more independent boards, impact the probability of supporting the SDGs.

Moreover, although the Refinitiv Asset4 data is recognised as one of the most common sources of high-quality data, we realise that estimating support for a multidimensional concept, such as an SDG, using only a dummy variable might understate/overstate the actual measures implemented, exposing the study to measurement errors. Our concern is motivated by recent studies that highlight the existence of symbolic gestures behind SDGs reporting, with firms often not providing many details on how specific SDGs were operationalised (Nicolò

et al., 2022). Furthermore, the usual concerns over endogeneity issues apply here as well, and we suggest a cautious interpretation of the causality links between board characteristics and support for the SDGs. The evidence of a significant correlation might in fact be linked to missing or unobservable variables, and coefficients could also be influenced by a significant correlation among independent variables. Even if in our research design certain endogeneity problems might be unlikely – for example, support of an SDG seems hardly able to influence a board's structure – the simple use of lagged values for the board characteristics could be biased since we are not able to control empirically for reverse causality. Therefore, future research could introduce more advanced methodologies to control for the potential confoundedness between board characteristics and the practice of supporting the SDGs, such as dynamic panel data.

Finally, some other board characteristics, such as the presence of sustainability committees or board attendance in relation to SDG support, the ownership structure or the presence of institutional investors, could be examined in future research endeavours.

ORCID

Jonathan Tagliatalata  <https://orcid.org/0000-0002-0921-8204>

Francesco Testa  <https://orcid.org/0000-0003-4494-8146>

REFERENCES

- Adams, C. A. (2017). Conceptualising the contemporary corporate value creation process. *Accounting, Auditing & Accountability Journal*, 30(4), 906–931. <https://doi.org/10.1108/Aaaj-04-2016-2529>
- Aguilera, R. V., Aragon-Correa, J. A., Marano, V., & Tashman, P. A. (2021). The corporate governance of environmental sustainability: A review and proposal for more integrated research. *Journal of Management*, 47(6), 1468–1497. <https://doi.org/10.1177/0149206321991212>
- Alda, M. (2019). Corporate sustainability and institutional shareholders: The pressure of social responsible pension funds on environmental firm practices. *Business Strategy and the Environment*, 28(6), 1060–1071. <https://doi.org/10.1002/bse.2301>
- Arayssi, M., Dah, M., & Jizi, M. (2016). Women on boards, sustainability reporting and firm performance. *Sustainability Accounting Management and Policy Journal*, 7(3), 376–401. <https://doi.org/10.1108/Sampj-07-2015-0055>
- Bansal, P., Grewatsch, S., & Sharma, G. (2021). How COVID-19 informs business sustainability research: It's time for a systems perspective. *Journal of Management Studies*, 58(2), 602–606. <https://doi.org/10.1111/joms.12669>
- Bezemer, P. J., Pugliese, A., Nicholson, G., & Zattoni, A. (2022). *Toward a synthesis of the board-stakeholder relationship: A literature review and future research agenda*. An International Review, In press. <https://doi.org/10.1111/corg.12481>
- Bianchi, G., & Testa, F. (2022). How can SMEs effectively embed environmental sustainability? Evidence on the relationships between cognitive frames, life cycle management and organizational learning process. *Business Ethics, the Environment & Responsibility*, 31(3), 634–648. <https://doi.org/10.1111/beer.12432>
- Bianchi, G., Testa, F., Tessitore, S., & Iraldo, F. (2022). How to embed environmental sustainability: The role of dynamic capabilities and managerial approaches in a life cycle management perspective. *Business Strategy and the Environment*, 31(1), 312–325. <https://doi.org/10.1002/bse.2889>
- Burke, L., & Logsdon, J. M. (1996). How corporate social responsibility pays off. *Long Range Planning*, 29(4), 495–502. [https://doi.org/10.1016/0024-6301\(96\)00041-6](https://doi.org/10.1016/0024-6301(96)00041-6)
- Byron, K., & Post, C. (2016). Women on Boards of Directors and corporate social performance: A meta-analysis. *Corporate Governance: An International Review*, 24(4), 428–442. <https://doi.org/10.1111/corg.12165>
- Campbell, J. L. (2007). Why would corporations behave in socially responsible ways? An institutional theory of corporate social responsibility. *Academy of Management Review*, 32(3), 946–967. <https://doi.org/10.5465/amr.2007.25275684>
- Cerbioni, F., & Parbonetti, A. (2007). Exploring the effects of corporate governance on intellectual capital disclosure: An analysis of European biotechnology companies. *The European Accounting Review*, 16(4), 791–826. <https://doi.org/10.1080/09638180701707011>
- Chams, N., & García-Blandón, J. (2019). Sustainable or not sustainable? The role of the Board of Directors. *Journal of Cleaner Production*, 226, 1067–1081. <https://doi.org/10.1016/j.jclepro.2019.04.118>
- Chan, M. C., Watson, J., & Woodliff, D. (2014). Corporate governance quality and CSR disclosures. *Journal of Business Ethics*, 125(1), 59–73. <https://doi.org/10.1007/s10551-013-1887-8>
- Cosma, S., Schwizer, P., Nobile, L., & Leopizzi, R. (2021). Environmental attitude in the board. Who are the “green directors”? Evidences from Italy. *Business Strategy and the Environment*, 30(7), 3360–3375. <https://doi.org/10.1002/bse.2807>
- Cuadrado-Ballesteros, B., Martínez-Ferrero, J., & García-Sánchez, I. M. (2017). Board structure to enhance social responsibility development: A qualitative comparative analysis of US companies. *Corporate Social Responsibility and Environmental Management*, 24(6), 524–542. <https://doi.org/10.1002/csr.1425>
- Dahlmann, F., & Grosvold, J. (2017). Environmental managers and institutional work: Reconciling tensions of competing institutional logics. *Business Ethics Quarterly*, 27(2), 263–291. <https://doi.org/10.1017/beq.2016.65>
- Daily, C. M., & Dalton, D. R. (1993). Board of Directors leadership and structure: Control and performance implications. *Entrepreneurship Theory and Practice*, 17(3), 65–81. <https://doi.org/10.1177/104225879301700305>
- Davidson, D. J., & Freudenburg, W. R. (1996). Gender and environmental risk concerns—A review and analysis of available research. *Environment and Behavior*, 28(3), 302–339. <https://doi.org/10.1177/0013916596283003>
- de Abreu, M. C. S., Soares, R. A., Daniel-Vasconcelos, V., & Crisóstomo, V. L. (2022). Does board diversity encourage an environmental policy focused on resource use, emission reduction and innovation? The case of companies in Latin America. *Corporate Social Responsibility and Environmental Management*. In press. <https://doi.org/10.1002/csr.2411>
- Diaz-Sarachaga, J. M. (2021). Monetizing impacts of Spanish companies toward the Sustainable Development Goals. *Corporate Social Responsibility and Environmental Management*, 28(4), 1313–1323. <https://doi.org/10.1002/csr.2149>
- Drempetic, S., Klein, C., & Zwergel, B. (2020). The influence of firm size on the ESG score: Corporate sustainability ratings under review. *Journal of Business Ethics*, 167(2), 333–360. <https://doi.org/10.1007/s10551-019-04164-1>
- Emerson, J. (2003). The blended value proposition: Integrating social and financial returns. *California Management Review*, 45(4), 35–51. <https://doi.org/10.2307/41166187>
- Enciso-Alfaro, S. Y., & García-Sánchez, I. M. (2022). Corporate governance and environmental sustainability: Addressing the dual theme from a bibliometric approach. *Corporate Social Responsibility and Environmental Management*. In press. <https://doi.org/10.1002/csr.2403>
- Endrikat, J., Guenther, E., & Hoppe, H. (2014). Making sense of conflicting empirical findings: A meta-analytic review of the relationship between corporate environmental and financial performance. *European Management Journal*, 32, 735–751. <https://doi.org/10.1016/j.emj.2013.12.004>
- Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *The Journal of Law and Economics*, 26(2), 301–325. <https://doi.org/10.1086/467037>
- Frias-Aceituno, J. V., Rodriguez-Ariza, L., & Garcia-Sanchez, I. M. (2014). Explanatory factors of integrated sustainability and financial reporting.

- Business Strategy and the Environment*, 23(1), 56–72. <https://doi.org/10.1002/bse.1765>
- García-Sánchez, I. M., Rodríguez-Ariza, L., Aibar-Guzmán, B., & Aibar-Guzmán, C. (2020). Do institutional investors drive corporate transparency regarding business contribution to the sustainable development goals? *Business Strategy and the Environment*, 29, 2019–2036. <https://doi.org/10.1002/bse.2485>
- García-Sánchez, I. M., Suárez-Fernández, O., & Martínez-Ferrero, J. (2019). Female directors and impression management in sustainability reporting. *International Business Review*, 28, 359–374. <https://doi.org/10.1016/j.ibusrev.2018.10.007>
- Greenwood, R., Raynard, M., Kodeih, F., Micelotta, E. R., & Lounsbury, M. (2011). Institutional complexity and organizational responses. *Academy of Management Annals*, 5, 317–371. <https://doi.org/10.1080/19416520.2011.590299>
- Hahn, T., Figge, F., Pinkse, J., & Preuss, L. (2018). A paradox perspective on corporate sustainability: Descriptive, instrumental, and normative aspects. *Journal of Business Ethics*, 148(2), 235–248. <https://doi.org/10.1007/s10551-017-3587-2>
- Harjoto, M., Laksmana, I., & Lee, R. (2015). Board diversity and corporate social responsibility. *Journal of Business Ethics*, 132(4), 641–660. <https://doi.org/10.1007/s10551-014-2343-0>
- Heras-Saizarboritia, I., Urbieta, L., & Boiral, O. (2021). Organizations' engagement with sustainable development goals: From cherry-picking to SDG-washing? *Corporate Social Responsibility and Environmental Management*, 29(2), 316–328. <https://doi.org/10.1002/csr.2202>
- Hillman, A. J., Canella, A. A., & Harris, I. C. (2002). Women and racial minorities in the boardroom: How do directors differ? *Journal of Management*, 28(6), 747–763. [https://doi.org/10.1016/s0149-2063\(02\)00192-7](https://doi.org/10.1016/s0149-2063(02)00192-7)
- Hillman, A. J., & Dalziel, T. (2003). Boards of Directors and firm performance: Integrating agency and resource dependence perspectives. *Academy of Management Review*, 28(3), 383–396. <https://doi.org/10.5465/amr.2003.10196729>
- Islam, R., French, E., & Ali, M. (2022). Evaluating board diversity and its importance in the environmental and social performance of organizations. *Corporate Social Responsibility and Environmental Management*, 29(5), 1134–1145. <https://doi.org/10.1002/csr.2259>
- Ivory, S. B., & Brooks, S. B. (2018). Managing corporate sustainability with a paradoxical lens: Lessons from strategic agility. *Journal of Business Ethics*, 148(2), 347–361. <https://doi.org/10.1007/s10551-017-3583-6>
- Izzo, M. F., Ciaburri, M., & Tiscini, R. (2020). The challenge of sustainable development goal reporting: The first evidence from Italian listed companies. *Sustainability*, 12(8), 3494. <https://doi.org/10.3390/su12083494>
- Jaffee, S., & Hyde, J. S. (2000). Gender differences in moral orientation: A meta-analysis. *Psychological Bulletin*, 126(5), 703–726. <https://doi.org/10.1037//0033-2909.126.5.703>
- Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review*, 72, 323–329.
- Jizi, M. (2017). The influence of board composition on sustainable development disclosure. *Business Strategy and the Environment*, 26(5), 640–655. <https://doi.org/10.1002/bse.1943>
- Kaplan, R. S. (2001). Strategic performance measurement and management in nonprofit organizations. *Nonprofit Management & Leadership*, 11(3), 353–370. <https://doi.org/10.1002/nml.11308>
- Kim, A., Bansal, P., & Haugh, H. (2019). No time like the present: How a present time perspective can foster sustainable development. *Academy of Management Journal*, 62(2), 607–634. <https://doi.org/10.5465/amj.2015.1295>
- Manes-Rossi, F., & Nicolo, G. (2022). Exploring sustainable development goals reporting practices: From symbolic to substantive approaches—Evidence from the energy sector. *Corporate Social Responsibility and Environmental Management*, 29(5), 1799–1815. <https://doi.org/10.1002/csr.2328>
- Martínez-Ferrero, J., & García-Meca, E. (2020). Internal corporate governance strength as a mechanism for achieving sustainable development goals. *Sustainable Development*, 28(5), 1189–1198. <https://doi.org/10.1002/sd.2068>
- Michelon, G., & Parbonetti, A. (2012). The effect of corporate governance on sustainability disclosure. *Journal of Management and Governance*, 16(3), 477–509. <https://doi.org/10.1007/s10997-010-9160-3>
- Monteiro, N. B. R., da Silva, E. A., & Moita Neto, J. M. (2019). Sustainable development goals in mining. *Journal of Cleaner Production*, 228, 509–520. <https://doi.org/10.1016/j.jclepro.2019.04.332>
- Musavengane, R. (2019). Small hotels and responsible tourism practice: Hoteliers' perspectives. *Journal of Cleaner Production*, 220, 786–799. <https://doi.org/10.1016/j.jclepro.2019.02.143>
- Naciti, V. (2019). Corporate governance and Board of Directors: The effect of a board composition on firm sustainability performance. *Journal of Cleaner Production*, 237, 117727. <https://doi.org/10.1016/j.jclepro.2019.117727>
- Naciti, V., Cesaroni, F., & Pulejo, L. (2021). Corporate governance and sustainability: A review of the existing literature. *Journal of Management and Governance*, 26(1), 55–74. <https://doi.org/10.1007/s10997-020-09554-6>
- Nicolò, G., Zampone, G., Sannino, G., & De Iorio, S. (2021). Sustainable corporate governance and non-financial disclosure in Europe: Does the gender diversity matter? *Journal of Applied Accounting Research*, 23(1), 227–249. <https://doi.org/10.1108/jaar-04-2021-0100>
- Nicolò, G., Zanellato, G., Tiron-Tudor, A., & Tartaglia Polcini, P. (2022). Revealing the corporate contribution to sustainable development goals through integrated reporting: A worldwide perspective. *Social Responsibility Journal*, 15(5), 829–857. <https://doi.org/10.1108/srj-09-2021-0373>
- Ntim, C. G., & Soobaroyen, T. (2013). Corporate governance and performance in socially responsible corporations: New empirical insights from a neo-institutional framework. *Corporate Governance: An International Review*, 21(5), 468–494. <https://doi.org/10.1111/corg.12026>
- OECD. (2019). *Measuring distance to the SDG targets* (p. 2019). OECD. <https://doi.org/10.1787/a8caf3fa-en>
- Orazalin, N. (2019). Corporate governance and corporate social responsibility (CSR) disclosure in an emerging economy: Evidence from commercial banks of Kazakhstan. *Corporate Governance*, 19(3), 490–507. <https://doi.org/10.1108/Cg-09-2018-0290>
- Pandey, N., Andres, C., & Kumar, S. (2022). Mapping the corporate governance scholarship: Current state and future directions. *Corporate Governance: An International Review*, 31(1), 127–160. <https://doi.org/10.1111/corg.12444>
- Panwar, R., Ober, H., & Pinkse, J. (2022). The uncomfortable relationship between business and biodiversity: Advancing research on business strategies for biodiversity protection. *Business Strategy and the Environment*. In press. <https://doi.org/10.1002/bse.3139>
- Papke, L. E., & Wooldridge, J. M. (1996). Econometric methods for fractional response variables with an application to 401(k) plan participation rates. *Journal of Applied Econometrics*, 11(6), 619–632. [https://doi.org/10.1002/\(SICI\)1099-1255\(199611\)11:6<619::AID-JAE418>3.0.CO;2-1](https://doi.org/10.1002/(SICI)1099-1255(199611)11:6<619::AID-JAE418>3.0.CO;2-1)
- Pizzi, S., Caputo, A., Corvino, A., & Venturelli, A. (2020). Management research and the UN sustainable development goals (SDGs): A bibliometric investigation and systematic review. *Journal of Cleaner Production*, 276, 124033. <https://doi.org/10.1016/j.jclepro.2020.124033>
- Pizzi, S., Rosati, F., & Venturelli, A. (2021). The determinants of business contribution to the 2030 Agenda: Introducing the SDG Reporting Score. *Business Strategy and the Environment*, 30, 404–421. <https://doi.org/10.1002/bse.2628>
- Poddar, A., Narula, S. A., & Zutshi, A. (2019). A study of corporate social responsibility practices of the top Bombay Stock Exchange 500 companies in India and their alignment with the Sustainable Development Goals. *Corporate Social Responsibility and Environmental Management*, 26(6), 1184–1205. <https://doi.org/10.1002/csr.1741>



- Post, C., Rahman, N., & McQuillen, C. (2015). From board composition to corporate environmental performance through sustainability-themed alliances. *Journal of Business Ethics*, 130(2), 423–435. <https://doi.org/10.1007/s10551-014-2231-7>
- Prado-Lorenzo, J. M., & Garcia-Sanchez, I. M. (2010). The role of the Board of Directors in disseminating relevant information on greenhouse gases. *Journal of Business Ethics*, 97(3), 391–424. <https://doi.org/10.1007/s10551-010-0515-0>
- Provasi, R., & Harasheh, M. (2021). Gender diversity and corporate performance: Emphasis on sustainability performance. *Corporate Social Responsibility and Environmental Management*, 28(1), 127–137. <https://doi.org/10.1002/csr.2037>
- Raimo, N., Nicolo, G., Polcini, P. T., & Vitolla, F. (2022). Corporate governance and risk disclosure: evidence from integrated reporting adopters. *Corporate Governance—the International Journal of Business in Society*, 22(7), 1462–1490. <https://doi.org/10.1108/Cg-07-2021-0260>
- Refinitiv. (2021a). Asset4 ESG LSEG. <https://www.refinitiv.com/en/financial-data/company-data/esg-data>
- Refinitiv. (2021b). *Worldscope Company Fundamentals* LSEG. <https://www.refinitiv.com/en/financial-data/company-data/fundamentals-data/worldscope-fundamentals>
- Richardson, B. J. (2009). Keeping ethical investment ethical: regulatory issues for investing for sustainability. *Journal of Business Ethics*, 87(4), 555–572. <https://doi.org/10.1007/s10551-008-9958-y>
- Rosati, F., & Faria, L. G. D. (2019a). Addressing the SDGs in sustainability reports: The relationship with institutional factors. *Journal of Cleaner Production*, 215, 1312–1326. <https://doi.org/10.1016/j.jclepro.2018.12.107>
- Rosati, F., & Faria, L. G. D. (2019b). Business contribution to the Sustainable Development Agenda: Organizational factors related to early adoption of SDG reporting. *Corporate Social Responsibility and Environmental Management*, 26(3), 588–597. <https://doi.org/10.1002/csr.1705>
- Sekarlangit, L. D., & Wardhani, R. (2021). The effect of the characteristics and activities of the Board of Directors on sustainable development goal (SDG) disclosures: Empirical evidence from Southeast Asia. *Sustainability*, 13(14), 8007. <https://doi.org/10.3390/su13148007>
- Silva, S. (2021). Corporate contributions to the Sustainable Development Goals: An empirical analysis informed by legitimacy theory. *Journal of Cleaner Production*, 292, 125962. <https://doi.org/10.1016/j.jclepro.2021.125962>
- Slawinski, N., & Bansal, P. (2015). Short on time: Intertemporal tensions in business sustainability. *Organization Science*, 26(2), 531–549. <https://doi.org/10.1287/orsc.2014.0960>
- Slawinski, N., Pinkse, J., Busch, T., & Banerjee, S. B. (2017). The role of short-termism and uncertainty avoidance in organizational inaction on climate change. *Business & Society*, 56(2), 253–282. <https://doi.org/10.1177/0007650315576136>
- Terjesen, S., Aguilera, R. V., & Lorenz, R. (2015). Legislating a woman's seat on the board: Institutional factors driving gender quotas for Boards of Directors. *Journal of Business Ethics*, 128(2), 233–251. <https://doi.org/10.1007/s10551-014-2083-1>
- Tibiletti, V., Marchini, P. L., Furlotti, K., & Medioli, A. (2021). Does corporate governance matter in corporate social responsibility disclosure? Evidence from Italy in the “era of sustainability”. *Corporate Social Responsibility and Environmental Management*, 28(2), 896–907. <https://doi.org/10.1002/csr.2097>
- United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations.
- van der Waal, J. W. H., & Thijssens, T. (2020). Corporate involvement in Sustainable Development Goals: Exploring the territory. *Journal of Cleaner Production*, 252, 119625. <https://doi.org/10.1016/j.jclepro.2019.119625>
- van Zanten, J. A., & van Tulder, R. (2021). Improving companies' impacts on sustainable development: A nexus approach to the SDGs. *Business Strategy and the Environment*, 30, 3703–3720. <https://doi.org/10.1002/bse.2835>
- Winn, M. I., & Pogutz, S. (2013). Business, ecosystems, and biodiversity: New horizons for management research. *Organization & Environment*, 26(2), 203–229. <https://doi.org/10.1177/1086026613490173>
- Zamponi, G., Nicolò, G., Sannino, G., & De Iorio, S. (2022). Gender diversity and SDG disclosure: the mediating role of the sustainability committee. *Journal of Applied Accounting Research*. In press. <https://doi.org/10.1108/JAAR-06-2022-0151>

How to cite this article: Tagliatalata, J., Pirazzi Maffiola, K., Barontini, R., & Testa, F. (2023). Board of Directors' characteristics and environmental SDGs adoption: an international study. *Corporate Social Responsibility and Environmental Management*, 30(5), 2490–2506. <https://doi.org/10.1002/csr.2499>

APPENDIX A

TABLE A1 Country distribution.

Country	Count	Percentage
United States	1423	32.22%
Europe	1086	24.59%
Japan	321	7.27%
China	307	6.95%
Australia	269	6.09%
Canada	173	3.92%
Hong Kong	82	1.86%
India	82	1.86%
South Africa	78	1.77%
Taiwan	69	1.56%
Korea	58	1.31%
Brazil	54	1.22%
Malaysia	44	1.00%
New Zealand	371	8.40%
Total	4417	100.00%

TABLE A2 Industry distribution.

Industry	Count	Percentage
Industrial goods	348	7.88%
Pharmaceuticals and medical research	322	7.29%
Mineral resources	307	6.95%
Software and IT services	304	6.88%
Industrial and commercial services	300	6.79%
Cyclical consumer services	272	6.16%
Technology equipment	269	6.09%
Energy—fossil fuels	262	5.93%
Food and beverages	256	5.80%
Cyclical consumer products	218	4.94%
Healthcare services and equipment	217	4.91%
Transportation	213	4.82%
Utilities	212	4.80%
Retailers	207	4.69%
Chemicals	159	3.60%
Automobiles and auto parts	130	2.94%
Telecommunications services	127	2.88%
Food and drug retailing	85	1.92%
Applied resources	62	1.40%
Personal and household products and services	55	1.25%
Consumer goods conglomerates	41	<1%
Renewable energy	23	<1%
Academic and educational services	19	<1%
Uranium	7	<1%
Holding companies	2	<1%
Total	4417	100.00%

**TABLE A3** T-test comparing SDG supporters vs non-supporters.

	SDG 6	SDG 7	SDG 11	SDG 12	SDG 13	SDG 14	SDG 15
B_SIZE	1.204*** (9.01)	1.408*** (11.62)	1.528*** (11.55)	1.406*** (12.88)	1.454*** (13.71)	1.282*** (7.63)	1.267*** (9.16)
GENDER	0.334 (0.53)	-0.0115 (-0.02)	-0.310 (-0.49)	1.707** (3.27)	2.051*** (4.04)	-0.0742 (-0.09)	0.0539 (0.08)
INDEP	-4.778*** (-4.19)	-8.225*** (-7.95)	-8.846*** (-7.82)	-6.773*** (-7.22)	-6.715*** (-7.35)	-8.359*** (-5.86)	-8.410*** (-7.15)
DUALITY	-0.0128 (-0.60)	-0.0193 (-0.99)	-0.0203 (-0.95)	-0.0353* (-2.00)	-0.0310 (-1.80)	-0.0211 (-0.78)	-0.0267 (-1.20)
ROA	0.0214*** (5.07)	0.0188*** (4.89)	0.0162*** (3.86)	0.0226*** (6.51)	0.0190*** (5.62)	0.0106* (2.00)	0.0174*** (3.97)
MTBV	-0.097 (-1.17)	-0.088 (-1.14)	-0.031 (-0.37)	-0.079 (-1.15)	-0.096 (-1.42)	-0.026 (-0.24)	-0.105 (-1.21)
LEVERAGE	0.111* (2.35)	0.151*** (3.51)	0.229*** (4.90)	0.195*** (5.05)	0.208*** (5.53)	0.229*** (3.89)	0.160*** (3.29)
F_SIZE	1.196*** (15.83)	1.265*** (18.55)	1.258*** (16.78)	1.164*** (18.88)	1.287*** (21.70)	1.203*** (12.57)	1.190*** (15.18)
Observations	4417	4417	4417	4417	4417	4417	4417

Note: The coefficients are given by supporters minus non-supporters. t Statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.