



Gender diversity on the board and in top management and ESG performance: evidence from Italian non-financial listed companies

Maria Cristina Arcuri¹ · Raoul Pisani²

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Abstract

This study explores the relationship between the percentage of women directors and managers (PWDM) and women CEOs on one hand, and the ESG performance of companies on the other. We carried out a panel analysis on 290 Italian non-financial listed companies over 2015–2022. Our results demonstrate that there is a negative relationship between PWDM and ESG ratings, but when the company's CEO is a woman, the Bloomberg ESG score and E score from LSEG and E and S scores from Bloomberg are positively influenced by a PWDM close to or above 50%. We also find that ESG performance is mainly associated with the percentage of independent directors, number of employees, firm age and certain financial variables, including ROA, ROA volatility, Tobin's Q and P/E. The novelty of this study lies, among other things, in examining the relationship between corporate governance and sustainability while focusing on operational roles in addition to board membership. The study may also have important implications for policies and programmes to promote gender equality in the broader context of Diversity and Inclusion.

Keywords ESG performance · Corporate social responsibility · Gender diversity · Board of directors · Corporate governance

JEL codes G32 · G34 · G40

✉ Maria Cristina Arcuri
mariacristina.arcuri@unipr.it
Raoul Pisani
raoul.pisani@unitn.it

¹ Department of Economics and Management, University of Parma, Via J.F. Kennedy 6, Parma 43125, Italy

² Department of Economics and Management, University of Trento, Via Inama 5, Trento 38122, Italy

1 Introduction

Since the 2008 crisis, there has been widespread demand for a new sustainable economic recovery, and in recognition of this, European Union (EU) policy has placed great emphasis on green economic growth and on Environmental, Social and Governance (ESG) innovation (European Commission, 2018). Attention to ESG objectives has impacts not only at the macroeconomic level/industrial level (agriculture, transport, extractive industries, manufacturing, construction, services, etc.), but also at the corporate level. In fact, recent studies demonstrate that improving ESG performance has significant implications in terms of reducing firm operational risk level (Bouslah et al., 2018; Godfrey et al., 2009; Muhammad et al., 2015; Farza et al., al., 2021), and since operational risk is a significant component of credit risk (Merton, 1974) this reduction helps firms to access financial markets (Jo & Na, 2012; Zeidan et al., 2015), and bank credit (Bauer & Hann, 2010; Goss & Roberts, 2011; Magnanelli & Izzo, 2017; Sharfman & Fernando, 2008). Other studies show that ESG-sensitive firms have not only a lower probability of liquidity shortfall and bankruptcy, but also a higher level of reputation, which facilitates innovation (Huang et al., 2020; Bae et al., 2021; Guérin & Suntheim, 2021; Hong & Liskovich, 2019), higher levels of trust among stakeholders including employees, suppliers and clients (Lins et al., 2017, 2019) and can also make ESG controversies into opportunities for growth and reputation enhancement (Elamer et al., 2024).

The relationship between gender diversity and, in particular, diverse composition of the Board of Directors (BoD or “board”) and firm ESG performance has been analyzed in this context, with often conflicting results. Many studies show that having at least three women on the BoD is significantly associated with stronger ESG performance (Glass et al., 2016) and more recent research (Amorelli & Garcia-Sanchez, 2020; Cambrea et al., 2023; Al-Shaer et al., 2024) not only confirms this critical mass effect, but also suggests that women’s professional background, skills, and experience further enhance firms’ ESG outcomes. Other studies suggest a more complex relationship, so that if on the one hand gender differences help the company’s ESG performance, on the other, over-representation of women on the board might be counterproductive (Adams & Ferreira, 2009; Đặng et al., 2023).

The aim of this study is thus to investigate whether there is a relationship between the percentage of women directors and managers (PWDM) and women CEO on the one hand, and the company’s ESG performance on the other, both in terms of overall ESG score and Environmental (E) and Social (S) scores separately. For this purpose, we analyze a sample of 290 non-financial companies listed on the Italian Stock Exchange in the period 2015–2022. We exclude banks, insurance and financial companies for two reasons: the nature of their production process could positively influence the environmental score of the sample (Gangi et al., 2019), and the relationship between ESG orientation and economic value is controversial (Di Tommaso & Thornton, 2020).

We concentrate on Italian companies for two reasons:

1. Italy is under specific legislation on mandatory gender quotas for the BoD of listed and state-owned companies, the Golfo-Mosca Law (Law 120/2011), and in 2019 an amendment raised the minimum threshold of females on BoD and Auditors to

- 40%, which is one of the highest percentages in Europe (European Commission, 2018; Seierstad, 2016; Slomka-Golebiowska et al., 2023);
2. A recent study “Seize the Change” (EY, 2024)¹ finds that despite the economic and financial impact of geopolitical tensions, Italian companies are increasingly integrating sustainability into their business with structured plans and targets. In fact, more than 60% of Italian companies have continued sustainability plan activities and 15% have used the new environment to accelerate the transition to new, more sustainable models.

The criticalities and inhomogeneity in currently available ESG metrics (Berg et al., 2022; Chatterji et al., 2016; Kotsantonis & Serafeim, 2019) are a potential limitation of the study, which we aim to overcome by using different SG ratings from different providers. We use the ESG score, and “E” and “S” pillars, from LSEG (London Stock Exchange Group plc, formerly Refinitiv) downloaded from Thomson Reuters Eikon Datastream and the ESG score and Disclosure scores, and “E” and “S” pillars, from Bloomberg. ESG scores from LSEG measure a company’s relative ESG performance, commitment and effectiveness; Bloomberg ESG scores measure a company’s management of financially material ESG issues; and Bloomberg ESG Disclosure scores measure the extensiveness of company’s ESG reporting. In the past, investors were primarily interested in profitable business opportunities, but nowadays a new generation of informed investors appear more willing to support companies that share their moral and social values (Eccles et al., 2017). This makes it necessary for issuers of financial instruments to integrate sustainable practices into their governance framework. Company organization and decision making, in order to optimize the value creation process, need to incorporate environmental responsibility, social equity and, in general, sustainable development. The key question for corporate governance and management is what aspects and possible changes are needed to address the challenge of sustainability (Kavadis & Thomsen, 2023). Sustainability risk management has also become crucial, as business strategy must ensure that sustainability policies do not deflect from primary business objectives (Burke et al., 2019; Clerc, 2021). We therefore aim to contribute to the existing literature on the relationship between corporate governance and sustainability by focusing more on operational roles than simply on board membership². For example, although board gender diversity is widely discussed, there is limited evidence on the potential impact of female CEOs on ESG scores (Al-Shaer et al., 2024). We thus extend the analysis in four ways; by including managers and CEOs, by conducting an empirical study over a more recent period than that in other analyses on listed Italian companies, by investigating the relationship between PWD and ESG scores, and by focusing on Environmental and Social pillars separately.

The remainder of the paper is structured as follows. Section 2 presents the theoretical basis and development of research hypotheses. Section 3 describes our sample, variables, and methodology. Section 4 contains the empirical results. Section 5 concludes the paper.

¹ https://www.ey.com/it_it/functional/forms/seize-the-change-2024-report.

² Some studies (e.g., Larcker et al., 2022) show that the trend to incorporate ESG issues into corporate boardrooms and capital markets is now *pervasive*.

2 Theoretical background and hypothesis development

For some years, a growing number of studies have focused on the relationship between gender differences on boards of directors and companies' ESG performance. This relationship has been examined both theoretically and empirically. Many empirical analyses report a positive association, although a smaller body of research suggests that the relationship may be more nuanced and complex.

2.1 Theoretical studies

Several theoretical frameworks - resource dependence, stakeholder, legitimacy, and gender socialization theories - explain the link between board gender diversity (BGD) and firms' ESG performance.

Resource dependence theory views the board as a mechanism connecting the firm to its external environment, thereby reducing uncertainty (Hillman & Dalziel, 2003). Diversity in gender, experience, and background broadens the board's resource base (Velte, 2016), and female directors provide differentiated knowledge and perspectives that enhance stakeholder understanding and access to key external resources (Nadeem et al., 2017). Empirical evidence shows that women on boards improve access to capital, information, and networks due to stronger market ties (Cordeiro et al., 2020) and contribute to more effective governance and strategic oversight (Yararam & Adapa, 2021). Consequently, a higher proportion of female directors constitutes a strategic resource that strengthens social legitimacy and reinforces firms' environmental and social commitments (Elmagrhi et al., 2019; Kyaw et al., 2017).

From a stakeholder theory perspective, firms are responsible for addressing the interests of all parties affected by their activities (Freeman, 1984). Since organizational performance depends on stakeholders such as employees, customers, investors, communities, and public institutions - and vice versa - firms must integrate these interests into strategic decision-making to ensure long-term sustainability (Castelo Branco & Lima Rodrigues, 2007). In this framework, female directors contribute to strengthening stakeholder relationships, as they tend to display greater sensitivity to CSR issues and environmental and social concerns (Adams & Licht, 2011; Atif et al., 2021). Their diverse perspectives and competencies enhance stakeholder representation in board deliberations, fostering more inclusive and balanced decisions (McGuinness et al., 2017). Board gender diversity supports improved social performance, as female directors more consistently prioritize stakeholder needs compared to male counterparts (McGuinness et al., 2017; Kirsch, 2018; Nguyen et al., 2020), guiding firms beyond mere compliance toward broader alignment with sustainability standards while maintaining robust governance structures.

Legitimacy theory offers an additional explanation for the link between board gender diversity and ESG performance, positing that firms engage in ESG activities to align their behavior with prevailing social norms and thereby secure legitimacy (Suchman, 1995). In this sense, female directors function as a governance mechanism that enhances legitimacy, given their heightened sensitivity to community and stakeholder concerns (Majeed et al., 2015; Muttakin et al., 2015). As gender equality has become an established social expectation, increasing female board representation signals a

firm's commitment to inclusiveness and ethical conduct (Cox et al., 1991). Firms often respond to social and institutional pressures by adopting gender diversity initiatives, which influence ESG outcomes since diversity and inclusion are central components of corporate social behavior (Cho et al., 2021). Empirical evidence shows that female directors promote transparency and higher-quality ESG disclosure, strengthening legitimacy and reputation (Arayssi et al., 2020), and demonstrate stronger commitments to ethical standards and climate-related issues, thereby supporting the adoption of environmental and social practices that enhance ESG performance (Shakil et al., 2021).

Gender socialization theory argues that men and women develop distinct traits and moral orientations through social interaction (Nadeem et al., 2020). Women tend to base moral reasoning on care and responsibility (Gilligan, 1977) and display greater sensitivity to social and relational issues, while gender differences in helping behaviors also show women engaging more in long-term, protective support (Eagly & Crowley, 1986). These distinctions can shape corporate behavior (Abiodun et al., 2023). Female directors typically exhibit more inclusive, ethical, and risk-averse orientations, promoting actions that support social and environmental well-being (Adams & Funk, 2011; Elmagrhi et al., 2019; McGuinness et al., 2017). Empirical evidence confirms their influence on ESG outcomes: they increase renewable energy consumption (Atif et al., 2021), reduce unethical practices such as environmental misconduct (Liu, 2018), and strengthen governance through improved board monitoring, higher meeting attendance, and more prudent financial policies (Adams & Ferreira, 2009; Goergen & Renneboog, 2014; Chen et al., 2017; Li & Zhang, 2019).

2.2 Studies demonstrating a positive relationship between gender differences and company's ESG performance

Various studies have shown that the presence of female directors positively affects environment performance (Kyaw et al., 2022; Cambrea et al., 2023) and that diverse board composition is positively associated with sustainability performance (Naciti, 2019) via better strategic capacities and competencies (Post et al., 2011, 2015; Walls et al., 2012) and ESG disclosure (Al-Shaer & Zaman, 2016; Liao et al., 2015; Omran et al., 2021).

The relationship between gender differences and companies' ESG performance has been empirically investigated based on agency, stakeholder, legitimacy and gender-socialization theories (e.g., Deegan, 2002; Martín-de Castro, 2021) and a positive relationship between female presence on the board and corporate ESG performance is widely suggested. The presence of female directors on corporate boards introduces a distinct set of competencies and value orientations that strengthens the board's commitment to ethical and sustainable conduct (Ben-Amar & McIlkenny, 2015). Their participation enhances the board's capacity for stakeholder management and supports the implementation of sustainability-oriented initiatives (Atif et al., 2021; Ben-Amar et al., 2017), contributes to mitigating environmental and social challenges (Elmagrhi et al., 2019), and ultimately leads to improved ESG performance (Cordeiro et al., 2020; Menicucci & Paolucci, 2024; Yarram & Adapa, 2021). Board gender diversity is generally associated with improved ESG performance (Byron & Post, 2016; Campopiano et al., 2023; Singhania et al., 2023; Wu et al., 2022). More-

over, Fernández-Méndez and Pathan (2025) find that investors react positively to the European gender quota, with stronger effects for firms exhibiting lower ESG scores. Some recent studies (Glass et al., 2016; Amorelli & Garcia-Sanchez, 2020; Yadav & Prashar, 2023; Cambrea et al., 2023; Issa & Hanaysha, 2023; Al-Shaer et al., 2024), based on the critical mass theory, highlight the minimum number of female directors (three) required to obtain a better ESG performance. Other studies (Kyaw et al., 2022) underline that female board representation matters: firms with gender-diverse board show a 9% lower probability of environmental emission than industry peers. The effect of relaxing financial constraints on innovation, which includes ESG investments, also seem to be significantly higher in women-led SMEs (Ruiz-Palomo et al., 2022), confirming that gender diversity has a positive impact on the innovativeness of firms (Ostergaard et al., 2011; Ritter-Hayashi et al., 2016; Bauweraerts et al., 2022; Alam et al., 2022). Focusing on the social and responsibility dimensions, empirical studies indicate that compared to men, women leaders are more social and more socially responsible (Borghesi et al., 2014; Byron & Post, 2016; Eagly, 2009; Hofstede, 1998; Kish-Gephart et al., 2010; Liu, 2021), more engaged in contingent reward behaviors (Eagly, 2009), in ethical behavior (Kish-Gephart et al., 2010) and more likely to invest in improving employee relations. Expanding the analysis to the board of directors, some research (e.g., Ciappei et al., 2023) confirms that female board representation is positively associated with information transparencies, financial communication towards investors (Gul et al., 2011; Srinidhi et al., 2011) and audit quality (Bose et al., 2022). These results may be due to the high level of professionalism among women board members, which influences men directors and results in more in-depth and effective discussions (Wiersema & Morse, 2024). In this context, some research (Byron & Post, 2016; McGuinness et al., 2017; Atif et al., 2021; Erin et al., 2021; Mehmood et al., 2023; Amorelli & García-Sánchez, 2021) confirms that female board representation is positively associated with socially responsible business practices. A recent study demonstrates that firms with a structurally and demographically diverse board of directors not only improve performance, but that ESG governance disclosure contributes to moderating and partially mediating the relationship between the diverse board of directors and firm performance (Fayaz et al., 2023).

2.3 Studies demonstrating a more nuanced relationship between gender differences and company's ESG performance

Other research, while acknowledging that gender differences help a company's ESG performance, shows a more complex relationship.

Some studies (Adams & Ferreira, 2009; Dăng et al., 2023) suggest that over-representation of women on the board can be counterproductive in improving ESG performance. There appears to be a “too-much-of-a-good-thing” effect (Pierce & Aguinis, 2013) when a beneficial variable reaches a point beyond which the desired effect ceases to be positive and linear, on the basis of the law of diminishing marginal returns (Pierce & Aguinis, 2013; Trumpp & Guenther, 2017). This effect appears to occur the relationship between the PWD and the companies' financial performance in Italian green SMEs (Arcuri & Pisani, 2023). A study of S&P 500 firms from 2010 to 2015 (Manita et al., 2018) finds no meaningful link between board gender diver-

sity and ESG disclosure. The evidence offers only partial support for critical mass theory, as having fewer than three female directors does not produce a significant effect. Beyond this threshold, however, the analysis still reveals no statistically significant relationship. An analysis (Birindelli et al., 2018) of 108 publicly listed banks in Europe and the United States from 2011 to 2016 shows that the link between female board representation and banks' ESG performance follows an inverted U-shaped pattern, indicating that only boards with a balanced gender composition exert a positive influence on ESG outcomes. Other studies have also shown an inverse link between Board Gender Diversity and ESG performance for listed firms both in Latin American countries (Husted & Sousa-Filho, 2019) and in Italy (Cucari et al., 2018). This finding may reflect lower female presence on boards as well as a lack of influence in that male directors may not always recognize or respect females as equals (Wiersema & Mors, 2024). A recent study on a sample of Italian listed companies in the period 2003–2019 (Cambrea et al., 2023) showed that firm ESG scores are positively influenced only by executive female directors and not by independent ones, although it confirmed an overall positive relation between the female presence on the board and firm ESG performance. This result appears to be consistent with other research (Amorelli & Garcia-Sanchez, 2020; Al-Shaer et al., 2024) confirming that the impact of women on boards depends on the nature of the task performed (Nielsen & Huse, 2010). Moreover, regulatory frameworks can partially shape the observed outcomes. Evidence from listed firms in Western Europe (Odriozola et al., 2024) shows that the effect of female directors differs across ESG pillars: board gender diversity has mixed or insignificant environmental effects in Germany but is positively associated with environmental performance in Spain, France, and the United Kingdom, reflecting country-specific regulatory pressures. By contrast, gender-diverse boards consistently strengthen social and governance performance across all countries considered.

2.4 Hypothesis development

In light of the different positions in the literature mentioned above and, in particular and on the basis of the studies that show a greater complexity in the relationship between gender diversity and the company's ESG performance, this study aims to explore the potential associations between the presence of women on boards and among managers and the company's overall ESG performance, as well as the individual "E" and "S" components separately.

In other words, we investigate the relationship between the Percentage of Women Directors and Managers (PWDM) and women CEO on the one hand, and the company's ESG performance and the Environmental and Social components separately on the other hand. The analysis focuses on a sample of Italian listed companies for three reasons:

- a) the Italian context is particularly interesting because Italy introduced specific legislation setting thresholds for the percentage of women on boards in 2012;
- b) listed companies are characterized by higher disclosure levels than non-listed companies;

- c) a recent study “Seize the Change” (EY, 2024)³ shows that more than 60% of Italian companies have continued sustainability plan activities and 15% have used the new environment to accelerate the transition to new, more sustainable models.

The period of analysis runs from 2015 to 2022 because only recently has it been possible to obtain all the data necessary for the analysis.

Consequently, our research hypotheses are the following:

Hypothesis 1: Women-led Italian listed companies have a better ESG performance than others (both in an overall sense and considering the specific “E” and “S” components).

Hypothesis 2: When the CEO is female, the PWDM is positively associated with the overall ESG performance and the “E” and “S” performance.

3 Data and methodology

3.1 Data and variables

Starting from the complete list of the Italian Stock Exchange (i.e., 451 companies, at the time of data download), we exclude banks, insurance and financial companies⁴, and obtain 368 non-financial companies. We then exclude companies for which financial data is not available, and thus obtain a final sample of 290 Italian non-financial listed companies, observed over the period 2015–2022, for a total of 2,320 observations.

Since we aim to explore the relationship between gender diversity in boards and management of companies and ESG performance, we first select a set of ESG scores (and Environmental and Social pillars) as dependent variable. ESG ratings from different providers can disagree substantially (Chatterji et al., 2016; Kotsantonis & Serafeim, 2019), sometimes because sources of data vary. The principal source for all agencies is publicly available information, such as company reports and websites, but other sources can vary from one rating agency to another, e.g., Bloomberg uses direct contact with the company, while LSEG also uses stock market registrations. Sometimes the same information sources are used, but are processed differently, and the number of indicators evaluated may also vary between the various raters. Finally, the difficulty of achieving a general definition of ESG materiality, which eventually triggers the weighting mechanism of the criteria evaluated, may lead to further divergences in the overall rating (Billio et al., 2021). In the light of these observations, and since ESG scores from different providers may substantially alter outcomes, we used at least two providers, which offer ESG scores under different methodologies and criteria (see Table 1). The dependent variables in our analysis are the following: (i) the

³ https://www.ey.com/it_it/functional/forms/seize-the-change-2024-report.

⁴ We exclude financial services firms from our analysis because they are *different* from non-financial firms (Foerster & Sapp, 2005). Financial firms perform activities with specific characteristics, generally have a much higher leverage (Fama & French, 1992; Ellili, 2023) and greater sensitivity to financial risks than non-financial firms. Furthermore, regarding ESG scores, the various providers often adjust their ESG ratings by integrating specific aspects of the sector concerned.

Table 1 Variable definitions

Variables	Abbreviations	Definitions	
<i>Dependent variables</i>			
ESG scores from LSEG	ESG score – LSEG	ESG scores (and “E” and “S” pillars) from LSEG measure a company’s relative ESG performance, commitment and effectiveness, based on company-reported data ^a	
<i>Environmental score from LSEG</i>	<i>E score – LSEG</i>		
<i>Social scores from LSEG</i>	<i>S score – LSEG</i>		
ESG Disclosure scores from Bloomberg	ESG Disclosure score – BB		
<i>Environmental Disclosure scores from Bloomberg</i>	<i>E Disclosure score – BB</i>	ESG Disclosure scores (and “E” and “S” pillars) from Bloomberg (BB) assess the disclosure of quantitative and policy-related ESG data by considering 120 qualitative and quantitative ESG indicators (such as carbon emissions, climate change effect, pollution, waste disposal, renewable energy, resource depletion, supply chain, political contributions, discrimination, diversity, community relations, human rights, cumulative voting, executive compensation, shareholders’ rights, takeover defense, staggered boards and independent directors) ^b	
<i>Social Disclosure scores from Bloomberg</i>	<i>S Disclosure score – BB</i>		
ESG scores from Bloomberg	ESG score – BB		
<i>Environmental scores from Bloomberg</i>	<i>E score – BB</i>		
<i>Social scores from Bloomberg</i>	<i>S score – BB</i>	ESG scores (and “E” and “S” pillars) from Bloomberg (BB) measure a company’s management of financially material ESG issues where “financial materiality” means that the issues can have a negative or a positive impact on a company’s financial performance, including revenue streams, operating costs, cost of capital, asset value and liabilities ^c	
<i>Independent variables</i>			
Female	Female		The percentage of women among directors and managers
Gender of the CEO	CEO gender		The gender of the CEO. Equal to 1 when the CEO is female, 0 otherwise
CEO duality	CEO duality	The possibility that the same person is chairman of the BoD and CEO simultaneously. Equal to 1 when it is the same person, 0 otherwise	
Percentage of independent directors	% Indep. directors	The percentage of independent directors on the BoD	
Age	Age	The natural logarithm of (1 + Age)	
Number of employees	No. employees	The number of employees	
Size	Size	The natural logarithm of total assets	
Return on Assets	ROA	The ratio of net profit to total assets	
ROA volatility	σROA	The ROA volatility	
Tobin’s Q	Tobin’s Q	Tobin’s Q	
Quick ratio	Liquidity ratio	The ratio of (cash and equivalents + marketable securities + accounts receivable) to current liabilities	
Leverage	Leverage	The ratio of Total Assets to Book value	
Price/Earnings	P/E	The ratio of Price to Earnings	

^aFor detailed information, see https://www.lseg.com/content/dam/data-analytics/en_us/documents/methodology/lseg-esg-scores-methodology.pdf

^bFor detailed information, see https://www.bloomberg.com/professional/product/esg-data/?utm_medium=Adwords_SEM&utm_source=pdsrch&utm_content=emea_esgdata_2024&utm_campaign=830133&tactic=830133&gad_source=1&gclid=Cj0KCQiA5rGuBhCnARIsAN11vgTg-OZntqZGEtHrnGSKrUWDzu7sF1XAiZImMgIqxNM-dC9f9QzftEaAs8cEALw_wcB

^cFor detailed information, see <https://hr.bloombergladria.com/data/files/Pitanja%20i%20odgovori%20o%20Bloomberg%20ESG%20Scoreu.pdf>

composite ESG score from LSEG (formerly Refinitiv), downloaded from Thomson Reuters Eikon Datastream; (ii) the ESG Disclosure score and (iii) the ESG score from Bloomberg (BB); and (iv) the separate scores for the underlying Environmental and Social pillars⁵, from both LSEG and Bloomberg.

The main explanatory variables are “Female”, which is the expression of PWDM for each company⁶, and the dummy variable “CEO gender”, equal to 1 when the CEO is female, 0 otherwise. Following previous literature (e.g., Chih et al., 2010; Tan & Zhu, 2022; Zhang & Lucey, 2022), we control for a set of characteristics (i.e., control variables) which impact on a firm’s ESG performance. Some are governance control variables: the dummy variable “CEO duality”, equal to 1 when the chairman of the BoD and the CEO are the same person, 0 otherwise; and the percentage of independent directors on the BoD (% Indep. directors). Other control variables are the following firm financial variables: Age (natural logarithm of 1 + Age); number of employees; Size (natural logarithm of total assets); Return on Asset (ROA); the ROA volatility (σ ROA); Tobin’s Q; Liquidity ratio (i.e., quick ratio); Leverage (Total Assets/Book value); and Price/Earnings (P/E). Table 1 reports the variable definitions.

3.2 Methodology

To address the association between PWDM and women CEOs on one hand and ESG scores and pillars (both from LSEG and BB) on the other hand, we apply the following panel regression model:

$$ESG_{i,t} = \alpha + \beta_1 \text{Female}_i + \beta_2 \text{CEO gender}_i + \sum_{j=3}^N \beta_j \text{Control}_{j,t-1} + e_i \quad (1)$$

where *ESG*, the dependent variable, is either the total ESG score or an individual score for one of the two pillars (E and S). *Female* is the PWDM, *CEO gender* is a dummy variable equal to 1 if the CEO is female and 0 otherwise. *Control* is the set of control variables used in the analysis described in Sect. 3.1. All variables are lagged to control for endogeneity problems.

4 Empirical results

4.1 Descriptive statistics and univariate tests

Table 2 reports descriptive statistics for our variables. LSEG and Bloomberg Disclosure ESG scores (including E and S scores) use a scale from 0 to 100, while Bloomberg ESG scores (including E and S scores) use a scale of 0 to 10. The means and medians are fairly close to each other, which means that our results are unlikely to be

⁵ We do not consider the “G” pillar because it might be based on gender diversity at the firm level.

⁶ We downloaded the data on directors and managers from AIDA Bureau van Dijk. This is information relating to directors, board members and officers, and operational managers, i.e., senior managers/executives (Top managers).

Table 2 Descriptive statistics

Variable	Mean	Std. Dev.	p10	Median	p90
ESG score - LSEG	56.965	18.694	32.66	58.200	81.86
E score - LSEG	53.876	22.960	23.23	54.115	84.395
S score - LSEG	63.451	20.230	35.77	66.210	88.620
ESG Disclosure score - BB	46.122	17.317	20.380	47.872	67.397
E Disclosure score - BB	41.563	17.931	15.101	42.313	64.391
S Disclosure score - BB	30.367	15.818	9.220	29.474	51.844
ESG score - BB	3.037	1.437	1.060	2.945	4.920
E score - BB	2.998	1.974	0.600	2.770	5.930
S score - BB	2.778	1.801	0.660	2.400	5.350
Female	0.384	0.213	0.111	0.375	0.684
CEO gender	0.073	0.260	0	0	0
CEO duality	0.352	0.478	0	0	1
% Indep. directors	0.358	0.177	0.143	0.333	0.600
Age	2.069	1.076	0.693	2.302	3.258
No. employees	747.762	3,286.258	5	92	887
Size	11.378	2.244	8.722	11.230	15.504
ROA	0.017	0.207	-0.058	0.019	0.129
σ ROA	0.063	0.153	0.008	0.036	0.114
Tobin's Q	1.600	1.200	0.879	1.277	2.581
Liquidity ratio	1.475	1.279	0.470	1.140	2.690
Leverage	3.523	6.557	1.230	2.315	5.880
P/E	18.784	17.673	1.995	13.789	42.030

This table reports descriptive statistics for all variables for all firm-year observations.

driven by outliers or skewed ESG distribution. The mean LSEG ESG score is 56.965, and the mean LSEG E and S scores are 53.876 and 63.451, respectively. The mean BB ESG Disclosure score is 46.122, and the mean BB Disclosure E and S scores are 41.563 and 30.367, respectively. The mean BB ESG score is 3.037, and the mean BB Disclosure E and S scores are 2.998 and 2.778 respectively. On average the PWDM is 38.4% and the mean of female CEO is 7.3% (i.e., 21 companies led by a female CEO, more than half of which for the entire period considered). The average firm has ROA of 1.7%, σ ROA of 0.063, a Tobin's Q of 1.6, a liquidity ratio of 1.475, a leverage ratio of 3.523 and a P/E of 18.784. A percentage of 35.2 CEOs also chair the firm's board of directors, and on average independent directors make up 35.8%.

Table 3 reports a univariate analysis based on CEO gender. Significant results are the following: female CEOs are associated with a lower LSEG E score and a higher Bloomberg S Disclosure score, higher PWDM, lower CEO duality, higher Age, lower number of employees, slightly larger size, lower ROA volatility, lower Tobin's Q, lower leverage, and higher liquidity ratio.

Table 4 reports the Pearson correlation matrix. We note some interesting results. The variable *Female* is negatively and significantly correlated with all ESG scores, while female CEOs are negatively and significantly correlated with the E score - LSEG, and positively and significantly correlated with the S score - BB. The correlation between CEO duality and the ESG scores is negative and significant. The percentage of independent directors and the firm size and age are positively and sig-

Table 3 Univariate analysis based on CEO gender

Variable	Male CEO		Female CEO		t-test Male vs. Female CEO	
	Mean	Std. Err.	Mean	Std. Err.	Δ	t-test
ESG score - LSEG	57.243	0.939	54.756	2.756	2.487	(0.811)
E score - LSEG	54.815	1.163	45.691	2.331	9.124**	(2.439)
S score - LSEG	63.728	1.004	61.603	2.852	2.125	(0.641)
ESG Disclosure score - BB	46.231	0.670	44.619	1.965	1.612	(0.673)
E Disclosure score - BB	41.768	0.729	39.935	2.302	1.833	(0.687)
S Disclosure score - BB	30.289	0.606	31.487	2.134	-1.198	(-0.547)
ESG score - BB	3.024	0.067	3.229	0.208	-0.205	(-0.844)
E score - BB	2.986	0.102	3.161	0.318	-0.174	(-0.478)
S score - BB	2.729	0.0845	3.520	0.285	-0.791**	(-2.517)
Female	0.376	0.005	0.485	0.011	-0.108***	(-6.414)
CEO duality	0.357	0.010	0.285	0.035	0.071*	(1.867)
% Indep. directors	0.347	0.004	0.378	0.012	-0.021	(-1.482)
Age	7.192	0.233	13.547	1.083	-6.356***	-7.189
No. employees	790.229	75.426	263.349	37.545	526.879**	1.967
Size	11.346	0.050	11.857	0.158	-0.511***	(-2.798)
ROA	0.017	0.005	0.024	0.005	-0.008	(-0.468)
σ ROA	0.066	0.003	0.023	0.002	0.043***	(3.491)
Tobin's Q	1.644	0.032	1.205	0.044	0.440***	(4.173)
Liquidity ratio	1.456	0.028	1.765	0.126	-0.310***	(-2.930)
Leverage	3.625	0.151	2.304	0.099	1.320**	(2.471)
P/E	18.929	0.613	17.947	1.518	0.982	(0.525)

This table shows the univariate analysis (t-test on the equality of means based on CEO gender). *, **, *** indicate the level of significance at 0.1, 0.05 and 0.01, respectively.

nificantly correlated with the ESG scores. The correlation between ROA, Tobin's Q and ESG scores is predominantly negative. ROA volatility is negatively correlated with all ESG scores. Finally, Leverage and P/E show some positive and significant correlation with ESG scores.

4.2 Regression results on the overall sample

Below we report results from panel analysis which includes Industry-Year Fixed Effects (FE). Table 5 shows the estimated coefficients from the regression of ESG scores. The coefficient of the *Female* variable is not statistically significant in our models. To test whether the effect of Female changes when the CEO is female, we introduce the interaction variable *Female*CEO gender* (Columns 2, 4 and 6). The interaction coefficient measures how much the effect of *Female* on ESG performance changes when the CEO is female compared to when the CEO is male. Model 1, Column 2, shows a negative association between female CEOs and ESG score - LSEG, which may reflect selection effects, so female executives are more likely to be appointed to companies facing weaker ESG performance (Ryan & Haslam, 2005; Al-Shaer et al., 2025), as also emerges from the data in Table 3. Moreover, recent empirical evidence suggests that the relationship between CEO gender and ESG scores is sensitive to the ESG data provider and may not reflect a uniform positive effect of

Table 4 Correlation matrix

	ESG score - LSEG	E score - LSEG	S score - LSEG	ESG score - BB	E score - BB	S score - BB	ESG Dis- clo- sure score - BB	E Dis- clo- sure score - BB	S Dis- clo- sure score - BB	Female CEO gender duality	% Indep. directors	Age	No. employees	Size	ROA	σROA	Li- quid- ity ratio	Leverage	To- bin's Q	P/E
ESG score	1																			
- LSEG																				
E score	0.847*	1																		
- LSEG																				
S score	0.897*	0.678*	1																	
- LSEG																				
ESG score	0.546*	0.439*	0.529*	1																
- BB																				
E score	0.156*	0.092	0.151*	0.721*	1															
- BB																				
S score	0.437*	0.337*	0.525*	0.785*	0.221*	1														
- BB																				
ESG	0.746*	0.667*	0.626*	0.738*	0.218*	0.547*	1													
Disclosure score—BB																				
E Disclo- sure score	0.588*	0.599*	0.505*	0.591*	0.148*	0.468*	0.845*	1												
- BB																				
S Disclo- sure score	0.722*	0.664*	0.656*	0.720*	0.313*	0.559*	0.870*	0.672*	1											
- BB																				
Female	-0.285*	-0.332*	-0.325*	-	-	-	-	-	-	1										
CEO	-0.038	-0.115*	-0.030	0.231*	0.151*	0.297*	0.139*	0.179*	0.214*											
gender				-0.037	-0.024	0.114*	-0.025	-0.027	0.020	0.133*	1									
CEO	-0.235*	-0.188*	-0.215*	-	-0.087	-	-	-	-	-0.026	-0.039	1								
duality				0.210*	0.154*	0.231*	0.105*	0.261*												
% Indep. directors	0.469*	0.406*	0.348*	0.425*	0.108*	0.252*	0.487*	0.372*	0.435*	0.240*	0.031	-	1							
																				0.148*

Table 4 (continued)

	ESG score -LSEG	E score -LSEG	S score -LSEG	ESG score -BB	E score -BB	S score -BB	ESG Dis- clo- sure score -BB	E Dis- clo- sure score -BB	S Dis- clo- sure score -BB	Female gender equality score	CEO quality score	% Indep. directors score	Age	No. employees	Size	ROA	σROA	Li- quid- ity ratio	Leverage	To- bin's Q	P/E
Age	0.292*	0.230*	0.219*	0.264*	0.046	0.172*	0.325*	0.251*	0.308*	0.302*	0.148*	-0.294*	1								
No. employees	0.362*	0.336*	0.324*	0.281*	0.049	0.215*	0.261*	0.136*	0.321*	-	-0.115*	0.242*	0.324*	1							
Size	0.754*	0.713*	0.622*	0.654*	0.212*	0.491*	0.730*	0.575*	0.714*	0.236*	0.059*	-0.514*	0.578*	0.385*	1						
ROA	-0.007	-0.009	-0.002	-	-	-	-	-0.040	-0.031	-0.011	0.009	0.077*	0.008	-0.119*	0.006	0.077	1				
σROA	-0.282*	-0.189*	-0.257*	0.099*	0.143*	0.145*	0.005*							-0.051*		-	-	1			
Liquidity ratio	0.014	-0.002	-0.006	0.254*	0.106*	0.158*	0.247*	0.215*	0.230*	0.090*	0.073*	0.055*	0.066*	-0.086*	0.250*	0.378*					
Leverage	0.074	0.098*	0.065	-0.078	-0.070	-0.002	-0.023	0.015	0.014	0.039	0.063*	0.030	0.061*	0.069*	-0.029	0.048*	0.0535	1			
Tobin's Q	-0.144*	-0.196*	-0.107*	0.094*	0.070	0.014	0.069	-0.015	0.091*	-	0.012	-0.058*	-0.111*	0.002	-	-0.003	0.022	-	1		
P/E	-0.022	-0.028	0.018	-	0.016	-	0.021	-0.049	0.018	0.052*	-	0.088*	-	-0.088*	-	-0.042	0.126*	0.029	0.001	1	
				0.090*	0.147*					0.102*			0.170*	-	0.176*						
				0.056	0.142*	0.041	0.016	-0.024	0.005	-0.015	-0.017	-0.095*	-	-0.062	-	-0.061	0.090*	0.064	-0.007	0.067*	1
													0.178*		0.151*						

The table reports the correlation matrix. * indicates significance levels at 5%.

Table 5 Panel regression - Dep. variable: ESG score

	(Model 1) ESG score -LSEG		(Model 2) ESG Disclosure BB		(Model 3) ESG score - BB	
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-23.409 (49.409)	-16.845 (48.706)	11.772 (24.338)	13.441 (25.089)	-0.479 (3.153)	-0.258 (3.191)
Female ²	18.351 (48.145)	12.689 (47.376)	-16.613 (26.757)	-18.769 (27.830)	-0.005 (3.056)	-0.168 (3.137)
CEO gender	3.667 (4.473)	-3.259** (1.453)	-0.438 (2.552)	15.710 (26.194)	0.074 (0.347)	4.247 (2.863)
Female*CEO gender		11.972** (5.543)		-75.898 (110.261)		-15.567 (12.713)
CEO duality	0.726 (5.372)	-0.891 (5.582)	-3.716 (3.025)	-3.725 (3.041)	-0.300 (0.248)	-0.288 (0.253)
% Indep. directors	8.343 (11.411)	5.379 (11.486)	19.448*** (6.976)	19.749*** (7.145)	1.548** (0.902)	1.606* (0.916)
Age	3.281 (2.169)	2.803 (2.587)	4.098*** (1.299)	4.292*** (1.417)	0.212 (0.238)	0.243 (0.916)
No. employees	0.001*** (0.0002)	0.001*** (0.0002)	0.001*** (0.0002)	0.001*** (0.001)	0.0001*** (0.00002)	0.0001*** (0.00002)
ROA	60.385 (42.628)	93.129** (42.088)	42.016* (23.411)	41.823* (23.615)	0.728 (2.755)	0.315 (2.764)
σROA	-1.460 (1.389)	-1.421 (1.336)	-1.482*** (0.476)	-1.504*** (0.495)	-7.390 (6.478)	-8.891 (6.753)
Tobin's Q	0.720 (2.211)	-0.003 (2.349)	3.530** (1.442)	3.665** (1.452)	0.126 (0.143)	0.129 (0.145)
Liquidity ratio	0.707 (1.362)	0.423 (1.373)	0.708 (0.820)	0.694 (0.833)	-0.105 (0.086)	-0.113 (0.085)
Leverage	0.799 (2.220)	0.863 (2.208)	0.573 (0.772)	0.594 (0.794)	-0.054 (0.112)	-0.071 (0.113)
P/E	0.092 (0.094)	0.075 (0.092)	0.114** (0.045)	0.112** (0.045)	0.018*** (0.005)	0.0184*** (0.006)
Constant	44.733 (17.636)	46.256 (19.478)	19.442** (8.689)	18.368* (9.354)	1.947* (1.091)	1.878 (1.153)
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.536	0.557	0.632	0.633	0.520	0.526

This table presents the results for panel regression with ESG scores as dependent variables. The standard errors are clustered at the firm level and are in parentheses. *, **, *** indicate the level of significance at 0.1, 0.05 and 0.01, respectively.

female leadership on sustainability metrics, highlighting the role of data and firm selection in shaping observed associations (Aabo & Giorici, 2023). The interaction coefficient is positive and significant in Model 1 (Column 2) and indicates that the effect of the percentage of women directors and managers on the ESG score - LSEG becomes more positive if the CEO is a woman. Table 5 also shows that ESG scores increase mainly when the percentage of independent directors, age of firms, ROA, Tobin's Q, and P/E increase. A negative association is found between ROA volatility on the one hand and Bloomberg ESG Disclosure score on the other hand (Model 2). In general, these results may reflect both resource constraints and strategic disclosure incentives. Firms with more volatile operating performance are likely to face greater uncertainty and tighter financial and organizational constraints, which may

limit their ability to invest in non-financial reporting activities such as ESG disclosure. In addition, managers in such firms may have weaker incentives to enhance transparency, particularly when greater disclosure could reveal underlying risks or operational weaknesses. This interpretation is consistent with prior literature showing that firms with more stable performance and stronger governance structures tend to exhibit higher levels of voluntary disclosure (e.g., Healy & Palepu, 2001; Dhaliwal et al., 2011; Rahman et al., 2023).

Table 6 reports the results of the disaggregation of the overall ESG score into pillars E and S. The PWDM coefficient is not statistically significant, suggesting that, in companies led by male CEOs, gender diversity in management is not systematically associated with environmental and social performance. In Columns 2, 4, 6, 8, 10 and 12 we introduce the interaction variable *Female*CEO gender* and find that the coefficient of the *CEO gender* variable again appears negative and statistically significant (as in Table 5, Model 1, Column 2). This may reflect this may reflect selection effects and tokenism. Prior literature (e.g., Li et al., 2025; Aguir et al., 2023) shows that female executives are more likely to be appointed in weaker firms facing difficult conditions (a phenomenon dubbed the “glass cliff” by Ryan & Haslam, 2005), while the benefits of gender diversity for ESG outcomes typically emerge only when women are more broadly represented within the leadership structure (e.g., Torchia et al., 2011; Yarram & Adapa, 2021). However, the positive and significant coefficient of the interaction term *Female*CEO gender* suggests that this relationship is conditional. Specifically, the presence of a female CEO reinforces the positive correlation between managerial gender diversity and environmental and social performance. Columns 5–8 show that E and S Disclosure scores – BB increase when the percentage of independent directors, age of firms, number of employees, and Tobin’s Q increase. E and S score – BB mainly increase when the number of employees increases; furthermore, E score – BB increases when P/E increases (Columns 9–12). Column 11 shows a positive association between female CEO and S score - BB.

4.3 Regression results on the sub-samples of companies with male or female CEO

Table 3 shows that when the CEO is a woman, the PWDM is higher than when there is a man. We thus made separate analyses, distinguishing the companies according to the gender of the CEO. Tables 7 and 8 confirm the positive relationship between the percentage of independent directors and age and ESG scores and pillars, for both female and male CEO. Table 7 shows that there is a significant relationships between PWDM and ESG score – BB (Column 3). In particular, there is a convex quadratic relationship, as shown by the statistical significance of the coefficient on Female and the square of Female. Specifically, our findings indicate that an increase in PWDM is associated with a reduction in ESG score - BB, but the relationship between ESG score - BB and PWDM changes its sign for a certain PWDM, where the negative relationship becomes positive. We calculate the turning point: the relationship between ESG score - BB and the percentage of females is negative up to a threshold of 53.84%, beyond which a positive relationship is observed. Up to a PWDM of approximately 53% (95% confidence interval: 0.518–0.558; share of observations above the threshold: 38.09%), the effect of having the female CEO on the ESG score

Table 6 Panel regression - Dep. variable: ESG pillars

	E score -LSEG			S score - LSEG			E Disclosure score -BB			S Disclosure score -BB			E score - BB			S score - BB		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(10)	(11)	(12)	(10)	(11)	(12)
Female	17.440 (61.594)	36.512 (60.013)	-43.001 (52.484)	-46.587 (51.753)	34.333 (27.994)	36.250 (29.394)	0.496 (26.868)	-0.724 (27.721)	1.593 (7.569)	2.492 (7.577)	-2.366 (5.531)	-3.159 (5.715)	2.492 (7.569)	-2.366 (5.531)	-3.159 (5.715)	2.492 (7.577)	-2.366 (5.531)	-3.159 (5.715)
Female ²	-30.016 (63.839)	-49.186 (60.721)	34.015 (49.551)	42.783 (48.567)	-35.754 (30.571)	-36.731 (32.663)	-2.970 (30.244)	-0.976 (31.446)	-1.279 (7.523)	-1.878 (7.625)	-0.389 (5.269)	0.795 (5.387)	-1.279 (7.523)	-0.389 (5.269)	0.795 (5.387)	-1.878 (7.625)	-0.389 (5.269)	0.795 (5.387)
CEO gender	-1.530 (6.625)	-4.838** (1.917)	8.614 (5.392)	-4.497*** (1.588)	0.770 (3.246)	34.052 (34.173)	6.093 (3.084)	3.060 (28.149)	-0.384 (0.701)	9.598 (8.247)	1.012** (0.428)	-4.416 (4.701)	-0.384 (0.701)	9.598 (8.247)	1.012** (0.428)	9.598 (8.247)	1.012** (0.428)	-4.416 (4.701)
Female*CEO gender		17.094** (7.303)		17.592*** (5.947)		-1.136 (1.479)		0.296 (1.205)		-34.862 (34.960)		29.609 (19.667)		-34.862 (34.960)		-34.862 (34.960)		29.609 (19.667)
CEO duality	1.810 (7.520)	-0.731 (7.608)	2.079 (5.313)	-0.019 (5.431)	0.601 (3.788)	0.916 (3.879)	-2.658 (3.427)	-2.537 (3.443)	-0.504 (0.472)	-0.408 (0.482)	-0.190 (0.404)	-0.152 (0.417)	-0.504 (0.472)	-0.408 (0.482)	-0.190 (0.404)	-0.408 (0.482)	-0.190 (0.404)	-0.152 (0.417)
% Indep. directors	10.301 (16.080)	6.0852 (16.045)	6.030 (12.078)	1.858 (12.101)	23.138*** (8.769)	24.266*** (8.967)	15.980** (6.294)	15.967** (6.473)	-0.833 (1.488)	-0.439 (1.518)	1.536 (1.772)	1.488 (1.773)	-0.833 (1.488)	-0.439 (1.518)	1.536 (1.772)	-0.439 (1.518)	1.536 (1.772)	1.488 (1.773)
Age	0.648 (3.294)	0.727 (3.897)	3.749 (2.695)	1.419 (2.763)	3.601** (1.839)	3.696** (1.902)	3.479*** (1.257)	3.349*** (1.304)	-0.093 (0.347)	-0.0178 (0.416)	-0.198 (0.373)	-0.307 (0.393)	-0.093 (0.347)	-0.0178 (0.416)	-0.198 (0.373)	-0.0178 (0.416)	-0.198 (0.373)	-0.307 (0.393)
No. employees	0.001*** (0.0002)	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)	0.0004** (0.0002)	0.0004** (0.0002)	0.007*** (0.0002)	0.001*** (0.0002)	0.0001* (0.00004)	0.0001* (0.00004)	0.0001*** (0.00003)	0.0001*** (0.00003)	0.0001* (0.00004)	0.0001*** (0.00003)	0.0001*** (0.00003)	0.0001* (0.00004)	0.0001*** (0.00003)	0.0001*** (0.00003)
ROA	21.073 (61.424)	78.829 (60.832)	66.198 (45.120)	94.037** (42.956)	11.016 (31.294)	6.129 (32.163)	14.519* (22.123)	13.444 (22.256)	2.475 (5.671)	1.455 (5.659)	-9.088** (4.010)	-8.999** (3.897)	2.475 (5.671)	1.455 (5.659)	-9.088** (4.010)	1.455 (5.659)	-9.088** (4.010)	-8.999** (3.897)
σROA	-0.498 (2.013)	-0.358 (1.935)	-0.944 (1.211)	-1.170 (1.196)	-83.103 (87.389)	-95.058 (93.234)	-84.391* (45.644)	-86.184* (47.844)	-1.256 (13.116)	-1.256 (11.209)	1.273 (10.393)	1.884 (11.238)	-1.256 (13.116)	-1.256 (11.209)	1.273 (10.393)	-1.256 (11.209)	1.273 (10.393)	1.884 (11.238)
Tobin's Q	-0.629 (2.637)	-1.617 (2.761)	0.587 (2.108)	-0.608 (1.992)	3.124* (1.741)	3.056* (1.754)	4.243** (1.807)	4.097** (1.858)	0.208 (0.302)	0.143 (0.319)	0.387* (0.223)	0.281 (0.211)	0.208 (0.302)	0.143 (0.319)	0.387* (0.223)	0.143 (0.319)	0.387* (0.223)	0.281 (0.211)
Liquidity ratio	1.573 (1.782)	1.269 (1.749)	0.922 (1.558)	0.294 (1.505)	1.142 (0.924)	1.045 (0.930)	1.223 (0.972)	1.222 (0.984)	-0.009 (0.146)	-0.038 (0.149)	-0.181 (0.109)	-0.167 (0.106)	-0.009 (0.146)	-0.038 (0.149)	-0.181 (0.109)	-0.038 (0.149)	-0.181 (0.109)	-0.167 (0.106)
Leverage	2.0787 (2.686)	2.337 (2.609)	1.253 (2.272)	0.919 (2.217)	-0.655 (0.793)	-0.794 (0.806)	1.187 (0.907)	1.129 (0.925)	-0.266 (0.220)	-0.321 (0.221)	-0.021 (0.152)	-0.055 (0.157)	-0.266 (0.220)	-0.321 (0.221)	-0.021 (0.152)	-0.266 (0.220)	-0.321 (0.221)	-0.055 (0.157)
P/E	0.0721 (0.120)	0.042 (0.121)	0.081 (0.101)	0.082 (0.097)	0.018 (0.043)	0.022 (0.053)	0.097** (0.047)	0.100 (0.047)	0.019* (0.010)	0.020 (0.010)	0.009 (0.007)	0.010 (0.007)	0.019* (0.010)	0.020 (0.010)	0.009 (0.007)	0.020 (0.010)	0.009 (0.007)	0.010 (0.007)

Table 6 (continued)

	E score -LSEG		S score - LSEG		E Disclosure score -BB		S Disclosure score - BB		E score - BB		S score - BB	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Constant	36.745 (23.407)	33.960 (26.380)	52.265 (17.221)	63.289 (16.765)	11.053 (9.490)	10.747 (10.154)	3.331 (9.614)	4.221 (9.998)	3.349 (2.366)	3.112 (2.622)	3.391** (1.679)	4.002 (1.817)
Industry- Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.556	0.592	0.463	0.493	0.545	0.549	0.613	0.614	0.488	0.513	0.418	0.434

This table presents the results for panel regression with ESG pillars (Environmental and Social pillars) as dependent variables. The standard errors are clustered at the firm level and are in parentheses. *, **, *** indicate the level of significance at 0.1, 0.05 and 0.01, respectively.

Table 7 Panel regression – CEO gender - Dep. variable: ESG score

	Female CEO			Male CEO		
	(1) ESG score -LSEG	(2) ESG Disclo- sure BB	(3) ESG score - BB	(4) ESG score -LSEG	(5) ESG Disclo- sure BB	(6) ESG score BB
Female	-6.290 (7.141)	-3.137 (1.914)	-0.718*** (0.148)	-5.618 (39.726)	-0.858 (28.333)	-2.043 (2.838)
Female ²	9.130 (6.368)	2.687 (1.795)	0.666*** (0.141)	-4.546 (41.514)	-4.723 (29.296)	1.200 (2.934)
CEO duality	67.797*** (16.511)	2.076 (8.012)	2.128*** (0.737)	-2.302 (3.854)	-3.395 (2.889)	-0.246 (0.291)
% Indep. directors	6.602*** (1.458)	79.820*** (20.908)	4.167*** (1.470)	36.835*** (10.197)	34.170*** (7.217)	1.372** (0.746)
Age	32.745*** (8.448)	3.418* (1.998)	-0.198 (0.173)	8.968*** (1.661)	11.446*** (1.182)	0.887*** (0.135)
No. employees	-0.006 (0.007)	0.004 (0.004)	0.002*** (0.0003)	0.0003* (0.0002)	0.0001 (0.0001)	0.00002* (0.00001)
ROA	1.709 (1.322)	52.724 (55.649)	-4.246 (4.577)	-18.901 (17.470)	-20.491 (13.027)	-4.582*** (1.347)
σROA	9.149 (2.607)	-70.246 (119.925)	-27.391*** (8.267)	-57.606 (75.093)	-59.537 (44.262)	-4.759 (4.368)
Tobin's Q	-8.080* (4.393)	-5.608 (4.602)	-1.244*** (0.399)	2.446*** (0.811)	2.510*** (0.744)	0.260*** (0.076)
Liquidity ratio	-4.243** (1.735)	-4.646** (2.243)	0.074 (0.185)	-0.278 (0.576)	0.797* (0.442)	-0.0003 (0.049)
Leverage	-2.815 (1.828)	-1.794 (1.874)	-0.099 (0.177)	3.676*** (0.929)	1.272** (0.522)	0.225*** (0.066)
P/E	-0.001 (0.064)	-0.028 (0.078)	-0.012 (0.009)	0.053* (0.031)	-0.0002** (0.0001)	0.005** (0.002)
Constant	-3.793 (2.346)	1.004** (0.464)	20.791*** (3.467)	5.861 (11.117)	-0.448 (7.858)	-0.008 (0.802)
Year dummies	Included	Included	Included	Included	Included	Included
R ²	0.631	0.084	0.267	0.307	0.292	0.191

This table presents the results for panel regression with ESG scores as dependent variables. The standard errors are clustered at the firm level and are in parentheses. *, **, *** indicate the level of significance at 0.1, 0.05 and 0.01, respectively.

– BB decreases. After the turning point, the effect begins to grow. And the percentage of 53.84% is high compared to the average of 48.5% women managers and executives in firms with female CEOs shown in Table 3. Figure 1 shows the estimated ESG score - BB resulting from increasing the percentage of females in SMEs. Although our subsample of businesses with female CEOs is small, our findings are consistent with the prevalent literature because they seem to confirm that when PWDM is high (more than 50%), women managers and directors can influence board work and decisions (Wiersema & Mors, 2024), including in the field of sustainability (i.e., a critical mass of female managers and directors leads to higher ESG scores). In our sample, the PWDM is also higher when the CEO is a woman (Table 3) and this seems consistent with previous literature (Birindelli et al., 2019), who find that female CEOs empower the critical mass of women on company boards to engage in environmental initiatives.

Table 8 Panel regression – CEO gender - Dep. Variable: ESG pillars

	Female CEO		Male CEO	
Panel A	(1)	(2)	(3)	(4)
	E score -LSEG	S score - LSEG	E score -LSEG	S score - LSEG
Female	-18.200*** (6.453)	-5.222 (10.810)	-3.095 (58.680)	-27.269 (46.229)
Female ²	18.416*** (5.755)	6.624 (9.640)	-24.081 (60.161)	11.328 (48.271)
CEO duality	72.874*** (14.921)	47.5222* (24.993)	0.059 (5.209)	-3.440 (4.478)
% Indep. directors	519.249*** (131.796)	371.758* (220.769)	36.930*** (13.759)	27.581** (11.867)
Age	26.693*** (7.634)	27.013** (12.788)	10.102*** (2.165)	6.721*** (2.008)
No. employees	-0.0016** (0.007)	0.001 (0.011)	0.0002 (0.0002)	0.0005** (0.0002)
ROA	-69.517 (119.494)	306.190 (200.163)	-53.383** (22.422)	-37.347* (22.060)
σROA	66.144*** (23.563)	46.836 (46.839)	50.620 (100.600)	-62.569 (87.748)
Tobin's Q	-2.751 (3.969)	-10.034 (6.649)	1.865* (1.056)	4.299*** (1.013)
Liquidity ratio	-3.356** (1.568)	-4.708* (2.626)	0.114 (0.734)	-0.398 (0.733)
Leverage	-1.201 (1.652)	-2.553 (2.767)	3.994*** (1.225)	4.526*** (1.151)
P/E	0.0494 (0.058)	-0.034 (0.097)	0.047 (0.040)	0.051 (0.040)
Constant	0.730 (2.120)	-1.496 (3.552)	0.252 (16.146)	23.491* (13.009)
Year dummies	Included	Included	Included	Included
R ²	0.532	0.227	0.254	0.214
	Female CEO		Male CEO	
Panel B	(5)	(6)	(7)	(8)
	E Disclosure score -BB	S Disclosure score - BB	E Disclosure score -BB	S Disclosure score - BB
Female	-5.300 (4.130)	-8.652*** (1.183)	-2.002 (40.259)	-15.299 (24.793)
Female ²	4.374 (4.020)	7.698*** (1.110)	-7.605 (40.802)	7.028 (25.622)
CEO duality	15.747 (17.059)	18.883*** (4.952)	0.886 (3.718)	-2.991 (2.515)
% Indep. directors	67.013 (83.109)	90.688*** (12.924)	35.353*** (9.215)	22.152*** (6.277)
Age	2.874 (2.654)	9.364*** (1.235)	11.585*** (1.511)	8.619*** (1.085)
No. employees	-0.0001 (0.009)	0.002 (0.002)	-0.0002 (0.0002)	0.0003** (0.0001)
ROA	1.395 (1.001)	37.661 (34.399)	-26.033 (17.388)	-21.161* (12.650)

Table 8 (continued)

	Female CEO		Male CEO	
Panel A	(1)	(2)	(3)	(4)
	E score -LSEG	S score - LSEG	E score -LSEG	S score - LSEG
σ ROA	-1.656 (2.785)	-2.286*** (0.741)	1.158 (65.251)	-61.210 (38.952)
Tobin's Q	-28.531*** (6.421)	-14.787*** (2.845)	1.548 (0.982)	2.972*** (0.721)
Liquidity ratio	2.179 (3.023)	-2.002 (1.386)	0.511 (0.603)	0.425 (0.446)
Leverage	-2.422 (2.983)	-0.944 (01.158)	-0.300 (0.751)	2.021*** (0.499)
P/E	0.004 (0.104)	-0.061 (0.048)	-0.0004*** (0.0001)	0.00001 (0.0001)
Constant	1.871 (0.681)	2.163*** (0.28728)	-1.255 (10.917)	-3.856 (6.932)
Year dummies	Included	Included	Included	Included
R ²	0.306	0.409	0.229	0.274
	Female CEO		Male CEO	
Panel C	(9)	(10)	(11)	(12)
	E score -BB	S score - BB	E score -BB	S score - BB
Female	-76.315*** (41.469)	-89.731*** (17.420)	-4.741 (6.064)	-1.854 (4.273)
Female ²	81.732*** (42.946)	76.917*** (16.607)	3.763 (5.980)	-0.371 (4.327)
CEO duality	2.101 (2.020)	1.345 (0.856)	-0.106 (0.555)	-0.066 (0.409)
% Indep. directors	-8.049 (8.681)	3.482** (1.709)	0.339 (1.402)	1.529 (1.048)
Age	-1.381*** (0.301)	0.519*** (0.192)	1.371*** (0.247)	0.502*** (0.185)
No. employees	0.002* (0.001)	0.002*** (0.0004)	0.00003 (0.00002)	0.00004* (0.00002)
ROA	6.403 (8.995)	-0.603 (5.459)	-4.565** (2.112)	-7.571*** (1.858)
σ ROA	23.905 (29.584)	-54.032*** (9.116)	-0.379 (9.548)	-0.643 (7.012)
Tobin's Q	3.153*** (1.099)	-1.346** (0.0547)	0.422*** (0.143)	0.189* (0.104)
Liquidity ratio	-0.581** (0.283)	0.019 (0.203)	0.043 (0.077)	-0.057 (0.070)
Leverage	-0.469 (0.405)	-0.051 (0.206)	0.231** (0.104)	0.160* (0.090)
P/E	-0.021 (0.015)	-0.004 (0.010)	0.004 (0.004)	0.003 (0.004)
Constant	-12.761 (8.297)	25.777*** (4.190)	-0.842 (1.761)	1.109 (1.172)

Table 8 (continued)

	Female CEO		Male CEO	
Panel A	(1)	(2)	(3)	(4)
	E score -LSEG	S score - LSEG	E score -LSEG	S score - LSEG
Year dummies	Included	Included	Included	Included
R ²	0.665	0.492	0.364	0.236

This table presents the results for panel regression with ESG pillars (Environmental and Social pillars) as dependent variables. The standard errors are clustered at the firm level and are in parentheses. *, **, *** indicate the level of significance at 0.1, 0.05 and 0.01, respectively.

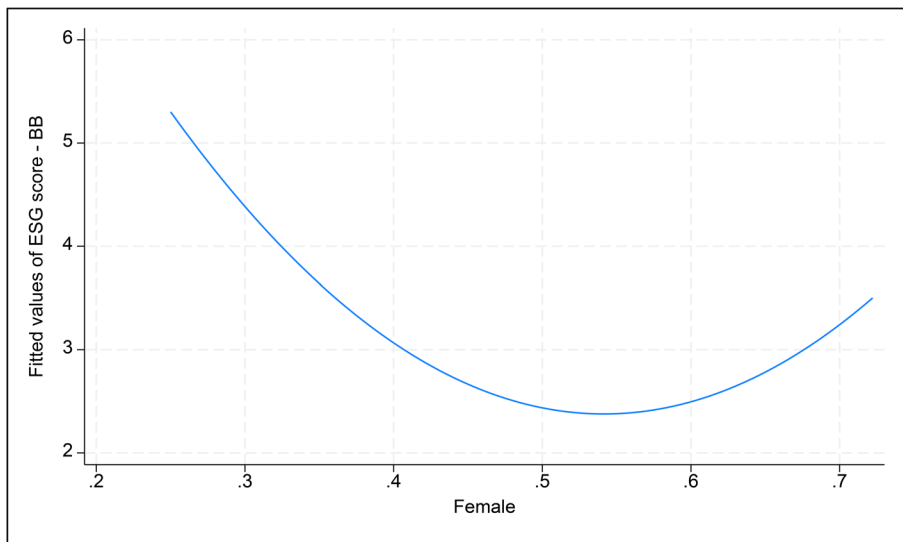
**Fig. 1** Quadratic prediction of ESG score – BB using female and female²

Figure 1 is based on estimates of Table 7, Column (3). It shows the change in the ESG score - BB for an increase in the percentage of females.

Table 8 shows that in the case of a female CEO, there is a significant relationship between PWDM and the following pillars: E score – LSEG (Panel A, Column 1), S Disclosure score – BB (Panel B, Column 6), E and S score – BB (Panel C, Columns 9 and 10). All these relationships are convex quadratic relationships, as shown by the statistical significance of the coefficient on Female and the square of Female. In other words, our findings indicate that an increase in PWDM is associated with a reduction in the pillars noted, but the relationship changes its sign for a certain PWDM, where the negative relationship becomes positive. We calculate the turning points of the relationships as follows:

- E score – LSEG: 49.41% (95% confidence interval: 0.432–0.556);
- S Disclosure score – BB: 56.20% (95% confidence interval: 0.547–0.576);
- E score – BB : 53.55% (95% confidence interval: 0.499–0.571);
- S score – BB: 58.33% (95% confidence interval: 0.552–0.614).

Except for the E score – LSEG, the other percentage are much higher than the average of 48.5% women managers and executives in firms with female CEOs (Table 3).

We also verify whether the 2019 amendment to the Golfo-Mosca law, aimed at increasing the weight of women in the BoD/auditors to at least 40% from 2020, contributes to impacting the relationship between gender and ESG scores. We carry out separate analysis for the sub-period 2017–2019 (three years before the amendment) and the sub-period 2020–2022 (three years after the amendment). The results are consistent with those shown in the previous tables and are available on request.

5 Conclusions

In the light of the increasing attention of investors to the sustainability aspects of business, and recent developments in Italian and international legislation, this study aims to investigate the theme of *sustainable corporate governance*. Long-term value creation is based not only on financial considerations and objectives, but also on ESG aspects in which the organizational characteristics of companies can play a key role. This paper analyses the relationship between corporate governance and sustainability, investigating operational roles rather than simply board membership. On a sample of Italian listed non-financial companies over the period 2015–2022, ESG data from LSEG (formerly Refinitiv) and from Bloomberg was used to investigate the relationship between the percentage of women directors and managers (PWDM) and women CEO on the one hand, and companies' ESG global performance and Environmental and Social performance separately, on the other.

Our results show that the PWDM is negatively and significantly correlated with all ESG scores, so Hypothesis 1 is rejected. However, when the company CEO is a woman, we find an interesting relationship between PWDM and ESG scores. An increase in PWDM is initially associated with a decrease in ESG scores, but the relationships between ESG scores (and the E and S components) change their signs at a certain PWDM (more than 50% in general), and the negative relationship becomes positive. When the company CEO is a woman, a high female presence (over 50%) on the board improves (and does not worsen) ESG performance. Hypothesis 2 is therefore partially accepted. These results conflict with previous findings of “too-much-of-a-good-thing” (Pierce & Aguinis, 2013) as in previous studies (Adams & Ferreira, 2009; Đặng et al., 2023), but demonstrate the existence of a complex relationship between gender diversity and company's ESG performance as highlighted by a part of the literature (see Sect. 2.3).

This study contributes to the literature on gender diversity and ESG by showing that the relationship between female leadership and ESG outcomes depends on the organizational context in which female CEOs operate. Isolated female leadership (i.e., in the absence of broader gender diversity within the organization) may not be sufficient to influence ESG practices and may instead reflect selection into weaker firms in pre-existing difficult conditions, consistent with the *glass cliff* argument (Ryan & Haslam, 2005). More broadly, our findings refine prior evidence on gender diversity and ESG by highlighting the importance of critical mass and internal alignment: while existing studies typically focus on the presence of female executives

per se, we show that their impact depends on whether gender diversity is embedded throughout the leadership structure. In this sense, our results help reconcile mixed findings in the literature (e.g., Aabo & Giorici, 2023), suggesting that heterogeneity in ESG outcomes may arise from differences in organizational composition rather than from CEO gender alone.

Our results can probably be explained first and foremost by national specificities identified in the literature as *country-level* factors such as governance structures, cultural dynamics, strength of institutional frameworks and development of capital markets. The results probably also reflect the relationship between ESG activities and firm performance (Husted & Sousa-Filho, 2019; Cucari et al., 2018; Kalia & Aggarwal, 2023) as well as the still relatively low female presence on boards and in top positions in Italy. On average the percentage of female CEOs in our sample is 7.3%. Second, although the impact of women on boards depends mainly on the nature of the task performed and previous background (Nielsen & Huse, 2010; Velte, 2016) and only partially on the proportion of internal and independent directors (Cambrea, 2023), our analysis shows for all companies in the sample, and not only those led by a female CEO, the importance of independent directors in influencing the ESG ratings. Third, our results suggest that women leaders are more likely to adopt a relationship-building approach and leadership styles that play a role in promoting sustainable projects (e.g., Harjoto et al., 2015). In 2023 the share of Italian female managers (28%) was well-below the European average (34.8%)⁷ so there is an urgent need for governance reforms to encourage women to reach top management positions. The findings of this study suggest that Gender Equality legislation in Italy could potentially contribute to promoting progress towards gender equality in senior management. In this regard, potential policy implications include: 1) a more appropriate allocation of responsibilities for Diversity and Inclusion; 2) the development of an autonomous Diversity and Inclusion strategy with measurable targets; 3) the provision of flexible working arrangements. However, further research is needed to assess the extent to which these measures would effectively improve ESG performance and increase the representation of women in top management positions in listed firms⁸. Indeed, the study has some limitations which provide useful indications for future research. First, despite the inclusion of industry-year fixed effects and lagged variables, it identifies associations rather than causal relationships. Furthermore, the number of companies in our sample, which depends on the small size of the Italian stock market, is relatively small; it would be useful to extend the analysis to a broader panel of listed companies across Europe. An extension to a European sample would also make it possible to evaluate the impact of country-level factors on the relationship between ESG performance and firm outcomes, as noted above (Husted & Sousa-Filho, 2019; Cucari et al., 2018; Kalia & Aggarwal, 2023). A further limitation stems from the exclusion of financial companies: since these large companies are closely supervised by specific regulatory authorities, it would be useful to compare our results with a parallel analysis of banks and insurance companies in different European countries. A final limitation concerns

⁷ Eurostat, Labour Force Survey, 2025.

⁸ Grant Thornton UK “Pathways to Parity: 20 Years of Women in Business Insights” Grant Thornton International Ltd.

the ESG rating process. As highlighted by recent research (Chatterji et al., 2016; Kotsantonis & Serafeim, 2019; Berg et al., 2022), rating systems are far from stable and it would therefore be useful to repeat the analysis using more accurate data.

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Declarations

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Maria Cristina Arcuri is an Associate Professor of Banking and Finance at Department of Economics and Management, University of Parma. Her research interests include Banking, Behavioural economics, Corporate finance, Financial markets, Insurance and Pension, Risk Management, Sustainability. She is a member of ADEIMF (Associazione dei docenti di economia degli intermediari e dei mercati finanziari e finanzad'impresa) and serves on its Board of Statutory Auditors. She is a Banking and Insurance Fellow at SDA Bocconi School of Management. She is the author of numerous national and international publications in top journals, including Business Strategy and the Environment, Small Business Economics, The Journal of Technology Transfer, North American Journal of Economics and Finance, Research in International Business and Finance. She presents her research at national and international conferences and is a member of several research groups.

Raoul Pisani is a Full Professor of Banking and Finance at Department of Economics and Management, University of Trento. His research focus on Banking, Life and non-life Insurance, Pension Funds, Credit Risk Management and, in recent years, on the impact of Artificial Intelligence and Climate Change on credit risk in banking and underwriting/pricing in insurance. He is a member of ADEIMF (Associazione dei docenti di economia degli intermediari e dei mercati finanziari e finanza d'impresa) and he is an Adjunct Professor at the SDA Bocconi School of Management. He is the author of numerous national and international publications in top journals, including Review of Managerial Science, European Journal of Finance, Research in International Business and Finance. He is a presenter at national and international conferences, and a member of several research groups.