Research in International Business and Finance 69 (2024) 102208

Contents lists available at ScienceDirect

Research in International Business and Finance

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

Environmental strategies, environmental performance and board sustainability committees: Are financial and non-financial companies different?☆

Maria Gaia Soana

University of Parma, Via Kennedy 6, Parma, Italy

ARTICLE INFO

JEL classification:
code: G20
Q51

Keywords:
Environmental strategy
Environmental performance
Board sustainability committee
Financial companies
Non-financial companies

ABSTRACT

This study investigates the individual and interactive impact of three environmental strategies, i.e., environmental human resource management, environmental supply chain, and green production and processes, on environmental corporate results and the possible mediating role played by the board sustainability committee. Using a sample of 2325 European listed financial and non-financial companies from 2010 to 2020, the findings show that environmental strategies work jointly to improve environmental performance. However, their interactive impact differs between financial and non-financial companies. Moreover, the results demonstrate that the board sustainability committee, standing alone, helps financial and non-financial firms improve their environmental outcomes. However, when it operates jointly with specific environmental strategies, it is a substitute in affecting environmental performance.

1. Introduction

The environment is a priority all over the world. Since 1998, the European Parliament has encouraged EU Member States to adopt integrated environmental policies and European companies to implement efficient environmental programs and improve their environmental performance (EP). In the last decade, many stakeholders have also pressured financial and non-financial companies to enhance their environmental outcomes (Adebanjo et al., 2016).

A growing number of financial and non-financial companies have therefore adopted environmental strategies, which has increasingly become a key issue in environmental management (Dai et al., 2017; Lagoarde-Segot, 2019; Yang et al., 2019). Environmental strategies are multifaceted and can encompass a wide range of initiatives and practices, such as green production (Gong et al., 2018), green supply chains (Govindan et al., 2014), green marketing (Groening et al., 2018), and green human resource management (Dumont et al., 2017). Extant studies show that strategies related to green-oriented organizational behaviours, individually considered, can exert a significant positive impact on EP (Post et al., 2015; Dumont et al., 2017; Latan et al., 2018; Shah and Soomro, 2020). However, their simultaneous effect on corporate EP seems nowadays totally unexplored.

The existence of a board sustainability committee (SC) can also affect firm EP. In the last decade, most international standards and guidelines have suggested the creation of SCs to implement corporate social responsibility policies, which are assumed to improve environmental, social, and governance (ESG) corporate performance. In this context, the SC could likely mediate the relationship

☆ Project funded under the National Recovery and Resilience Plan (NRRP), Mission 04 Component 2 Investment 1.5 – NextGenerationEU, Call for tender n. 3277 dated 30/12/2021, Award Number: 0001052 dated 23/06/2022.

E-mail address: mariagaia.soana@unipr.it.

https://doi.org/10.1016/j.ribaf.2023.102208
Received 30 June 2023; Received in revised form 21 November 2023; Accepted 31 December 2023
Available online 3 January 2024

between strategic environmental goals and EP. Precisely, the SC could guide the company toward adopting the most effective strategies to improve its environmental outcomes. Extant academic literature has so far focused on the direct impact of SCs on EP (Berrone and Gomez-Mejia, 2009; Rodrigue et al., 2013; Dixon-Fowler et al., 2017; Biswas et al., 2018). However, the SC's possible mediating role in affecting the impact of environmental strategies on corporate environmental outcomes has not yet been investigated.

This paper is motivated by three main considerations. First, companies follow several environmental strategies simultaneously in the form of environmental bundles, which determine environmental outcomes jointly (Majid et al., 2019). In this context, the level of a particular environmental strategic action is ideally dependent on the levels of other environmental strategic actions simultaneously in place at the firm level. Thus, the paper considers multiple environmental strategic mechanisms and examines the individual and the interactive effects of various environmental strategies on company EP. Second, the existence of the board SC is supposed to affect firm environmental outcomes (Dixon-Fowler et al., 2017). Adopting a holistic approach in exploring the relationship between corporate governance mechanisms and environmental issues (Jain and Jamali, 2016), board SC is assumed to mediate the relationship between environmental strategies and environmental outcomes. Third, the role played by environmental strategies and the board SC in affecting EP is supposed to be important in both financial and non-financial companies. Although most previous literature excludes financial companies from the empirical analyses because of their specific characteristics (Foerster and Sapp, 2005; Biswas et al., 2018), this approach does not seem reasonable in the field of environmental issues. Recent financial regulation (European Banking Authority (EBA) (EBA), 2021) has in fact encouraged financial companies to implement environmental strategies and create board SCs that adopt these practices similarly to non-financial companies.

This paper aims to study the individual and interactive effects of various environmental strategic actions on EP in financial and non-financial firms and the possible mediating role played by the board SC. The sample consists of 2325 listed companies (550 financial and 1775 non-financial companies) from 21 European countries, observed from 2010 to 2020.

The study innovates extant literature from different points of view. First, it investigates for the first time the impact of the interactive effects of various environmental strategic actions on EP. Although previous papers have already tested the relationship between individual environmental strategies and corporate environmental outcomes, no one seems to have studied yet whether and how different strategic environmental practices, simultaneously implemented, are substitutes or complementary in affecting corporate EP. Second, the paper investigates whether the presence of the board SC mediates this relationship. To date, extant studies have focused on the direct impact of the SC on EP. Still, the role of SCs in mediating the relationship between environmental strategies and environmental outcomes seems totally unexplored. Third, this study is the first to test the effects of different environmental strategies on environmental outcomes by comparing listed financial and non-financial companies. Previous literature in this field has mostly excluded financial intermediaries from their samples, considering the uniqueness of their business made them incomparable to other companies. However, the regulatory pressures from financial regulators in recent years to promote environmental practices in the financial industry have led many financial companies to adopt environmental strategies similar to non-financial companies. This makes therefore the comparative analysis between financial and non-financial firms particularly interesting and innovative. Finally, the focus on 21 European countries, rather than one single country, is a further innovation.

2. Theoretical background, literature review and hypotheses development

2.1. Theoretical background

Environmental strategy is defined as a set of initiatives that can reduce the impact of operations on the natural environment through products, processes, and corporate policies (Bansal and Roth, 2000; Latan et al., 2018). As suggested by previous literature (Menguc and Ozanne, 2005; Sambasivan et al., 2013; Zhang et al., 2019), in this study environmental strategy refers to a process, rather than an outcome, involving voluntary actions beyond compliance, which both financial and non-financial companies take to reduce the negative environmental impact of their practices, to produce green goods and to provide environmental-friendly services. Organizational behavior towards the environment includes a wide range of practices, such as environmental human resource management (Dumont et al., 2017), environmental supply chains (Govindan et al., 2014), investments in environmental-friendly technologies and green products (Seman et al., 2019).

Three main theoretical perspectives provide a foundation for understanding how environmental strategies influence EP at the firm level. First, the natural resource-based view suggests that a company's unique environmental resources and capabilities, such as eco-friendly technologies or a strong environmental culture, can lead to competitive advantage and improved environmental outcomes (Hart, 1995; Hart and Dowell, 2011). Second, institutional theory (DiMaggio and Powell, 1983) emphasizes the role of external pressures, norms, and regulations in shaping a company's strategy to improve its EP (Berrone et al., 2013; Albertini, 2017). Specifically, financial and non-financial companies may adopt environmental strategic actions to enhance their environmental outcomes to conform to community expectations, meet regulatory requirements, and gain legitimacy. Finally, according to stakeholder theory (Freeman, 1984), organizations must consider the interests and concerns of various stakeholders, including customers, investors, and environmental advocacy groups. Environmental strategies that effectively address stakeholders' concerns can lead to improved environmental performance and, therefore, stakeholder support.

From a theoretical perspective, the SC can also significantly contribute to enhancing corporate EP. The positive influence of the SC on EP, specifically responsible for overseeing environmental and social issues, can be explained by different theories (Dixon-Fowler et al., 2017). First, agency theory suggests that the SC promotes environmental policies and advises management on strategic environmental practices. Moreover, according to resource dependence theory, directors on SC should bring additional environmental expertise useful to pursue environmental initiatives effectively (Hillman et al., 2000). Furthermore, these directors, according to

stewardship theory, should also be more concerned with their firm's EP, assumed to influence perceptions of their reputation (Fama, 1980).

2.2. Literature review and hypotheses development

2.2.1. Environmental strategy and environmental performance

Academic studies have empirically analyzed the impact of environmental strategies on EP.

The first stream of literature in this area investigates the relationship between corporate environmental strategy, considered as a whole, and EP. Almost all of these studies, mainly conducted in individual countries such as the USA (Post et al., 2015), the UK (Shaukat et al., 2016; Orazalin, 2019), Indonesia (Latan et al., 2018), Malaysia (Sambasivan et al., 2013), and Sri Lanka (Wijethilake, 2017), show that the implementation of environmental strategic actions by firms leads to better environmental outcomes.

A second stream of literature focuses on the link between specific environmental strategic actions and EP.

Previous studies indicate that companies can improve their environmental outcomes by building green teams among employees (Dangelico, 2015; Hanna et al., 2020) and, more generally, adopting environmental human resource management systems (Dumont et al., 2017; Majid et al., 2019; Zhang et al., 2019). These practices enable companies to utilize expert knowledge within existing teams, which helps them identify environmental problems and find effective, innovative solutions (Daily et al., 2012; Antonioli et al., 2013). Extant studies suggest that various environmental human resource management practices can be useful in improving environmental performance, including environmental training programs and reward schemes. Environmental training programs can help establish a shared vision of environmental initiatives and increase environmental commitment, skills, and awareness among employees (Daily et al., 2012; Ji et al., 2012). Additionally, compensation mechanisms that consider environmental issues can motivate managers to enhance their attitude toward green initiatives and leverage their knowledge to address environmental problems (Zhang et al., 2019), thus improving their capabilities in promoting environmental performance (Luzzini et al., 2015).

In addition, previous research shows that incorporating green suppliers into a company's supply chain and aligning environmental goals with those of suppliers can lead to improved environmental outcomes. This is because companies can acquire core environmentally friendly resource assets and skills from their supplier partners (Govindan et al., 2014; Dai et al., 2015; Li et al., 2016; Majid et al., 2019; Seman et al., 2019; Shah and Soomro, 2020).

Furthermore, extant literature demonstrates the existence of a positive relationship between EP and investments in environmental-friendly technologies and green products (Li et al., 2016; Majid et al., 2019; Seman et al., 2019).

In this second stream of literature, most studies have used samples from single countries, such as the USA (Dai et al., 2015; Dangelico, 2015; Hanna et al., 2000), Mexico (Daily et al., 2012), China (Ji et al., 2012; Li et al., 2016; Dumont et al., 2017), Malaysia (Seman et al., 2019), Pakistan (Majid et al., 2019; Shah and Soomro, 2020) and India (Govindan et al., 2014). There are only a few cross-country analyses, such as Zhang et al. (2019).

The existing literature on the impact of environmental strategies on environmental performance has certain limitations. Firstly, it is primarily focused on individual countries, and it often employs small sample sizes from limited periods, leading to inconsistent findings (Appannan et al., 2023). Additionally, the relationship between EP and specific environmental strategic actions has been investigated only stand-alone, without considering whether different strategies are substitutes or complementary in influencing environmental outcomes.

Existing theoretical and empirical literature seems to suggest that different environmental strategies may contribute synergistically to enhancing EP. Precisely, different environmental strategies, specifically environmental human resource management practices (EHRM), environmental supply chain mechanisms (ESC), and green production and processes (EPR), may work jointly to improve EP, and the presence of one practice could strengthen another. The following hypothesis is therefore proposed:

H_1. : EHRM, ESC, and EPR are complementary in increasing firm EP.

Moreover, most extant analyses exclude financial companies from their samples. This is a common practice in corporate finance, as it is often argued that due to the increased leverage of financial companies and their unique operations, it is difficult to compare them with non-financial companies (Foerster and Sapp, 2005; Biswas et al., 2018).

However, excluding *ex-ante* financial companies from empirical analyses in terms of environmental strategies does not seem reasonable today. The importance of environmental factors in the financial industry has increased considerably over recent years, thanks to different regulatory interventions made in the USA and Europe. For instance, in 2021, the Board of Governors of the Federal Reserve System established the Financial Stability Climate Committee to evaluate climate-related risks to financial stability in the USA. In 2022, the Securities and Exchange Commission proposed a new rule requiring public companies to provide detailed reporting of their climate-related risks, emissions, and net-zero transition plans. In Europe, Level 1 of the Sustainable Finance Disclosure Regulation (SFDR), which imposed mandatory sustainability disclosure obligations on asset managers and other financial market participants, came into effect in 2021. In the same year, the European Commission issued the Sustainable Finance Package, which consists of the Corporate Sustainability Reporting Directive (CSRD, approved in 2022), the EU Taxonomy Climate Delegated Act, and the Six Delegated Acts on Fiduciary Duties, Investment, and Insurance Advice.

Previous literature shows that, in the last decade, many financial companies have successfully adopted different environmental strategies, adding environmental criteria to their lending decisions, thus informing the public about their efforts to ensure sustainable development (Mengze and Wei, 2015; Ramzan et al., 2021; Zhang, 2021; Galletta et al., 2022). In this context, the issue of whether different environmental strategic actions have a complementary role in affecting EP deserves to be investigated both in financial and non-financial firms. Hence, the following hypothesis is proposed:

H_2. : The impact of environmental strategies on firm EP is the same in financial and non-financial companies.

2.3. Board sustainability committee, environmental performance and environmental strategy

Several papers have examined the link between SC and EP from an empirical perspective. However, the results of studies testing the direct effect of the presence of SC on environmental outcomes are inconclusive. Longitudinal data from 469 US firms, analyzed by Berrone and Gomez-Mejia (2009), show no statistically significant relationship between the presence of environmental committees and EP. This finding is also confirmed by Rodrigue et al. (2013), who demonstrate that the SC in the USA primarily focuses on protecting EP from regulatory and/or reputational damages, rather than improving it. However, Biswas et al. (2018), using a sample of 407 Australian non-financial companies, show that firms with SCs have better environmental outcomes. Similar evidence is found in the USA by Walls et al. (2012) and Dixon-Fowler et al. (2017). Furthermore, Orazalin (2019) uses a sample of UK non-financial companies to show the positive impact of the SC on EP and the mediating effect played by corporate social responsibility strategy.

Drawing on existing theoretical and empirical literature, it is assumed that the board SC can act as a mediator between corporate environmental strategies and environmental outcomes. A well-structured and environmentally proactive SC may assist companies in developing strategies to improve their environmental performance, thus reinforcing the relationship between their environmental strategy and EP. The following hypothesis is therefore proposed:

H_3. : The board SC strengthens the impact of EHRM, ESC and EPR on firm EP.

In this context, it is believed that the previous hypothesis should be tested on both financial and non-financial companies. The above-mentioned considerations regarding environmental regulations and green practices in financial intermediaries suggest that financial companies should not be excluded from the study samples. The question of whether the SC acts as a mediator between corporate environmental strategies and environmental outcomes deserves therefore to be investigated in both financial and non-financial firms. Hence, the following hypothesis is proposed:

H_4. : The mediating role of board SC in affecting the relationship between environmental strategies and firm EP is the same in financial and non-financial companies.

Table 1
Sample distribution by country, macro-sector, and year.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Country												
Austria	15	15	15	15	16	16	15	20	33	34	36	230
Belgium	22	22	23	23	24	25	26	30	48	46	47	336
Denmark	23	23	23	23	24	25	26	29	43	49	61	349
Finland	23	23	23	24	24	24	24	26	34	43	81	349
France	80	79	80	80	81	84	85	102	142	146	176	1135
Germany	68	74	74	76	80	85	87	110	168	183	257	1262
Greece	16	16	17	17	17	17	17	21	25	26	25	214
Ireland	14	14	16	16	16	16	16	16	22	24	24	194
Italy	34	35	35	35	35	37	40	55	88	93	125	612
Luxemburg	2	4	4	4	6	6	6	10	14	16	22	94
Netherlands	25	26	27	28	29	32	35	37	54	58	62	413
Norway	17	17	17	17	18	19	19	23	49	58	81	335
Poland	22	24	25	26	30	30	30	32	42	42	41	344
Portugal	7	7	7	7	7	7	8	9	14	14	14	101
Russia	29	30	31	32	33	34	34	34	43	43	45	388
Spain	36	38	39	39	41	42	42	48	69	71	68	533
Sweden	43	43	44	45	48	60	61	66	123	172	315	1020
Switzerland	59	61	64	65	66	66	67	77	130	151	194	1000
Turkey	23	24	24	25	26	26	26	30	55	60	79	398
United Kingdom	202	218	220	222	245	287	293	326	382	464	566	3425
Total	760	793	808	819	866	938	957	1101	1578	1793	2319	12,732
Industry												
Industrial	517	542	552	563	589	630	642	746	1101	1259	1717	8858
Utility	64	66	67	67	68	70	71	79	97	105	123	877
Transportation	23	23	24	24	25	26	26	29	39	41	52	332
Bank/Savings & Loan	65	65	65	66	67	72	74	77	91	97	108	847
Insurance	30	30	31	31	33	34	36	38	45	50	51	409
Other Financial	61	67	69	68	84	106	108	132	205	241	268	1409
Total	760	793	808	819	866	938	957	1101	1578	1793	2319	12,732

3. Data and methodology

3.1. Sample and data collection

Data are extracted from the Thomson Reuters ASSET4 database, which provides ESG information, and from the Refinitiv Eikon database, which provides global economic, company, and financial data. The initial sample included 28,116 firm-year observations from 2556 European-listed financial and non-financial listed firms between 2010 and 2020. These companies are selected as constituents of the Refinitiv ESG Europe Index, available in Thomson Reuters ASSET4. The sample period for the study begins in 2010. This is because there is very few data available on EP and environmental strategies in Thomson Reuters ASSET4 before that year (Marsat et al., 2022). Furthermore, the study period ends in 2020 due to significant environmental regulatory interventions that have been implemented in Europe starting from 2021, including Level 1 of the Sustainable Finance Disclosure Regulation, the Corporate Sustainability Reporting Directive, and the EU Taxonomy Climate Delegated Act. These interventions have resulted in substantial changes in the environmental reporting standards of listed European companies, making their EP data not fully comparable to previous years. After removing some firm-year observations because of missing environmental and social indicators and/or financial data, the final sample contains 12,732 firm-year observations from 2325 European listed companies from 2010 to 2020. Table 1 presents the sample composition by country, macro-sector and year.

3.2. Measurement

3.2.1. Dependent variable

Following previous literature (Shaukat et al., 2016; Haque and Ntim, 2018; Orazalin, 2019), environmental performance (EP) is measured by the environmental pillar score provided by the Thomson Reuters ASSET4 database. The score ranges from 0% to 100%. It is estimated by aggregating three main dimensions, i.e., resource use, emission reductions, and environmental innovation, which are in turn calculated by summing further individual micro-level environmental sub-dimensions.

3.2.2. Independent variables

The dependent variables are three firm environmental strategies: environmental human resource management (EHRM), environmental supply chain (ESC), and green production and processes (EPR). Following prior studies (Shaukat et al., 2016; Orazalin, 2019), these variables are obtained from Thomson Reuters ASSET4.

Specifically, EHRM is proxied by three items: (i) environment management team, (ii) environment management training, and (iii) sustainability compensation incentives. Environmental management team (EM_TEAM) is a dummy variable that equals 1 if the company has an environmental management team, 0 otherwise. This can be any employee team that performs environmental issues functions. Team members are company employees operational on a day-to-day basis and not board directors, therefore not members of board committees. Environment management training (EM_TRAIN) is a dummy variable that equals 1 if the company trains its employees on environmental issues, 0 otherwise. The training can be provided by the company or by external trainers. Sustainability compensation incentives (S_COMP) is a dummy variable that equals 1 if the firm senior executive's remuneration is linked to corporate social responsibility and/or health and safety and/or environmental and/or sustainability targets, 0 otherwise.

ESC is estimated through two items: (i) environmental supply chain management and (ii) environmental supply chain partnership termination. Environmental supply chain management (ESC_MGT) is a dummy variable that equals 1 if the company uses environmental criteria in the selection process of its suppliers or sourcing partners, 0 otherwise. Environmental supply chain partnership termination (ESC_TER) is a dummy variable that equals 1 if the company reports or shows to be ready to end a partnership with a sourcing partner if environmental criteria are not met, 0 otherwise.

Finally, EPR is proxied with two items: (i) product environmentally responsible use and (ii) environmental products. Product environmentally responsible use (PR_USE) is a dummy variable that equals 1 if the company reports product features and applications or services that will promote responsible, efficient, cost-effective and environmentally preferable use and/or use that will reduce the negative impact (less emission, pollution, noise, etc.) on the environment, 0 otherwise. Environmental products (E_PROD) is a dummy variable that equals 1 if the company reports on at least one product line or service that is designed to have positive effects on the environment or which is environmentally labeled and marketed, 0 otherwise.

3.2.3. Mediating variable

The presence of the board SC is measured by a dummy variable extracted from the Thomson Reuters ASSET4 database, which takes the value 1 when the company has an SC, 0 otherwise. This is consistent with previous studies (Dixon-Fowler et al., 2017; Biswas et al., 2018; Orazalin, 2019).

3.2.4. Control variables

Some firm-specific control variables that may affect EP are considered. Consistently with previous literature (Dixon-Fowler et al., 2017; Biswas et al., 2018; Orazalin, 2019), the selected variables are extracted from the Thomson Reuters Refinitiv Eikon database. Firm size (SIZE) is included in the analysis, as larger firms are shown to pay more attention to the environment and to have more resources to invest in green technologies, thus exhibiting higher EP. Firm size is measured using the natural logarithm of total assets. As more profitable companies show superior environmental outcomes, firm profitability is also considered, estimated by the return on assets (ROA). Furthermore, Leverage (LEV) and liquidity (LIQ) are included, given that less indebted companies and those with higher

cash flow tend to invest more in environmental activities. These variables are measured by total debt over total capital (LEV) and by current assets over total assets (LIQ), respectively. Moreover, R&D intensity (R&D) is considered, as firms' investments in research and development are shown to be positively associated with EP. R&D intensity is calculated as the ratio of R&D expenses over total assets. Finally, the GDP growth rate (GDP) is considered as a country control variable. It is extracted from the World Bank database and calculated as the annual percentage growth rate of GDP per capita based on constant local currencies.

Following previous literature, the control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at 1% of each tail. Table 2 reports all the research variables described above.

3.3. Research methodology

Following previous literature on environmental strategy and EP (Orazalin, 2019; Tingbani et al., 2020), ordinary least square fixed-effect regressions on panel data are run to capture possible variation across different firms and also to deal with variation over time. This methodology allows for taking omitted or unobserved variables into account and controlling for unobserved heterogeneity among the sample firms (Uyar et al., 2021). To ensure that the fixed-effect method is appropriate for the study, compared to the pooled ordinary last square and the random-effect analyses, the F-test is run. Three different models are developed.

Model 1 (1) aims to detect the determinants of EP as follows:

$$EP_{i,t} = \alpha_{i,t} + \beta_1 ENV\_STRAT_t + \beta_2 \quad FIRM\_CHARACT_{it} + GDP + YEAR + \varepsilon_{i,t} \tag{1}$$

where $EP_{i,t}$ is environmental performance of firm *i* at time *t*, $ENV\_STRAT_{i,t}$ are the three environmental strategies described in Section 3.2.2 adopted at time *t*, i.e., EHRM, ESC and EPR, $FIRM\_CHARACT_t$ are the firm characteristics at time *t* used as control variables, i.e., size (SIZE), profitability (ROA), leverage (LEV), liquidity (LIQ), and R&D intensity (R&D), GDP is the GDP growth rate, and the vector YEAR refers to the time fixed effects.

Model 2 aims to investigate the determinants of EP considering the interactions between different environmental strategies, as shown in (2):

$$EP_{i,t} = \alpha_{i,t} + \beta_1 ENV\_STRAT_t + \beta_2 \quad INTER\_ENV\_STRAT_t + \beta_3 \quad FIRM\_CHARACT_t + GDP + YEAR + \varepsilon_{i,t} \tag{2}$$

where $INTER\_ENV\_STRAT_{i,t}$ are the interactions between different environmental strategies, i.e., EHRM, ESC and EPR. Following Panayi et al. (2021), Eq. (2) is run including the interaction terms in a hierarchical manner, by adding each interaction term with the associated main effects in a separate model. This makes possible to analyze how different environmental strategies interact with each other at different levels in improving EP.

Moreover, Model 3 tests whether the board SC mediates the relationship between environmental strategy and EP by interacting SC with the different environmental strategies, as follows (3):

$$EP_{i,t} = \alpha_{i,t} + \beta_1 ENV\_STRAT_t + \beta_2 SC_t + \beta_3 ENV\_STRAT_t xSC_t + \beta_4 FIRM\_CHARACT_t + GDP + YEAR + \varepsilon_{i,t} \tag{3}$$

where $SC_{i,t}$ is the presence of board SC at time *t*, while $ENV\_STRAT_{,t}xSC_t$ is the interacted variable testing the mediating role of the SC.

Finally, to test Hypotheses 2 and 4, the sample is split into two different sub-samples of financial and non-financial companies,

Table 2
Variable measurement description.

Symbol	Full Name	Measurement
EP	Environmental performance	Estimated by aggregating three main dimensions: resource use, emission reductions, and environmental innovation. The score ranges from 0% to 100%.
EM_TEAM	Environment management team	Dummy variable - 1 if the company has an environmental management team, 0 otherwise.
EM_TRAIN	Environment management training	Dummy variable - 1 if the company trains its employees on environmental issues, 0 otherwise.
S_COMP	Sustainability compensation incentives	Dummy variable - 1 if the firm senior executive's remuneration is linked to corporate social responsibility and/or health and safety and/or environmental and/or sustainability targets, 0 otherwise.
ESC_MGT	Environmental supply chain management	Dummy variable - 1 if the company uses environmental criteria in the selection process of its suppliers or sourcing partners, 0 otherwise.
ESC_TER	Environmental supply chain partnership termination	Dummy variable - 1 if the company reports being or shows it is ready to end a partnership with a sourcing partner if environmental criteria are not met, 0 otherwise.
PR_USE	Product environmentally responsible use	Dummy variable - 1 if the company reports features and applications or services that will promote responsible, efficient, cost-effective, and environmentally preferable use of product and/or reduce the negative impact on the environment, 0 otherwise.
E_PROD	Environmental products	Dummy variable - 1 if the company reports on at least one product line or service that is designed to have positive effects on the environment or which is environmentally labeled and marketed, 0 otherwise.
SC	Sustainability Committee	Dummy variable - 1 if the company has a board sustainability committee, 0 otherwise.
SIZE	Size	The natural logarithm of total assets.
ROA	Profitability	Estimated by the return on assets.
LEV	Leverage	Measured by total debt over total capital.
LIQ	Liquidity	Estimated by current assets over total assets.
R&D	R&D intensity	Calculated as the ratio of R&D expenses over total assets.
GDP	GDP growth rate	The annual percentage growth rate of GDP per capita based on constant local currencies.

respectively.

4. Findings

4.1. Descriptive statistics and correlation analysis

Table 3 reports the descriptive statistics of the research variables.

These results show that the mean value of EP, ranging from 0% to 100%, is 48.45% in the whole sample, 48.90% in financial companies, and 48.34% in non-financial companies. Hence, no significant differences emerge in the environmental performance levels between the two sub-samples. This suggests that both financial and non-financial firms have grasped the importance of environmental challenges and regulatory requirements to work for a cleaner planet and better firm environmental outcomes.

However, some differences emerge in environmental strategies. Specifically, the mean values of EM_TEAM, EM_TRAIN and S_COMP in financial companies (0.37, 0.44 and 0.23, respectively) are lower than in non-financial firms (0.55, 0.61 and 0.27, respectively). The two-sample t tests (Table 4) demonstrates that these differences are statistically significant. Statistically significant differences are also found between financial and non-financial companies in the mean values of ESC_MGT, ESC_TER, PR_USE and E_PROD. Overall, it appears that financial companies are lagging behind other firms in the implementation of environmental strategies.

Similar evidence is found about the presence of the SC. The summary statistics show in fact that approximately 59% of financial

Table 3
Descriptive statistics.

Variables	Mean	Min	Max	Standard deviation	Obs.
EP	48.45	0.00	99.21	27.96	12,732
SC	0.63	0.00	1.00	0.48	12,732
EM_TEAM	0.51	0.00	1.00	0.50	12,732
EM_TRAIN	0.58	0.00	1.00	0.49	12,732
S_COMP	0.26	0.00	1.00	0.44	12,732
ESC_MGT	0.62	0.00	1.00	0.48	12,732
ESC_TER	0.25	0.00	1.00	0.43	12,732
PR_USE	0.55	0.00	1.00	0.50	12,732
E_PROD	0.51	0.00	1.00	0.50	12,732
SIZE	14.45	1.95	24.31	2.49	12,732
ROA	6.60	-21.08	23.20	8.64	12,732
LIQ	2.52	0.98	16.10	9.18	12,732
LEV	26.27	0.00	54.10	17.69	12,732
R&D	0.05	0.00	10.22	0.16	12,732
GDP	1.29	-11.3	24.4	3.11	12,732
Financial					
EP	48.90	0.00	99.13	31.40	2665
SC	0.59	0.00	1.00	0.49	2665
EM_TEAM	0.37	0.00	1.00	0.48	2665
EM_TRAIN	0.44	0.00	1.00	0.50	2665
S_COMP	0.23	0.00	1.00	0.42	2665
ESC_MGT	0.50	0.00	1.00	0.50	2665
ESC_TER	0.12	0.00	1.00	0.32	2665
PR_USE	0.51	0.00	1.00	0.50	2665
E_PROD	0.46	0.00	1.00	0.50	2665
SIZE	15.90	2.77	24.31	2.70	2665
ROA	7.37	-21.84	23.20	9.09	2665
LIQ	2.65	0.98	15.80	9.80	2665
LEV	25.83	0.00	53.90	16.88	2665
R&D	0.03	0.00	0.95	0.08	2665
GDP	1.29	-11.3	24.4	3.25	2665
Non-financial					
EP	48.34	0.00	99.21	26.98	10,067
SC	0.64	0.00	1.00	0.48	10,067
EM_TEAM	0.55	0.00	1.00	0.50	10,067
EM_TRAIN	0.61	0.00	1.00	0.49	10,067
S_COMP	0.27	0.00	1.00	0.45	10,067
ESC_MGT	0.66	0.00	1.00	0.47	10,067
ESC_TER	0.28	0.00	1.00	0.45	10,067
PR_USE	0.56	0.00	1.00	0.50	10,067
E_PROD	0.52	0.00	1.00	0.50	10,067
SIZE	14.12	1.95	23.87	2.32	10,067
ROA	6.42	-21.08	22.91	7.79	10,067
LIQ	2.28	1.01	16.10	8.87	10,067
LEV	27.46	0.00	54.10	18.01	10,067
R&D	0.05	0.00	10.22	0.16	10,067
GDP	1.29	-11.3	24.4	3.07	10,067

Table 4
Differences in means between financial and non-financial companies.

	Differences in means (*t*-test)
EP	0.841
SC	4.756 * **
EM_TEAM	16.645 * **
EM_TRAIN	15.841 * **
S_COMP	16.621 * **
ESC_MGT	15.400 * **
ESC_TER	17.217 * **
PR_USE	4.586 * **
E_PROD	5.503 * **

Note. * ** Significant at 1% level

companies and 64% of non-financial firms have a board sustainability committee.

The bivariate correlations between each pair of independent variables are also calculated. Table 5 indicates the absence of serious potential multicollinearity issues in the analyses, as no coefficients exceed the threshold value of 0.60. The variance inflation factor (VIF) test is also reported (Table 6). All the VIF values are lower than 5, again suggesting that multicollinearity is not an issue in Models (1), (2) and (3).

4.2. Empirical results: environmental strategies and environmental performance

The study investigates the individual and interactive effects (Model 1 and Model 2) of various environmental strategic actions on EP. Table 7 reports the results.

Focusing on the individual effect of various environmental strategies (Table 7(a)), a significant positive relationship emerges between environmental human resource management mechanisms (EM_TEAM, EM_TRAIN and S_COMP) and EP. This suggests that managerial teams aware of environmental issues, training programs focused on environmental issues, and management compensation incentives considering environmental factors are all powerful tools for improving firm environmental outcomes. These outcomes are also positively influenced by environmental supply chain systems (ESC_MGT and ESC_TER). This demonstrates that using environmental criteria in selecting suppliers or sourcing partners, and replacing them if they do not meet these criteria, can significantly strengthen corporate EP. Furthermore, a positive relationship emerges between the dependent variable and green production and processes. This suggests that promoting green products or services helps firms to improve their environmental outcomes.

Focusing on the interactive effects of various environmental strategies (Table 7(b)), the findings also show that environmental human resource management, an environmental supply chain and green production and processes, maintain their positive influence on EP, also when considered jointly. None of the coefficients of interacted variables reported in Table 7(b) are statistically significant. This means that these environmental strategies work jointly to improve EP, and the presence of one practice does not weaken another, thus supporting H_1.

Some firm-specific characteristics are also included in the models as control variables. Size, profitability and R&D intensity have a positive and significant effect on EP, as suggested by previous literature. Leverage shows no impact on the dependent variable, which is, however, negatively affected by firm liquidity. This evidence suggests that larger, more profitable and less liquid companies, which invest in R&D, are characterized by higher environmental outcomes, as suggested by most previous literature (Dixon-Fowler et al., 2017; Orazalin, 2019). Finally, the GDP growth rate shows a negative and significant effect on EP. This can be explained considering that high GDP growth leads to increased resource consumption and waste generation, which might contribute to decrease corporate environmental outcomes all over the country.

In order to test H_2, the sample has been split between financial and non-financial companies (Table 8). The findings show that, when considering the individual effect of various environmental strategies (Model 1, Table 8, Columns (a) and (c)), in both financial and non-financial companies, there is a significant positive relationship between EP and environmental human resource management mechanisms, environmental supply chain, and green production and processes, respectively. However, when focusing on the interactive effects of various environmental strategies (Model 2), differences between the two sub-samples emerge. In non-financial companies some interacted variables (EM_TEAMxPR_USE, EM_TRAINxPR_USE and S_COMxPR_USE) show positive and statistically significant coefficients, thus indicating a complementary effect of these environmental strategic actions (Table 8d). Environmentally responsible product use thus strengthens the positive effect on EP of the presence of an environmental management team, environmental training programs and sustainability compensation incentives. However, in financial companies some interacted variables, and specifically EM_TEAMxESC_MGT, EM_TEAMxESC_TER, EM_TEAMxPR_USE and EM_TEAMxE_PROD, display negative and statistically significant coefficients (Table 8b). This suggests that the presence of an environmental management team exerts a substitutive effect on the environmental supply chain and the green production and process strategies.

The firm-specific characteristics and the GDP growth rate inserted into the models as control variables, all grouped in CONTROLS, display the same relationships with the dependent variable shown in Table 7.

Overall, the findings reported in Table 8 show that the impact of environmental strategies on firm EP differs from financial and non-financial companies, thus rejecting H_2.

Table 5
Correlation matrix.

	SC	EM_TEAM	EM_TRAIN	S_COMP	ESC_MGT	ESC_TER	PR_USE	E_PROD	SIZE	ROA	LIQ	LEV	R&D	GDP
SC	1.00													
EM_TEAM	0.45 * **	1.00												
EM_TRAIN	0.40 * **	0.51 * **	1.00											
S_COMP	0.22 * **	0.17 * **	0.17 * **	1.00										
ESC_MGT	0.45 * **	0.42 * **	0.43 * **	0.18 * **	1.00									
ESC_TER	0.27 * **	0.28 * **	0.25 * **	0.13 * **	0.44 * **	1.00								
PR_USE	0.32 * **	0.33 * **	0.31 * **	0.14 * **	0.42 * **	0.30 * **	1.00							
E_PROD	0.29 * **	0.30 * **	0.30 * **	0.12 * **	0.42 * **	0.30 * **	0.58 * **	1.00						
SIZE	0.28 * **	0.27 * **	0.30 * **	0.11 * **	0.27 * **	0.23 * **	0.29 * **	0.27 * **	1.00					
ROA	0.01 * **	0.00 * *	0.00 * **	0.00 * **	0.03 * **	0.00 * **	0.02 * **	0.00 * **	0.04 * **	1.00				
LIQ	-0.04 * **	-0.04 * **	-0.04 * **	-0.02 * *	-0.04 * *	-0.02 * **	-0.01 * *	-0.01 * **	-0.03 * **	0.00 * **	1.00			
LEV	0.01 * *	-0.01 * *	0.01 * **	0.02 * *	0.01 * *	0.00 * **	0.01 * *	0.01 * *	0.01 * **	-0.03 * **	0.00 * **	1.00		
R&D	-0.17 * *	-0.14 * *	-0.17 * **	-0.06 * **	-0.14 * *	-0.10 * **	-0.14 * *	-0.10 * *	-0.26 * **	-0.67 * **	0.10 * **	0.02 * **	1.00	
GDP	0.00 * **	0.06 * **	0.04 * **	-0.09 * **	0.04 * *	0.02 * **	0.05 * *	0.02 * **	0.01 * **	0.03 * *	0.00 * **	-0.00 * **	0.00 * **	1.00

Note. * ** , * * Significant at 1% and 5% level, respectively

Table 6
VIF Test for multicollinearity.

Variable	VIF
SC	1.449
EM_TEAM	1.564
EM_TRAIN	1.493
S_COMP	1.096
ESC_MGT	1.533
ESC_TER	1.333
PR_USE	4.248
E_PROD	4.896
SIZE	1.579
ROA	1.202
LIQ	1.139
LEV	1.044
R&D	1.304
GDP	1.086

4.3. Empirical results: environmental strategies, environmental performance and the role of board SC

The study also tests the possible mediating role of the board SC in the relationship between environmental strategy and EP. The results are reported in Table 9.

The evidence shows that the board SC, stand-alone, improves firm EP. This is true for both financial and non-financial companies (Table 9 Columns (c) and (e)). This suggests that the board SC, standing alone, helps companies to improve their environmental outcomes in European countries.

Focusing on the role of the SC in mediating the relationship between environmental strategies and EP, our results related to the whole sample and the two sub-samples are almost analogous. They demonstrate that the board SC maintains its positive influence on EP when it operates jointly with different environmental strategies. However, some interacted variables, and specifically EM_TRAINxSC, S_COMxSC and PR_USExSC, display negative and statistically significant coefficients both in the global sample (Table 9 (b)) and in the two sub-samples of financial and non-financial companies (Table 9(d) and (f)). These results suggest that the board SC acts as a substitute for environmental management training, sustainability compensation mechanisms and product environmental responsible use, because the SC partially replaces these specific environmental strategic actions in increasing EP.

The firm-specific characteristics inserted into the models as control variables display the same relationships with the dependent variable shown in Table 7.

Overall, the evidence shown in Table 9 leads to reject H_3 and accept H_4.

5. Discussion of results

The findings reported in Section 4 suggest some important considerations and reveal novel evidence compared to previous literature.

First, different environmental strategies and, specifically, environmental human resource management, environmental supply chain and green production and processes, are shown to be effective in improving EP of both financial and non-financial companies. On the one hand, these results confirm previous evidence demonstrating that various tools are available for non-financial firms to enhance their environmental outcomes, such as building green teams among employees (Dangelico, 2015; Hanna et al., 2000), developing environmental training programs (Daily et al., 2012; Ji et al., 2012), adopting management compensation incentives linked to environmental objectives (Luzzini et al., 2015), aligning environmental goals with those of suppliers (Seman et al., 2019; Shah and Soomro, 2020) and investing in green production and processes (Li et al., 2016; Majid et al., 2019; Seman et al., 2019). On the other hand, this study shows for the first time that these tools are also effective in improving EP of financial companies. Moreover, these results extend previous literature in showing that the positive impact of environmental strategies on firm environmental outcomes does not occur only in single countries (Daily et al., 2012; Li et al., 2016; Seman et al., 2019; Shah and Soomro, 2020), but throughout all European countries.

Second, this study tests whether and how different strategic environmental practices, simultaneously implemented, are substitutes or complementary in affecting corporate EP. As no previous papers have investigated this issue, this excludes the possibility of a comparison of our results with extant literature. The findings demonstrate that the presence of an environmental strategy, i.e., environmental human resource management, environmental supply chain and green production and processes, does not weaken another in increasing firm EP. This means that these practices are complementary. Furthermore, the empirical analyses show that the interactive effects of various environmental strategies differ between financial and non-financial companies. Specifically, some complementary effects emerge between environmental strategic actions in non-financial companies. On the contrary, when considering financial companies, the presence of an environmental management team exerts a substitutive effect on the environmental supply chain and the green production and process strategies. There are probably two main reasons for this. The first is that the characteristics of a financial firm make a management team dedicated exclusively to environmental issues less effective in improving EP than in a non-financial firm. The second reason is that financial companies are still lagging behind non-financial companies in terms

Table 7
Environmental strategies and environmental performance: whole sample.

Variables	(a) Model 1			(b) Model 2		
EM_TEAM	12.026 * **			9.704 * **	14.966 * **	
	(13.620)			(6.239)	(11.710)	
EM_TRAIN	6.956 * **			6.804 * **	9.091 * **	
	(7.194)			(5.069)	(6.583)	
S_COM	5.239 * **			7.244 * **	8.631 * **	
	(6.663)			(4.472)	(6.071)	
ESC_MGT		19.554 * **		17.084 * **		18.354 * **
		(21.250)		(12.980)		(13.730)
ESC_TER		7.598 * **		11.157 * **		10.173 * **
		(9.842)		(7.310)		(5.614)
PR_USE			13.721 * **		18.824 * **	18.591 * **
			(9.136)		(6.889)	(7.302)
E_PROD			5.738 * **		5.738 * *	0.305 * *
			(3.989)		(2.090)	(2.119)
EM_TEAM x ESC_MGT				− 1.682		
				(−0.936)		
EM_TEAM x ESC_TER				− 1.982		
				(−0.907)		
EM_TRAIN x ESC_MGT				− 0.640		
				(−0.378)		
EM_TRAIN x ESC_TER				− 4.621		
				(−0.853)		
S_COM x ESC_MGT				− 2.191		
				(−1.184)		
S_COM x ESC_TER				− 2.672		
				(−1.096)		
EM_TEAM x PR_USE					− 8.308	
					(−0.838)	
EM_TEAM x E_PROD					1.355	
					(0.469)	
EM_TRAIN x PR_USE					− 2.869	
					(−0.918)	
EM_TRAIN x E_PROD					− 0.796	
					(−0.259)	
S_COM x PR_USE					− 3.187	
					(−1.117)	
S_COM x E_PROD					− 2.683	
					(−1.000)	
ESC_MGT x PR_USE						− 7.975
						(−0.538)
ESC_MGT x E_PROD						4.705
						(1.476)
ESC_TER x PR_USE						− 3.175
						(−0.963)
ESC_TER x E_PROD						− 0.953
						(−0.323)
SIZE	6.684 * **	6.574 * **	7.957 * **	5.242 * **	5.992 * **	6.033 * **
	(27.480)	(29.450)	(36.920)	(22.390)	(26.230)	(28.590)
ROA	0.045 * **	0.018 * *	0.060 * **	0.013 * *	0.039 * **	0.023 * *
	(3.051)	(1.996)	(4.405)	(2.028)	(2.769)	(2.011)
LEV	0.006	0.006	0.008	0.003	0.002	0.004
	(0.854)	(1.412)	(1.353)	(0.627)	(0.351)	(1.175)
LIQ	− 1.474 * **	− 1.123 * **	− 1.261 * **	− 0.964 * **	− 1.002 * **	− 0.750 * **
	(−5.339)	(−4.391)	(−4.697)	(−4.209)	(−4.196)	(−3.398)
R&D	4.893	7.202	19.259 * **	5.494	16.341 * **	16.064 * **
	(0.960)	(1.250)	(3.630)	(1.120)	(3.535)	(3.216)
GDP	− 1.283 * **	− 0.987 * **	− 0.633 *	− 1.017 * **	− 0.733 * *	− 0.495 *
	(−3.718)	(−3.369)	(−1.861)	(−3.230)	(−2.145)	(−1.904)
constant	− 59.673 * **	− 62.748 * **	− 80.903 * **	− 50.502 * **	− 64.840 * **	− 65.478 * **
	(−16.280)	(−18.350)	(−23.540)	(−14.710)	(−18.910)	(−20.510)
Observations	12,732	12,732	12,732	12,732	12,732	12,732
R-squared	0.751	0.774	0.760	0.798	0.801	0.810
YEAR_FE	YES	YES	YES	YES	YES	YES
F-stat	386.167 * **	502.547 * **	453.016 * **	318.854 * **	307.172 * **	388.376 * **

Note. The table reports the results of the fixed-effect regression on panel data. The dependent variable is environmental performance (EP). The independent variables are the environmental strategic actions. Firm controls, country controls and time-fixed effects are included. The control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at the 1% of each tail. Robust *t* statistics are reported in parentheses and based on robust standard errors corrected for autocorrelation and heteroscedasticity. * ** , * *, * Significant at 1%, 5% and 10% level, respectively.

Table 8
Environmental strategies and environmental performance: financial and non-financial companies.

	Financial						Non-financial					
Variables	(a) Model 1			(b) Model 2			(c) Model 1			(d) Model 2		
EM_TEAM	16.255 * **			19.302 * **	18.460 * **		13.877 * **			10.583 * **	16.147 * **	
	(9.962)			(7.261)	(6.484)		(16.630)			(6.993)	(13.04)	
EM_TRAIN	19.131 * **			12.864 * **	14.884 * **		7.736 * **			7.223 * **	9.222 * **	
	(12.500)			(5.617)	(6.978)		(8.318)			(5.402)	(6.558)	
S_COM	7.113 * **			6.952 * **	7.078 * **		4.493 * **			7.179 * **	7.824 * **	
	(4.046)			(2.847)	(3.383)		(5.839)			(4.552)	(5.801)	
ESC_MGT		31.548 * **				29.743 * **		19.733 * **		15.935 * **		17.422 * **
		(19.180)				(15.570)		(21.220)		(11.750)		(13.220)
ESC_TER		7.957 * **				− 5.634		7.463 * **		11.034 * **		10.462 * **
		(3.366)				(−1.058)		(9.336)		(7.039)		(5.614)
PR_USE			13.900 * **			18.805 * **			12.678 * **		20.707 * **	19.713 * **
			(5.425)			(6.193)			(9.507)		(7.909)	(7.761)
E_PROD			20.644 * **			13.253 * **			7.968 * **		3.682 * **	0.656 * **
			(7.696)			(3.789)			(6.195)		(2.874)	(3.820)
EM_TEAM x ESC_MGT				− 13.346 * **						− 0.469		
				(−4.331)						(−0.268)		
EM_TEAM x ESC_TER				− 12.687 * **						− 0.457		
				(−3.854)						(−0.219)		
EM_TRAIN x ESC_MGT				− 5.134						0.730		
				(−1.092)						(0.428)		
EM_TRAIN x ESC_TER				11.867						− 5.316		
				(0.966)						(−1.272)		
S_COM x ESC_MGT				− 3.768						− 3.092		
				(−1.241)						(−0.724)		
S_COM x ESC_TER				1.133						− 1.736		
				(0.309)						(−1.228)		
EM_TEAM x PR_USE					− 8.038 * *						11.765 * **	
					(−2.254)						(4.601)	
EM_TEAM x E_PROD					− 3.910 * *						− 2.887	
					(−2.166)						(−1.031)	
EM_TRAIN x PR_USE					1.192						5.231 * *	
					(0.265)						(2.120)	
EM_TRAIN x E_PROD					− 3.386						− 0.152	
					(−0.750)						(−0.055)	
S_COM x PR_USE					− 4.262						4.929 * *	
					(−0.982)						(2.192)	
S_COM x E_PROD					1.704						− 0718	
					(0.384)						(−0.294)	
ESC_MGT x PR_USE						− 10.139						1.092
						(−1.084)						(0.501)
ESC_MGT x E_PROD						− 2.144						− 0.447
						(−0.370)						(−0.123)
ESC_TER x PR_USE						6.977						− 2.833
						(0.963)						(−0.887)
ESC_TER x E_PROD						4.291						0.929
						(0.673)						(0.729)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
constant	− 42.969 * **	− 30.628 * **	− 42.342 * **	− 21.051 * **	− 23.619 * **	− 17.172 * **	− 60.753 * **	− 63.656 * **	− 78.217 * **	− 50.835 * **	− 63.139 * **	− 63.840 * **
	(−7.152)	(−4.879)	(−7.412)	(−3.596)	(−4.616)	(−3.417)	(−16.950)	(−18.780)	(−23.010)	(−14.970)	(−18.940)	(−20.250)
Observations	2665	2665	2665	2665	2665	2665	10,067	10,067	10,067	10,067	10,067	10,067
R-squared	0.646	0.663	0.673	0.720	0.752	0.762	0.724	0.740 * **	0.732	0.774	0.782	0.785
YEAR_FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-stat	142.025 * **	190.548 * **	231.245 * **	131.525 * **	143.817 * **	212.527 * **	478.258 * **	575.213 * **	530.642 * **	387.019 * **	365.155 * **	462.398 * **

Note. The table reports the results of the fixed-effect regression on panel data. The dependent variable is environmental performance (EP). The independent variables are the environmental strategic actions. Firm controls, country controls and time-fixed effects are included. The control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at the 1% of each tail. Robust *t* statistics are reported in parentheses and based on robust standard errors corrected for autocorrelation and heteroscedasticity. * ** , * *, * Significant at 1%, 5% and 10% level, respectively.

Table 9
Environmental strategies, sustainability committee, and environmental performance.

	Global sample				Financial				Non-financial			
Variables	(a)	(b) Model 3			(c)	(d) Model 3			(e)	(f) Model 3		
SC	16.527 * **	14.349 * **	12.809 * **	18.324 * **	29.897 * **	23.385 * **	21.899 * **	24.095 * **	17.035 * **	13.577 * **	12.590 * **	18.612 * **
	(17.80)	(10.100)	(9.475)	(15.050)	(19.420)	(13.130)	(11.610)	(12.270)	(18.810)	(9.900)	(9.761)	(15.910)
EM_TEAM		7.359 * **				8.940 * *				9.939 * **		
		(4.758)				(2.565)				(6.725)		
EM_TRAIN		8.721 * **				20.582 * **				8.329 * **		
		(6.106)				(8.240)				(6.051)		
S_COM		8.152 * **				7.890 * **				7.102 * **		
		(4.801)				(2.924)				(4.426)		
ESC_MGT			17.621 * **				28.206 * **				17.282 * **	
			(13.890)				(10.620)				(13.450)	
ESC_TER			6.295 * **				2.312				5.356 * **	
			(3.573)				(0.382)				(3.132)	
PR_USE				15.883 * **				18.151 * **				15.363 * **
				(6.594)				(3.643)				(7.106)
E_PROD				5.528 * *				12.652 * *				7.028 * **
				(2.258)				(2.362)				(3.167)
EM_TEAM x SC		2.592				2.846				1.240		
		(1.408)				(0.716)				(0.709)		
EM_TRAIN x SC		− 4.724 * **				− 10.213 * **				− 2.734 * *		
		(−2.677)				(−3.221)				(−2.375)		
S_COM x SC		− 4.145 * *				− 3.457 * **				− 4.203 * *		
		(−2.258)				(−3.124)				(−2.406)		
ESC_MGT x SC			− 0.882				− 7.829 * *				0.352	
			(−0.500)				(−2.408)				(0.202)	
ESC_TER x SC			0.256				7.127				1.103	
			(0.132)				(1.130)				(0.576)	
PR_USE x SC				− 8.089 * **				− 10.561 * *				− 8.565 * **
				(−2.678)				(−2.082)				(−3.189)
E_PROD x SC				2.045				5.416				2.211
				(0.692)				(0.905)				(0.855)
SIZE	7.135 * **	5.783 * **	5.449 * **	6.379 * **	4.737 * **	3.569 * **	2.696 * **	2.912 * **	7.167 * **	5.791 * **	5.437 * **	6.253 * **
	(30.06)	(23.10)	(23.35)	(28.23)	(11.56)	(8.975)	(6.913)	(8.226)	(29.03)	(23.030)	(22.590)	(27.000)
ROA	0.048 * **	0.039 * **	0.015 * **	0.050 * **	0.079 *	0.111 * *	0.009 * *	0.078 *	0.056 * **	0.051 * **	0.016 *	0.054 * **
	(3.720)	(3.063)	(2.312)	(4.344)	(1.987)	(2.036)	(2.182)	(1.785)	(4.226)	(3.691)	(1.592)	(4.691)
LEV	0.011	0.007	0.006	0.008	0.049	− 0.001	− 0.002	0.065	0.008	0.005	0.003	0.006
	(1.427)	(0.943)	(1.397)	(1.318)	(0.724)	(−0.007)	(−0.081)	(0.625)	(0.684)	(1.057)	(1.220)	(1.371)
LIQ	− 1.563 * **	− 1.380 * **	− 1.040 * **	− 1.089 * **	− 0.901	− 0.804	0.701	− 0.623	− 1.566 * **	− 1.329 * **	− 1.052 * **	− 1.078 * **
	(−5.665)	(−5.373)	(−4.547)	(−4.590)	(−0.043)	(−0.121)	(0.021)	(−0.745)	(−6.391)	(−6.036)	(−5.415)	(−5.239)
R&D	7.674	6.404	5.148	18.279	6.875	10.770	1.692	10.198	5.302	7.370	2.322	13.803
	(1.311)	(1.234)	(0.961)	(0.523)	(1.243)	(0.029)	(0.295)	(0.079)	(0.856)	(1.356)	(0.424)	(0.504)
GDP	− 1.016 * **	− 1.071 * **	− 0.876 * **	− 0.440 * **	− 0.162 *	− 0.188 *	− 0.490 * *	− 0.793 * *	− 0.643 * **	− 0.532 * *	− 0.435 *	− 0.136 * *
	(−3.657)	(−3.416)	(−3.379)	(−1.555)	(−1.724)	(−1.623)	(−2.408)	(−2.079)	(−2.879)	(−2.364)	(−1.798)	(−2.617)
constant	− 65.181 * **	− 53.021 * **	− 51.987 * **	− 67.589 * **	− 48.798 * **	− 34.327 * **	− 20.960 * **	− 27.031 * **	− 66.199	− 54.559 * **	− 52.198 * **	− 66.354 * **
	(−17.880)	(−14.230)	(−14.760)	(−19.410)	(−8.223)	(−6.085)	(−3.683)	(−5.310)	(−17.560)	(−14.580)	(−14.300)	(−18.270)
Observations	12,732	12,732	12,732	12,732	2665	2665	2665	2665	10,067	10,067	10,067	10,067
R-squared	0.742	0.770	0.793	0.790	0.640	0.702	0.714	0.743	0.707	0.743	0.764	0.765
YEAR_FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-stat	483.649 * **	320.732 * **	446.583 * **	440.06 * **	189.820 * **	141.111 * **	192.629 * **	211.440 * **	561.327 * **	386.571 * **	519.401 * **	510.691 * **

Note. The table reports the results of the fixed-effect regression on panel data. The dependent variable is environmental performance (EP). The independent variables are the environmental strategic actions and the presence of the sustainability committee. Firm controls, country controls and time-fixed effects are included. The control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at the 1% of each tail. Robust *t* statistics are reported in parentheses and based on robust standard errors corrected for autocorrelation and heteroscedasticity. * ** , * *, * Significant at 1%, 5% and 10% level, respectively.

Table 10
Robustness test: instrumental variable regression analysis 2sls.

Variables	(a) Global sample			(b) Financial			(c) Non-financial		
SC	17.934 * **	20.629 * **	24.679 * **	28.304 * **	27.833 * **	32.178 * **	17.917 * **	20.627 * **	24.678 * **
	(9.385)	(10.590)	(15.060)	(10.150)	(10.780)	(12.940)	(9.589)	(10.660)	(14.840)
EM_TEAM	11.994 * **			11.777 * **			11.994 * **		
	(7.139)			(3.171)			(7.045)		
EM_TRAIN	8.070 * **			22.905 * **			8.073 * **		
	(4.983)			(7.519)			(5.120)		
S_COM	3.744 * *			14.318 * **			3.743 * *		
	(2.105)			(4.713)			(2.065)		
ESC_MGT		25.083 * **			33.963 * **			25.082 * **	
		(17.200)			(11.730)			(17.007)	
ESC_TER		3.442 * *			− 0.600			3.443 * *	
		(2.082)			(−0.094)			(2.036)	
PR_USE			20.531 * **			28.187 * **			20.531 * **
			(7.220)			(4.746)			(7.127)
E_PROD			5.489 * *			14.135 * *			5.489 *
			(2.504)			(2.321)			(1.905)
EM_TEAM x SC	− 2.999			− 1.022			− 2.968		
	(−1.548)			(−0.247)			(−1.496)		
EM_TRAIN x SC	− 1.724 * *			− 12.252 * **			− 1.742 *		
	(−2.493)			(−3.341)			(−0.897)		
S_COM x SC	− 1.537 * *			− 8.792 * *			− 1.526		
	(−2.186)			(−2.490)			− 0.787		
ESC_MGT x SC		− 9.491			− 14.663 * **			− 9.499	
		(−0.220)			(−3.992)			(−0.226)	
ESC_TER x SC		4.690			9.402			4.706	
		(0.631)			(1.446)			(0.568)	
PR_USE x SC			− 12.643 * **			− 16.339 * *			− 12.633 * **
			(−3.762)			(−2.484)			(−3.653)
E_PROD x SC			2.303			− 1.902			2.293
			(0.710)			(−0.288)			(0.702)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES
constant	− 33.748 * **	− 32.587 * **	− 44.365 * **	− 12.267 * *	− 4.782 * **	− 8.497 *	− 33.703 * **	− 32.577 * **	− 44.353 * **
	(−9.421)	(−10.450)	(−14.180)	(−2.373)	(−3.843)	(−1.954)	(−8.977)	(−10.090)	(−13.830)
Observations	12,732	12,732	12,732	2665	2665	2665	10,067	10,067	10,067
R-squared	0.500	0.600	0.542	0.539	0.552	0.621	0.500	0.559	0.542
YEAR_FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-test (first stage)	392.113	295.480	430.645	268.800	272.092	371.682	391.835	295.483	430.412
Sargan p-value	0.234	0.240	0.204	0.228	0.237	0.194	0.217	0.241	0.203

Note. The table reports the results of the second step of the 2sls regressions. The instrumental variables inserted in the first-stage regressions are the presence of the sustainability committee (SC) at time *t*-1 and corporate sustainability strategy (CSR_STR). The dependent variable is environmental performance (EP). The independent variables are the environmental strategic actions and the presence of the sustainability committee. Firm controls, country controls and time-fixed effects are included. The control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at the 1% of each tail. Robust *t* statistics are reported in parentheses and based on robust standard errors corrected for autocorrelation and heteroscedasticity. * ** , * *, * Significant at 1%, 5% and 10% level, respectively.

Table 11
Robustness test: environmental strategies, sustainability committee and environmental performance excluding companies from France, Germany and UK.

	Model 1			Model 2			(c)	(d) Model 3		
EM_TEAM	12.991 * **			8.228 * **	16.492 * **			8.535 * **		
	(11.760)			(3.437)	(8.975)			(4.058)		
EM_TRAIN	3.473 * **			8.021 * **	5.715 * **			11.493 * **		
	(2.594)			(4.296)	(2.892)			(5.970)		
S_COM	4.616 * **			5.029 * *	6.168 * **			4.863 * *		
	(4.079)			(2.379)	(3.381)			(2.351)		
ESC_MGT		18.198 * **		17.888 * **		15.807 * **			18.098 * **	
		(14.000)		(10.290)		(8.256)			(10.950)	
ESC_TER		7.702 * **		8.314 * **		11.102 * **			7.786 * **	
		(7.107)		(4.264)		(4.342)			(3.493)	
PR_USE			13.899 * **		21.819 * **	20.306 * **				15.822 * **
			(6.101)		(5.526)	(6.847)				(3.964)
E_PROD			4.982 * *		3.646 * *	0.487 * *				6.739 *
			(2.262)		(2.315)	(2.333)				(1.675)
SC							14.050 * **	17.063 * **	14.724 * **	18.144 * **
							(11.600)	(9.464)	(7.410)	(10.800)
EM_TEAM x ESC_MGT				− 1.487						
				(−0.581)						
EM_TEAM x ESC_TER				2.297						
				0.845						
EM_TRAIN x ESC_MGT				− 6.463						
				(−0.883)						
EM_TRAIN x ESC_TER				− 3.172						
				(−1.510)						
S_COM x ESC_MGT				− 1.874						
				(−0.717)						
S_COM x ESC_TER				1.671						
				(0.781)						
EM_TEAM x PR_USE					− 6.128					
					(−1.011)					
EM_TEAM x E_PROD					− 1.019					
					(−0.186)					
EM_TRAIN x PR_USE					− 10.061					
					(−0.653)					
EM_TRAIN x E_PROD					6.494					
					(1.083)					
S_COM x PR_USE					− 1.090					
					(−0.227)					
S_COM x E_PROD					− 1.930					
					(−0.419)					
ESC_MGT x PR_USE						− 6.210				
						(−1.239)				
ESC_MGT x E_PROD						6.004				
						(1.208)				
ESC_TER x PR_USE						− 3.826				
						(−0.548)				
ESC_TER x E_PROD						− 1.641				
						(−0.245)				

(*continued on next page*)

Table 11 (*continued*)

	Model 1			Model 2			(c)	(d) Model 3		
EM_TEAM	12.991 * **			8.228 * **	16.492 * **			8.535 * **		
EM_TEAM x SC								3.074		
								(1.273)		
EM_TRAIN x SC								− 14.471 * **		
								(−6.158)		
S_COM x SC								− 0.885 * *		
								(−2.492)		
ESC_MGT x SC									− 4.496	
									(−0.789)	
ESC_TER x SC									− 0.632	
									(−0.252)	
PR_USE x SC										− 9.493 *
										(−1.859),
E_PROD x SC										0.563
										(0.114)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
constant	− 65.355 * **	− 67.358 * **	− 87.595 * **	− 57.375 * **	− 72.946 * **	− 72.978 * **	− 63.488 * **	− 59.506 * **	− 53.886 * **	− 72.590 * **
	(−12.230)	(−13.290)	(−17.650)	(−11.070)	(−15.000)	(−15.720)	(−12.090)	(−11.260)	(−10.670)	(−15.440)
Observations	12,732	12,732	12,732	12,732	12,732	12,732	12,732	12,732	12,732	12,732
R-squared	0.759	0.781	0.774	0.805	0.810	0.818	0.745	0.778	0.799	0.798
YEAR_FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-stat	212.093 * **	263.728 * **	222.975 * **	176.237 * **	157.654 * **	201.324 * **	242.587 * **	186.717 * **	238.618 * **	216.528 * **

Note. The table reports the results of the fixed-effect regression on panel data. The dependent variable is environmental performance (EP). The independent variables are the environmental strategic actions and the presence of the sustainability committee. Firm controls, country controls and time-fixed effects are included. The control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at the 1% of each tail. Robust *t* statistics are reported in parentheses and based on robust standard errors corrected for autocorrelation and heteroscedasticity. * ** , * *, * Significant at 1%, 5% and 10% level, respectively.

Table 12
Robustness test: environmental strategies, sustainability committee and environmental performance excluding industrial companies.

	Model 1			Model 2			(c)	(d) Model 3		
EM_TEAM	11.338 * **			7.358 * **	20.757 * **			14.397 * **		
	(6.454)			(3.112)	(5.089)			(3.201)		
EM_TRAIN	8.745 * **			6.984 * **	4.104 * **			8.839 * **		
	(3.522)			(4.651)	(2.674)			(3.801)		
S_COM	1.606 * *			4.965 * *	4.527 * **			10.262 * **		
	(2.250)			(1.980)	(3.082)			(3.689)		
ESC_MGT		20.881 * **		13.547 * **		5.725 * **			15.658 * **	
		(3.014)		(6.418)		(2.703)			(3.460)	
ESC_TER		4.144 *		7.684 * **		2.285 * **			6.318 * **	
		(1.188)		(5.454)		(3.386)			(4.971)	
PR_USE			11.259 * **		9.590 * **	13.221 * **				13.501 * **
			(4.781)		(4.821)	(5.281)				(3.294)
E_PROD			9.555 *		6.492 * *	01.906 * *				22.068 * **
			(1.879)		(2.364)	(2.052)				(6.644)
SC							16.663 * **	11.275 * **	12.604 * *	10.904 *
							(3.228)	(4.174)	(2.468)	(1.735)
EM_TEAM x ESC_MGT				− 1.862						
				(−0.471)						
EM_TEAM x ESC_TER				2.196						
				0.983						
EM_TRAIN x ESC_MGT				− 2.207						
				(−0.954)						
EM_TRAIN x ESC_TER				− 5.212						
				(−1.376)						
S_COM x ESC_MGT				− 2.563						
				(−0.963)						
S_COM x ESC_TER				1.212						
				(0.687)						
EM_TEAM x PR_USE					− 5.415					
					(−0.736)					
EM_TEAM x E_PROD					− 3.247					
					(−0.628)					
EM_TRAIN x PR_USE					− 8.657					
					(−1.047)					
EM_TRAIN x E_PROD					8.113					
					(1.315)					
S_COM x PR_USE					− 1.084					
					(−0.988)					
S_COM x E_PROD					− 1.852					
					(−0.934)					
ESC_MGT x PR_USE						− 8.059				
						(−0.812)				
ESC_MGT x E_PROD						2.167				
						(1.051)				
ESC_TER x PR_USE						− 8.578				
						(−1.463)				
ESC_TER x E_PROD						− 1.824				
						(−0.564)				

(*continued on next page*)

Table 12 (*continued*)

	Model 1			Model 2			(c)	(d) Model 3		
EM_TEAM	11.338 * **			7.358 * **	20.757 * **			14.397 * **		
EM_TEAM x SC								16.341		
								(0.061)		
EM_TRAIN x SC								− 1.614 * **		
								(−3.144)		
S_COM x SC								− 13.597 * **		
								(−3.892)		
ESC_MGT x SC									− 4.318	
									(−0.387)	
ESC_TER x SC									− 0.591	
									(−0.834)	
PR_USE x SC										− 13.099 *
										(−1.741)
E_PROD x SC										0.441
										(1.447)
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
constant	− 44.686 * **	− 45.573 * *	− 31.889 * **	− 43.406 * *	− 42.722 * *	− 49.849 * **	− 55.144 * **	− 29.367 * **	− 25.982 * **	− 20.524 * **
	(−3.219)	(−2.343)	(−2.851)	(−2.194)	(−2.228)	(−3.119)	(−2.874)	(−3.999)	(−2.952)	(−4.364)
Observations	12,732	12,732	12,732	12,732	12,732	12,732	12,732	12,732	12,732	12,732
R-squared	0.860	0.859	0.860	0.880	0.877	0.873	0.831	0.863	0.866	0.867
YEAR_FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F-stat	125.212 * **	126.428 * **	124.593 * **	126.741 * **	127.412 * **	121.084 * **	118.957 * **	129.817 * **	131.618 * **	128.942 * **

Note. The table reports the results of the fixed-effect regression on panel data. The dependent variable is environmental performance (EP). The independent variables are the environmental strategic actions and the presence of the sustainability committee. Firm controls, country controls and time-fixed effects are included. The control variables based on accounting data (SIZE, ROA, LEV, LIQ, R&D) are winsorized at the 1% of each tail. Robust *t* statistics are reported in parentheses and based on robust standard errors corrected for autocorrelation and heteroscedasticity. * ** , * *, * Significant at 1%, 5% and 10% level, respectively.

of green strategies. Hence, the managerial teams operating today in banks, insurance and other financial intermediaries are not yet equipped with sufficient skills to act effectively, together with other environmental strategies, on EP.

Third, the study demonstrates that the board SC, stand-alone, improves EP of both financial and non-financial companies. On the one hand, this result confirms previous evidence on non-financial companies by Dixon-Fowler et al. (2017) and Biswas et al. (2018). On the other hand, this finding improves extant literature by demonstrating that the positive impact of the board SC on environmental outcomes extends to financial companies and to all European countries.

Finally, the paper tests for the first time in the literature the role of the SC in mediating the relationship between environmental strategies and EP. These results show that the board SC acts as a substitute for environmental management training, sustainability compensation mechanisms and product environmental responsible use in increasing EP of both financial and non-financial companies. There could be different reasons for this. On the one hand, effective application of certain environmental strategies may make the board SC partially superfluous in improving corporate environmental outcomes. In this perspective, as suggested by Rodrigue et al. (2013) and Burke et al. (2019), the SC could be more oriented towards protecting EP from regulatory and/or reputational damages than to improving it. On the other hand, it could be that SCs do not yet have sufficient expertise to be pro-active and help companies to improve the effectiveness of their environmental strategies and, therefore, to further enhance EP.

6. Robustness checks

Additional analyses are conducted in order to test the robustness of the main results.

First, an instrumental variable (IV) regression analysis 2sls is performed to test H_3. Previous literature (Elmaghrabi, 2021) suggests in fact that the relationship between the board SC and EP can suffer from endogeneity. Hence, the instrumental variable (IV) regression approach controls for possible endogeneity problems related to the variable SC. Instrumental variables should satisfy two conditions: they should be correlated with the endogenous variable, and uncorrelated with the error term. Two instrumental variables are used to control for the possible endogeneity of the variable SC: (i) the one firm-year lag of the independent test variable (SC at time *t-1*) and (ii) the corporate sustainability strategy (CSR_STR). The SC at time *t-1* is supposed to influence the SC at time *t* for different reasons, as suggested by previous literature (Biswas et al., 2018; Uyar et al., 2021). First, if a company establishes an SC at time *t-1*, it indicates a commitment to addressing ESG issues that is likely to persist in the future, as sustainability initiatives are often long-term and require ongoing attention. Second, companies are increasingly aware of stakeholder expectations for ESG practices, and the presence of an SC at time *t-1* can signal responsiveness to these expectations, which firms meet over time by maintaining the committee. Third, in the last decade, legal and regulatory requirements related to sustainability have become more stringent in Europe. In this context, the SC may help companies stay compliant with evolving ESG regulations, making it a continued necessity. The second instrumental variable is corporate sustainability strategy (CSR_STR) at time *t*. It is measured by the CSR strategy score provided by the Thomson Reuters ASSET4 database. The score ranges from 0% to 100% and reflects a company's practices to communicate that it integrates ESG dimensions into its day-to-day decision-making processes. Corporate sustainability strategy and the presence of the SC are supposed to be highly related for different reasons. First, a sustainability strategy sets the company's goals and objectives for integrating ESG principles into its operations, and having an SC helps ensure that these objectives are actively pursued and monitored. Second, an SC typically consists of members who bring diverse expertise in various ESG-related areas, and that therefore can guide the development and execution of the firm sustainability strategy. The two instrumental variables are both correlated with the possible endogenous variable and not correlated with the error term. However, this does not guarantee that the two instrumental variables are good instruments within Model 3. For this reason, the F-test and the Sargan-Hansen test are run. The F-test allows to detect the presence of weak instruments, while the Sargan-Hansen test (alternatively named over-identification test) assesses the validity of instrumental variables. The results of the second step of the IV regression analysis are reported in Table 10.

They show that the board SC, standing alone, improves firm environmental outcomes, but when it acts together with specific environmental strategic mechanisms, and specifically environmental management training, sustainability compensation mechanisms and product environmental responsible use, it partially replaces them in increasing EP. The F-test is always higher than 10, thus signaling that instrumental variables are strong. Moreover, the *p*-value of the Sargan-Hansen test is always large, and that leads to accept the null hypothesis that the overidentifying restrictions are valid. Therefore, the two instrumental variables are shown to be good instruments in Model 3. Overall, the results of the IV regression analysis are largely consistent with the main analysis, thus confirming previous results.

Moreover, EP is estimated using an alternative measure. Specifically, the Emission Category Score from the Thomson Reuters Asset4 database is employed, as suggested by Biswas et al. (2018). This score estimates a company's commitment and effectiveness toward reducing environmental emissions in the production and operational processes and ranges from 0% to 100%. Eqs. (1), (2) and (3) are run using this alternative variable and the results support the main analyses reported in Tables 7, 8 and 9.

Furthermore, as the sample contains European financial and non-financial companies from both EU and non-EU countries, which are subject to different regulations in terms of environmental policies, additional fixed-effect regressions are run excluding non-EU countries. Overall, the results are highly consistent with the main analysis, thus confirming previous findings. Moreover, as shown in Table 1, companies from France, Germany and UK represent approximately 46% of the sample. For this reason, Eqs. (1), (2) and (3) are run excluding French, German and UK companies. The results of the global sample, reported in Table 11, strongly support previous evidence shown in Table 7 and Table 9 (a) and (b).

Table 1 also shows that industrial companies represent approximately 70% of the sample. Therefore, Eqs. (1), (2) and (3) are further run excluding these companies. The findings, reported in Table 12, support again the main evidence displayed in Tables 7, 9(a) and 9(b).

Finally, the robustness of the main results is controlled for the presence of potential outliers in the variables related to environmental strategies. Therefore, additional fixed-effect regressions are run after winsorizing the dependent variables at the 5% level to remove potential outliers from both tails of the sample, as suggested by Orazalin (2019). Overall, these further results confirm those of the main analyses.[1]

7. Conclusions

This paper aims to study the individual and interactive effects of various environmental strategic actions on EP and identify possible differences between financial and non-financial companies. In addition, the study explores the role of the board SC in mediating the linkage between different environmental strategies and firm environmental outcomes.

The results highlight how environmental human resource management, environmental supply chain, and green production and processes strategies, considered individually, positively impact on firm environmental performance of the whole sample. However, when they operate jointly, the effect differs between financial and non-financial companies. Specifically, in non-financial firms, various environmental strategic actions work jointly to improve EP, while in financial firms, an environmental strategic mechanism, and specifically the presence of an environmental management team, partially replaces the environmental supply chain and green production and process in improving environmental outcomes.

Moreover, the findings show that the board SC, considered individually, improves firm EP, but when it operates jointly with some environmental strategies, and specifically with environmental management training, sustainability compensation mechanisms, and product environmental responsible use, it partially replaces these environmental strategic actions in increasing EP.

This paper makes several contributions to research and practice.

From the research perspective, it enriches previous literature by showing that environmental strategies are effective in improving EP of both non-financial and financial companies throughout all European countries. However, in non-financial companies, some environmental strategic actions have a complementary effect on EP, while in non-financial companies, the effect is substitutive. Moreover, the paper demonstrates that, in both financial and non-financial firms, when the board SC operates jointly with some environmental strategies, it partially replaces them in improving environmental outcomes.

In practical terms, these findings are useful for managers as they show that there is no single “one-size-fits-all” approach for firms adopting environmental strategies. The interactive effect of different strategies on EP is sometimes complementary and sometimes substitutive, which suggests that companies employing different strategies jointly should constantly monitor the level of each single mechanism, as each one can affect the positive impact on environmental outcomes of the others simultaneously in place. Moreover, as the results of the moderation analysis indicate, a board SC, when operating together with some environmental strategies, can reduce their positive effect on EP. This may be due to a lack of adequate environmental expertise in the SC, which prevents it from mobilizing board resources to achieve better environmental outcomes. This suggests that both financial and non-financial companies should select SC members with true environmental expertise. They could in fact play a key role in incentivizing green production, enhancing employee environmental awareness, and setting ambitious environmental targets and rewards for inspiring environmental behavior among the staff, and thus effectively improve firm EP.

The main limitations of this study are as follows. First, it is limited to European countries. Further research could usefully analyze the individual and interactive effects of various environmental strategic actions on EP, and the mediating role of the board SC, in other countries, including the developing countries. Second, the study investigates the presence of a board SC but does not consider their expertise because of a lack of available data. Future studies could usefully expand this perspective, and test whether board SCs characterized by high environmental expertise can really strengthen the positive impact of environmental strategies on EP.

CRediT authorship contribution statement

Soana Maria Gaia: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

Data Availability

Data will be made available on request.

References

Adebanjo, D., Teh, P.L., Ahmed, P.K., 2016. The impact of external pressure and sustainable management practices on manufacturing performance and environmental outcomes. Int. J. Oper. Prod. Manag. 36 (9), 995–1013. https://doi.org/10.1108/IJOPM-11-2014-0543.

Albertini, E., 2017. What we know about environmental policy: an inductive typology of the research. Bus. Strategy Environ. 26 (3), 277–287. https://doi.org/10.1002/bse.1913.

Antonioli, D., Mancinelli, S., Mazzanti, M., 2013. Is environmental innovation embedded within high-performance organizational changes? the role of human resource management and complementarity in green business strategies. Res. Policy 42 (4), 975–988. https://doi.org/10.1016/j.respol.2012.12.005.

[1] Results of the regressions using the Emission Category Score as alternative measure of EP and excluding non-EU countries and potential outliers are available on request.

Appannan, J.S., Said, R.M., Ong, T.S., Senik, R., 2023. Promoting sustainable development through strategies, environmental management accounting, and environmental performance. Bus. Strategy Environ. 32 (4), 1914–1930. https://doi.org/10.1002/bse.3227.
Bansal, P., Roth, K., 2000. Why companies go green: a model of ecological responsiveness. Acad. Manag. J. 43 (4), 717–736. https://doi.org/10.2307/1556363.
Berrone, P., Gomez-Mejia, L.R., 2009. Environmental performance and executive compensation: an integrated agency-institutional perspective. Acad. Manag. J. 52 (1), 103–126. https://doi.org/10.5465/amj.2009.36461950.
Berrone, P., Fosfuri, A., Gelabert, L., Gomez-Mejia, L.R., 2013. Necessity as the mother of 'Green Inventions: institutional pressures and environmental innovations. Strateg. Manag. J. 34 (8), 891–909. https://doi.org/10.1002/smj.2041.
Biswas, P., K., Mansi, M., Pandey, R., 2018. Board composition, sustainability committee and corporate social and environmental performance in Australia. Pac. Account. Rev. 30 (4), 517–540. ⟨https://www.emerald.com/insight/content/doi/10.1108/PAR-12-2017-0107/full/html⟩.
Burke, J.J., Hoitash, R., Hoitash, U., 2019. The heterogeneity of board-level sustainability committees and corporate social performance. J. Bus. Ethics 154, 1161–1186. https://doi.org/10.1007/s10551-017-3453-2.
Dai, J., Cantor, D.E., Montabon, F.L., 2015. How environmental management competitive pressure affects a focal firm's environmental innovation activities: A green supply chain perspective. J. Bus. Logist. 36, 242–259. https://doi.org/10.1111/jbl.12094.
Dai, J., Cantor, D.E., Montabon, F.L., 2017. Examining corporate environmental proactivity and operational performance: a strategy-structure-capabilities-performance perspective within a green context. Int. J. Prod. Econ. 193, 272–280. https://doi.org/10.1016/j.ijpe.2017.07.023.
Daily, B.F., Bishop, J.W., Massoud, J.A., 2012. The role of training and empowerment in environmental performance: a study of the Mexican maquiladora industry. Int. J. Oper. Prod. Manag. 32 (5), 631–647. https://doi.org/10.1108/01443571211226524.
DiMaggio, P.J., Powell, W.W., 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. Am. Sociol. Rev. 48 (2), 147–160. https://doi.org/10.2307/2095101.
Dixon-Fowler, H.R., Ellstrand, A.E., Johnson, J.L., 2017. The role of board environmental committees in corporate environmental performance. J. Bus. Ethics 140 (3), 423–438. https://doi.org/10.1007/s10551-015-2664-7.
Dumont, J., Shen, J., Deng, X., 2017. Effects of green HRM practices on employee workplace green behavior: The role of psychological green climate and employee green values. Hum. Resour. Manag. 56 (4), 613–627. https://doi.org/10.1002/hrm.21792.
Elmaghrabi, M.E., 2021. CSR committee attributes and CSR performance. Uk evidence. Corp. Gov. Vol. 21 (No. 5), 892–919. https://doi.org/10.1108/CG-01-2020-0036.
European Banking Authority (EBA), 2021. Report on management and supervision of ESG risks for credit institutions and investment firms. EBA. https://www.eba.europa. EU/eba-publishes-its-report-management-and-supervision-ESG-risks-credit-institutions-and-investment.
Fama, E.F., 1980. Agency problems and the theory of the firm. J. Political Econ. 88 (2), 288–307. https://doi.org/10.1086/260866.
Foerster, S.R., Sapp, S.G., 2005. Valuation of financial versus non-financial firms: a global perspective. J. Int. Financ. Mark., Inst. Money 15 (1), 1–20. https://doi.org/10.1016/j.intfin.2004.01.003.
Freeman, R. (1984). Strategic management: A stakeholder approach. Pitman, Marshall.
Galletta, S., Mazzù, S., Naciti, V., 2022. A bibliometric analysis of ESG performance in the banking industry: from the current status to future directions. Res. Int. Bus. Financ. 62, 101684 https://doi.org/10.1016/j.ribaf.2022.101684.
Gong, G., Deng, Q., Gong, X., Liu, W., Ren, Q., 2018. A new double flexible job-shop scheduling problem integrating processing time, green production, and human factor indicators. J. Clean. Prod. 174, 560–576. https://doi.org/10.1016/j.jclepro.2017.10.188.
Govindan, K., Kaliyan, M., Kannan, D., Haq, A.N., 2014. Barriers analysis for green supply chain management implementation in Indian industries using analytic hierarchy process. Int. J. Prod. Econ. 147, 555–568. https://doi.org/10.1016/j.ijpe.2013.08.018.
Groening, C., Sarkis, J., Zhu, Q., 2018. Green marketing consumer-level theory review: s compendium of applied theories and further research directions. J. Clean. Prod. 172, 1848–1866. https://doi.org/10.1016/j.jclepro.2017.12.002.
Hanna, M.D., Newman, W.R., Johnson, P., 2000. Linking operational and environmental improvement through employee involvement. Int. J. Oper. Prod. Manag. 20 (2), 148–165. https://doi.org/10.1108/01443570010304233.
Haque, F., Ntim, C.G., 2018. Environmental policy, sustainable development, governance mechanisms, and environmental performance. Bus. Strategy Environ. 27 (3), 415–435. https://doi.org/10.1002/bse.2007.
Hart, S.L., 1995. A natural-resource-based view of the firm. Acad. Manag. Rev. 20 (4), 986–1014. https://doi.org/10.2307/258963.
Hart, S.L., Dowell, G., 2011. A natural-resource-based view of the firm: fifteen years after. J. Manag. 37 (5), 1464–1479. https://doi.org/10.1177/0149206310390219.
Hillman, A.J., Cannella, A.A.J., Paetzold, R.L., 2000. The resource dependence role of corporate directors: strategic adaptation of board composition in response to environmental change. J. Manag. Stud. 37 (2), 235–255. https://doi.org/10.1111/1467-6486.00179.
Jain, T., Jamali, D., 2016. Looking inside the black box: The effect of corporate governance on corporate social responsibility. Corp. Gov.: Int. Rev. 24 (3), 253–273. https://doi.org/10.1111/corg.12154.
Ji, L., Huang, J., Liu, Z., Zhu, H., Cai, Z., 2012. The effects of employee training on the relationship between environmental attitude and firms' performance in sustainable development. Int. Hum. Resour. Manag. 23 (14), 2995–3008. https://doi.org/10.1080/09585192.2011.637072.
Lagoarde-Segot, T., 2019. Sustainable finance. A critical realist perspective. Res. Int. Bus. Financ. 47, 1–9. https://doi.org/10.1016/j.ribaf.2018.04.010.
Latan, H., Chiappetta, H., Jabbour, C.J., Lopes de Sousa Jabbour, A.B., Wamba, S.F., Shahbaz, M., 2018. Effects of environmental strategy, environmental uncertainty and top management's commitment on corporate environmental performance: The role of environmental management accounting. J. Clean. Prod. 180, 297–306. https://doi.org/10.1016/j.jclepro.2018.01.106.
Li, S., Jayaraman, V., Paulraj, A., Shang, K.C., 2016. Proactive environmental strategies and performance: role of green supply chain processes and green product design in the Chinese high-tech industry. Int. J. Prod. Res. 54 (7), 2136–2151. https://doi.org/10.1080/00207543.2015.1111532.
Luzzini, D., Brandon-Jones, E., Brandon-Jones, A., Spina, G., 2015. From sustainability commitment to performance: the role of intra- and inter-firm collaborative capabilities in the upstream supply chain. Int. J. Prod. Econ. 165 (2015), 51–63. https://doi.org/10.1016/j.ijpe.2015.03.004.
Majid, A., Yasir, M., Yasir, M., Javed, A., 2019. Nexus of institutional pressures, environmentally friendly business strategies, and environmental performance. Corp. Soc. Responsib. Environ. Manag. 27 (2), 706–716. https://doi.org/10.1002/csr.1837.
Marsat, S., Pijourlet, G., Ullah, M., 2022. Does environmental performance help firms to be more resilient against environmental controversies? International evidence. Financ. Res. Lett. 44, 102028 https://doi.org/10.1016/j.frl.2021.102028.
Menguc, B., Ozanne, L., 2005. Challenges of the green imperative: a natural resource-based approach to the environmental orientation-business performance relationship. J. Bus. Res. 58, 430–438. https://doi.org/10.1016/j.jbusres.2003.09.002.
Mengze, H., Wei, L., 2015. A comparative study on environment credit risk management of commercial banks in the Asia-Pacific region. Bus. Strategy Environ. 4 (3), 159–174. https://doi.org/10.1002/bse.1810.
Orazalin, N., 2019. Do board sustainability committees contribute to corporate environmental and social performance? the mediating role of corporate social responsibility strategy. Bus. Strategy Environ. 29, 140–153. https://doi.org/10.1002/bse.2354.
Panayi, E., Bozos, K., Veronesi, G., 2021. Corporate governance "bundles" and firm acquisitiveness. Corp. Gov. Int. Rev. 29 (4), 402–426. https://doi.org/10.1111/corg.12371.
Post, C., Rahman, N., McQuillan, C., 2015. From board composition to corporate environmental performance through sustainability-themed alliances. J. Bus. Ethics 130 (2), 423–435. https://doi.org/10.1007/s10551-014-2231-7.
Ramzan, M., Amin, M., Abbas, M., 2021. How does corporate social responsibility affect financial performance, financial stability, and financial inclusion in the banking sector? evidence from Pakistan. Res. Int. Bus. Financ. 55, 101314 https://doi.org/10.1016/j.ribaf.2020.101314.
Rodrigue, M., Mangan, M., Cho, C., 2013. Is environmental governance substantive or symbolic? an empirical investigation. J. Bus. Ethics 114 (1), 107–129. https://doi.org/10.1007/s10551-012-1331-5.

Sambasivan, M., Bah, S.M., Jo-Ann, H., 2013. Making the case for operating “Green”: impact of environmental proactivity on multiple performance outcomes of Malaysian firms. J. Clean. Prod. 42, 69–82. https://doi.org/10.1016/j.jclepro.2012.11.016.

Seman, N.A.A., Govindan, K., Mardani, A., Zakuan, N., Saman, M.Z.M., Hooker, R.E., Ozkul, S., 2019. The mediating effect of green innovation on the relationship between green supply chain management and environmental performance. J. Clean. Prod. 229, 115–127. https://doi.org/10.1016/j.jclepro.2019.03.211.

Shah, N., Soomro, B.A., 2020. Internal green integration and environmental performance: the predictive power of proactive environmental strategy, greening the supplier, and environmental collaboration with the supplier. Bus. Strategy Environ. 30 (2), 1333–1344. https://doi.org/10.1002/bse.2687.

Shaukat, A., Qiu, Y., Trojanowski, G., 2016. Board attributes, corporate social responsibility strategy, and corporate environmental and social performance. J. Bus. Ethics 135 (3), 569–585. https://doi.org/10.1007/s10551-014-2460-9.

Tingbani, I., Chithambo, L., Tauringana, V., Papanikolaou, N., 2020. Board gender diversity, environmental committee, and greenhouse gas voluntary disclosures. Bus. Strategy Environ. 29 (6), 2194–2210. https://doi.org/10.1002/bse.2495.

Uyar, A., Kuzey, C., Kilic, M., Karaman, A.S., 2021. Board structure, financial performance, corporate social responsibility performance, CSR committee, and CEO duality: disentangling the connection in healthcare. Corp. Soc. Responsib. Environ. Manag. 28 (6), 1730–1748. https://doi.org/10.1002/csr.2141.

Walls, J.L., Berrone, P., Phan, P.H., 2012. Corporate governance and environmental performance: is there really a link? Strateg. Manag. J. 33 (8), 885–913. https://doi.org/10.1002/smj.1952.

Wijethilake, C., 2017. Proactive sustainability strategy and corporate sustainability performance: the mediating effect of sustainability control systems. J. Environ. Manag. 196, 569–582. https://doi.org/10.1016/j.jenvman.2017.03.057.

Yang, D., Jiang, W., Zhao, W., 2019. Proactive environmental strategy, innovation capability, and stakeholder integration capability: a mediation analysis. Bus. Strategy Environ. 28, 1534–1547. https://doi.org/10.1002/bse.2329.

Zhang, D., 2021. How environmental performance affects firms’ access to credit: evidence from EU countries. J. Clean. Prod. 315, 128–294. https://doi.org/10.1016/j.jclepro.2021.128294.

Zhang, S., Wang, Z., Zhao, X., 2019. Effects of proactive environmental strategy on environmental performance: mediation and moderation analyses. J. Clean. Prod. 235, 1438–1449. https://doi.org/10.1016/j.jclepro.2019.06.220.