Environmental, social, governance and gender diversity under the adoption of European Directive 2014/95/EU

Christianna Chimonaki [11,a], Stelios Papadakis[a], Christos Lemonakis[a]

[a] Hellenic Mediterranean University, Greece

Abstract

Research Question: Does Gender Diversity positively or negatively affect the non-financial information on ESG?

Motivation: This research explores the connection between ESG and the synthesis of the Board of Directors. More explicitly, we explore if the board's Gender Diversity improves non-financial information on ESG. Also, the effect of board gender diversity on ESG is under investigation as the findings in the current literature about the synthesis of board gender diversity are mixed. Considering this gap, this research tries to understand if Gender Diversity positively or negatively affects the non-financial information on ESG.

Idea: This research article aims to study the relationship between gender diversity on board and European companies' environmental, social, and governance (ESG) ratings. It also examines the potential impact of European Directive 2014/95/EU, which requires disclosure of non-financial information, on this relationship.

Data: The investigation used the dataset of 5,380 observations from 20 European countries from 2013 to 2022.

Tools: The association between the ESG ratings and control variables was examined using regression analysis.

Findings: The investigation results confirm a statistically significant impact between gender diversity and ESG performance ratings. The findings confirm conclusions drawn in other research studies. The adoption and enforcement of EU Directive 2014/95/EU had a remarkable and positive impact on European firms' ESG policies, as shown by statistical significance in several regression models. Gender diversity on company boards positively impacted

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[1] *Corresponding author*: Chimonaki Christianna, Institute of Financial Analysis, Business Administration and Tourism Hellenic Mediterranean University, Agios Nikolaos, 72100, GREECE, e-mail: xristianna@hmu.gr.

all ESG models except the Governance Pillar Score. The investigation shows the importance of board synthesis, gender diversity, and additional variables concerning ESG reporting practices.

Contribution: This research explores the connection between ESG and the synthesis of the Board of Directors. More explicitly, we explore if the board's Gender Diversity improves non-financial information on ESG. Also, the effect of board gender diversity on ESG is under investigation as the findings in the current literature about the synthesis of board gender diversity are mixed. Considering this gap, this research tries to understand if Gender Diversity positively or negatively affects the non-financial information on ESG.

Keywords: Environmental, Social, Governance, gender diversity, sustainable governance, European Union, Accounting.

JEL Codes: M41

1. Introduction

With the advent of social media and the Internet, the public is more informed than ever about corporate practices and impacts. Awareness of social and environmental issues has increased, and companies that prioritize sustainability and ethical behavior are viewed more positively. Companies that do not prioritize these issues risk negative public perception, boycotts, or legal action. In addition, climate change, resource depletion, and biodiversity loss have become major global issues, leading to an increasing focus on corporate environmental responsibility. Companies are now expected to minimize their ecological footprint, reduce waste, and contribute to environmental protection. This is not only demanded by the public but is also becoming a legal requirement in many countries.

As sustainability awareness grows, investors emphasize ESG principles in their investment decisions. They look for companies with sustainable and responsible practices, often seen as indicators of long-term success and risk management. This aspect has led to the proliferation of ESG funds, green bonds, and impact investing. Governments and regulators are increasingly imposing sustainability-related requirements on companies. These include requirements to reduce carbon emissions, adopt circular economy practices, disclose sustainability efforts in financial reporting, or even meet specific ESG criteria. Non-compliance can lead to penalties, increased regulatory scrutiny, or reputational damage.

Sajjad *et al.* (2020) and Maama *et al.* (2019) note that demand for more sustainable corporate responsibility has increased among stakeholders, investors, creditors, and

regulators. Also, the recent healthcare crisis (COVID-19) and market uncertainty are forcing companies to make more sustainable decisions regarding non-financial information and environmental and social issues. Reporting on non-financial information highlights corporate managers' efforts to create a greener and more socially responsible society. Oil and gas and chemical companies are increasing ESG reporting to reduce harmful impacts on society and improve their reputation (Garcia *et al.*, 2017).

Thus, the European Union perceives the issues of more sustainable corporate responsibility (CSR) and the demand for more reliable and transparent environmental and social implementation, which was approved by the European Directive 2014/95/EU in 2015. The European Directive required listed companies to publish a non-financial report outlining their strategy and subsequent policies on environmental, social, human rights, employee, and anti-corruption issues (Mio *et al.*, 2020). In 2017, mandatory adoption of ESG disclosure practices from the European Union was introduced, but there is little consistency between companies and countries (Qureshi *et al.*, 2020).

To summarize all the above, this research explores the connection between ESG and the synthesis of the Board of Directors (BoD). More explicitly, we explore if the board's GD improves non-financial information on ESG. Also, the effect of board gender diversity (BGD) on ESG is under investigation as the findings in the current literature about the synthesis of the BoD are mixed. Mititean (2023) and Issa *et al.* (2021), in their study, support that the environmental and social performance of a firm is affected by the attributes of the BoD, and the BGD affect positively firms to achieve better environmental and social performance, respectively. On the other hand, Radu *et al.* (2022) conclude that BGD negatively affects a firm's social performance.

Considering this gap, this research tries to understand if GD positively or negatively affects the non-financial information on ESG.

The paper is divided as follows. The next section analyzes the related literature and the hypotheses' development. The methodology used is in the third section. The fourth section is the research outcomes, the fifth section presents the discussion, and the last six section include the conclusions, consequences, restrictions, and suggestions for future study opportunities.

2. Literature review

2.1 Stakeholders' & dependence theories

The literature review shows that the Stakeholders' theory connects ESG disclosure and corporate governance mechanisms. The Board administers and organizes

companies. De Villiers *et al.* (2020) and Fernandez *et al.* (2019) prove the vital responsibility of corporate boards and the stakeholder theory. The Board is accountable for designing effective internal control, which reflects the firm's reliable and transparent operation and information (Arayssi *et al.*, 2020). De Villiers *et al.* (2020) and Valls *et al.* (2019) support the idea that the BoD is the core body for corporate decision-making. Overall, the Board supervises and controls managers' behavior and keeps the balance among the interest parties of the firm in financial and non-financial issues by applying adequate policies and strategies. Maintaining the balance among a firm's interest parties depends on the experience, administrative capability, and the Board of Director's perspective.

Furthermore, Fernandez *et al.* (2019) support the idea that a healthy corporate governance structure has to be based on synthesis regarding members' diversity. Both women's and men's gender can participate as board directors of firms. So, the adequate combination of both genders can improve discussions and decision-making on the Board. Yarram *et al.* (2021), Manita *et al.* (2018), Rao *et al.* (2016), and Hillman *et al.* (2007) are some of the researchers who combine the stakeholder theory and resource dependence theory and conclude the possible relationship between the variety of the two genders in a synthesis of ESG disclosure and the Board.

De Villiers *et al.* (2020) studied the resource dependence theory. They concluded that the BoD has to monitor managers and permit them to bring balance to benefit the firm's stakeholders. This theoretical perspective notes that firms must limit their dependence and uncertainty on the outward environment and focus on their director's resources (Hillman *et al.*, 2017). This theory concluded that GD via the participation of females on the Board is essential. Females' participation in the Board can add value to the company with their capability, ideas, opinions, competitive knowledge, and solutions. They can interact with the exterior environment, progress in the core decision-making process, and decrease external doubt.

2.2 Hypotheses development

Overall, EU Directive 2014/95/EU is known as the Non-financial Reporting Directive and refers to the requirements of ESG reporting in large firms in the EU. Similarly, EU Directive 2014/95/EU is crucial legislation which aims to improve accountability and transparency regarding the influence of business activities on ESG factors, including GD in the European Union. The issues of GD on the BoD and increasing the proportion of females in the board composition are critical to advancing ESG disclosures (Wasiuzzaman *et al.*, 2020). Female's participation on the Board can add value to the company with their experiences, ideas, opinions, competitive knowledge, and solutions. They can interact with the exterior

environment, advance the core policymaking process, and decrease external doubts. Recent research has examined the association between GD on the Board and improving ESG disclosure practices in firms.

In their review, Lagasio *et al.* (2019) explore the sample of twenty-four research studies and determine that the higher percentage of female participation on the Board leads to strengthened ESG disclosures. Arayssi *et al.* (2020) examine BGD and ESG disclosures and determine a positive and significant relationship between BGD and environmental, social, and governance disclosures. Also, Arayssi *et al.* (2020) note that alongside BGD and board independence, it can be a successful tool to harmonize financial targets and social responsibilities. Furthermore, Qureshi *et al.* (2020) examine eight hundred twelve listed companies from Europe and note that the participation of females on the BoD can positively influence the overall ESG disclosure score. Conversely, some academics (Cucari *et al.*,2018; Husted *et al.*,2019) have proved that women's participation on boards adversely affects ESG disclosures.

According to Arayssi *et al.* (2020), Jackson *et al.* (2020) and Uyar *et al.* (2020), the information level of environmental, social, and governance for each company influences ESG scores disclosed via different communication tools. According to Nicolò *et al.* (2021), "the ESG scores are created on a specific bundle of weighted indicators attributed to each element of ESG. The scores also reflect the peculiarities of each industry sector companies belong to (Arayssi *et al.*, 2020)". Therefore, the overall ESG disclosure score reflects each company's ESG transparency in critical published disclosed measures ESG. This investigation, therefore, seeks to understand the relationship between BGD and whether ESG score increases with female board participation. Thus, we examine 20 European countries from 2013 to 2022 with eleven independent control variables and attempt to interpret the association between GD and ESG. So, according to the above, the hypothesis development is:

H0: The relationship between gender diversity of board members and ESG disclosures (score) is positive.

Women directors can manage customers and markets better as they are more flexible than male directors (Nicolo *et al.*, 2021). Zahid *et al.* (2020) supports the idea that women directors react better to ethical, environmental, and social issues than men. Valls *et al.* (2019) support that women directors have more education in non-financial issues and avoid violence in environmental and social issues than men. So, Wasiuzzaman *et al.* (2020) support that the above women's characteristics can lead companies to implement more accountable behaviors and sustainability procedures in the ESG issues.

Zahid *et al.* (2020) and Fernandez *et al.* (2019) developed a positive significant association between women directors and CSR and sustainability in the environment, society, and workplace. In addition, Jizi (2017), in his research, used a sample of 350 companies for the years 2007 to 2012 and concluded that women's participation on the Board has a positive effect on CSR, especially with the topics of environment and social. Similarly, Uyar *et al.* (2020) determined a positive association between women directors and CSR disclosure in the tourism industry. Alternatively, Husted *et al.* (2017) and Cucari *et al.* (2018) examine Latin American and Italian firms and determine a negative relationship between participation on female boards and ESG disclosure. Additionally, Manita *et al.* (2018) observed that women's participation on the Board has not significantly impacted ESG disclosures. More specifically, Orazalin Baydauletov (2020) concluded that BGD positively correlates with CSR in environmental and social performance.

The EU Directive 2014/95/EU requires large firms to publish non-financial information, including environmental issues. Environmental issues include information about environmental risks, policies, and impacts. The firms report expected topics about energy use, water consumption, gas emissions, greenhouse gas emissions, and other environmental issues. The European Directive covers social issues and encourages firms to report their social impact. Social issues include labour practices, employment, social relationships, and respect for human rights.

Finally, the factor of governance is very crucial for the European Directive. The governance issues firms report are board diversity, corporate structure, and risk management. The European Directive aim to improve transparency and promote responsible decision-making.

Overall, the European Directive addresses GD as a crucial issue in corporate reporting—large firms must publish information about the synthesis and the policies of GD on boards. According to the European Directive, firms are required to publish diversity policies and measures to achieve gender balance.

H0a: The relationship between gender diversity of board members and environmental score is positive.

H0b: The relationship between gender diversity of board members societal score is positive.

H0c: The relationship between gender diversity of board members and governance score is positive.

The knowledge of ESG and GD has increased since 2016, according to the bibliometric review of Amorelli *et al.* (2021). Many of these review researchers found a positive significant relationship between CSR and BGD. Oppositely, some other researchers have not found any significant relationship between GD and

corporate social responsibility. So, GD needs more research to examine the reasons for both categories.

As existing literature notes, board composition influences non-financial disclosure practices (Giannarakis *et al.*, 2014; Arayssi *et al.*, 2020). There are several studies where their findings contribute to understanding the role of board composition in shaping non-financial disclosure practices and their effect on company performance. Recent research has examined the association between board composition and non-financial disclosure practices in firms.

Yarram *et al.* (2021) and Uyar *et al.* (2020) examine ESG disclosure scores as proxies to developed CSR disclosure. Also, Fernandez *et al.* (2019), Nadeem *et al.* (2017), and Zahid *et al.* (2020) explore sustainability practices and corporate sustainability disclosures to determine if there exists a significant relationship with BGD. Also, Giannarakis *et al.* (2014) have not detected a considerable association between participation on women's boards and the degree of CSR disclosure. According to the research (Amorelli *et al.*, 2021; Wasiuzzaman *et al.*, 2020; and Arayssi *et al.*, 2020), the results are mixed. However, the expectation is that females' participation on the Board will ensure a more reliable and transparent ESG and improve corporate social responsibility.

According to stakeholder theory, the BoD is accountable for harmonizing the company's interest parties and applying adequate accountability systems, including financial and non-financial information, for the company's performance. Also, in the resource dependence theory, female participation in the Board improves the firm's accountability. So, we explore if GD leads to more reliable and transparent non-financial information and sustainable CSR.

H0d: The relationship between gender diversity of board members and ESG Controversies score is negative.

3. Methodology

(A) Sample

The initial research of our sample contains all the countries from Western, Northern, and Southern Europe. First, we decided to use this sample as these countries have similar economies and interact with each other. Also, the European Directive 2014/95/EU was a crucial step and established non-financial reporting from voluntary to mandatory in the framework to harmonize non-financial reporting, which began in 2003 in the EU Modernization Directive 2003/51. The European Directive 2014/95/EU is decisive as it encourages the European private sector to adopt it.

Table 1. Synthesis of our sample for each country

European Countries	Number of observations	% by country
Austria	90	1.67%
Belgium	160	2.97%
Cyprus	20	0.37%
Denmark	170	3.16%
Finland	210	3.90%
France	650	12.08%
Germany	570	10.59%
Greece	80	1.49%
Ireland	240	4.46%
Italy	150	2.79%
Luxembourg	60	1.12%
Netherlands	270	5.02%
Norway	120	2.23%
Portugal	30	0,56%
Spain	230	4,28%
Sweden	280	5,20%
Switzerland	420	7,81%
United Kingdom	1630	30.30%
Total	**5380**	**100.00%**

Source: Authors' results

Focusing on active enterprises from Western, Northern, and Southern European nations, we collect the Thomson Reuters Eikon database statistics. The Eikon database initially provides information on ESG parameters and includes a sample of 9,929 publicly traded firms. In order to do a comparison study, we reduce our selection to a small number of industries, including energy (319 enterprises), basic materials (623), industries (1,571), consumer cyclical (1,377), consumer non-cyclical (642), consumer non-cyclical (1,146), healthcare (762), and technology (1,146). Our final sample spans 2013 to 2022 and consists of 5,380 observations made across 20 European countries after 4,549 enterprises were eliminated owing to insufficient ESG data. Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom are among these countries. Because our dataset is uneven, not all companies are represented every year. Table 1 presents a thorough summary of the sample.

(B) Econometric models

- The Thomson Reuters Eikon® database obtains the dataset on the sample companies associated with each country's environmental, social, and governance (ESG) statistics. We conduct an independent analysis of the three constituent elements of ESG and the ESG Controversies Score. The first element of the ESG framework relates to environmental factors. The definitions appear in Table 2.
- As previous researchers, Wasiuzzaman *et al.* (2020), Qureshi *et al.* (2020), and Garcıa *et al.* (2020), the estimation of the independent variable of BGD is calculated as the percentage of women on the Board. In addition, to keep away from biased results and improve our research's consistency, we added some control variables.
- The first control variable is the Board size, which is the total number of boards at the end of the year. According to the literature (Zahid *et al.*, 2020; Arayssi *et al.*, 2020), the board size of directors influences ESG disclosure. A large BoD can reflect the ESG disclosures as it benefits from more background experience and can lead to more robust internal decision-making. Alternatively (Fasan *et al.*, 2017), a considerable board size of directors may reduce the above benefit. It can create coordination and communication problems, reduce the board monitoring ability, and lead to unreliable and transparent ESG disclosures.
- The second control variable is the average Board meeting attendance, which is the total attendance percentage of meetings declared by the firms. The ratio of Board meeting attendance is calculated as the average attendance meeting to the overall number of meetings. The Board meeting attendance measures the Board's activity. Board meeting attendance is a significant component of ESG disclosures as a higher meeting attendance increases the opportunity to share more information and vote for environmental and social issues (Valls *et al.*, 2019). Conversely, more frequent board meetings can negatively reflect the quality of the board members and lead to inefficiency and poor performance on the part of the BoD. More Board meeting attendance increases the cost of communication and diversifies the agenda in more informal issues on the ESG.
- The third control variable is the Board cultural diversity percentage, which is the percentage of board directors who have different cultural backgrounds from the location of the headquarters.
- Finally, the fourth control variable is the management score, which indicates the company's effectiveness and commitment to following the more effective corporate governance principles.
- We include one more group of control variables and, more explicitly, accounts from financial statements and accounting ratios which are related to the ESG performance of companies according to the literature.
- First, we examine the firm's size by examining total assets. The firm's actual value normalized to reflect the I/B/E/S default currency and corporate actions. Total Assets are anything intangible or tangible that can be owned or controlled to

produce value, which is held to have positive economic value and considered an asset. The size of the company is significant in ESG reporting. More prominent firms feel the social pressure for more ESG information (Tamimi *et al.*, 2017). So, we expect total assets to have a positive significant association with ESG disclosures.

- Secondly, we examine the firm's profitability by the Return on Equity (ROE) ratios and return on assets (ROA). The ROE ratio is estimated by dividing net income by total Equity and is a profitability ratio. Also, ROA is one more profitability ratio estimated by dividing the firm's net income before financing costs by total assets. ROA reflects the operating efficiency of the firm. We assume a significant relationship between the two profitability ratios and ESG disclosures.

- Then, we examine leverage ratios as total debt to Equity and total debt to capital. Also, we examine two leverage ratios as a wider group of creditors controls the more leveraged firms and provides more financial and non-financial information to adjust their confidence in the creditors.

According to the above analysis, the equations are:

- $Esg_{overall\ (i,t)} = \alpha_0 + \alpha_1 BGD_{i,t} + \sum_{k=2}^{10} a_k CONTROLS_K + \varepsilon_{i,t}$
  (Equation 1)

- $ENVIR_{(i,t)} = \alpha_0 + \alpha_1 BGD_{i,t} + \sum_{k=2}^{10} CONTROLS_K + \varepsilon_{i,t}$
  (Equation 2)

- $SOCIAL_{(i,t)} = \alpha_0 + \alpha_1 BGD_{i,t} + \sum_{k=2}^{10} a_k CONTROLS_K + \varepsilon_{i,t}$
  (Equation 3)

- $GOVERNA_{(i,t)} = \alpha_0 + \alpha_1 BGD_{i,t} + \sum_{k=2}^{10} a_k CONTROLS_K + \varepsilon_{i,t}$
  (Equation 4)

- $Esg\ con_{(i,t)} = \alpha_0 + \alpha_1 BGD_{i,t} + \sum_{k=2}^{10} a_k CONTROLS_K + \varepsilon_{i,t}$
  (Equation 5)

Table 2. Summarize of the variables

[Variable]	Abbreviation	Definition	Authors	Source of Definitions
A. Dependent variables Where (based on EIKON® Database, for ten consecutive years)				
ESG Disclosures	ESG overall	Environmental, Social, and Governance Scores	Jackson et al., (2020); Aravssi et al. (2020); Uyar et al. (2020)	Thomson Reuters Eikon database
Environmental Disclosure	ENVIR	The environmental pillar score measures the firm's impact on a natural ecosystem's abiotic and biotic components. The environmental pillar refers to the strategic practice's organizations adopt to exploit environmental opportunities effectively and mitigate environmental risks to create long-term stakeholder value through sustainable management practices.	Orazalin et al. (2021), Batae et al. (2020), Alsayegh et al. (2020); Orazalin (2019);	Thomson Reuters Eikon database
Social Disclosures	SOCIAL	The social pillar score indicates the firm's ability to create confidence and faithfulness in its workforce, customers, and society. It shows the firm's status and the healthiness of its license to operate, which are critical elements in determining its capability to create long-term stakeholder value.	Batae et al. (2020), Alsayegh et al. (2020); Orazalin (2019)	Thomson Reuters Eikon database
Governance Disclosures	GOVERNA	The corporate governance pillar indicates the firm's systems and processes, ensuring that board members and executives act in the best interests of its long-term stakeholders. It shows the firm's ability, through its use of best management practices, to direct and control its rights and responsibilities by establishing motivations and checks and balances to generate long-term stakeholder value.	Jackson et al. (2020) Amara et al. (2023)	Thomson Reuters Eikon database
ESG Controversies Score	ESG con	The controversies score indicates the company's exposure to ESG controversies and the negative impact, which reflected adverse events in global media.	Dragomir et al. (2022)	Thomson Reuters Eikon database
B. Independent variables				
Board Gender Diversity	BGD	BGD is calculated as the percentage of women on the Board.	Garcia et al. (2020); Qureshi et al. (2020); Wasiuzzaman and Wan Mohammad (2020)	Thomson Reuters Eikon database

[Variable]	Abbreviation	Definition	Authors	Source of Definitions
C. Control variables (based on EIKON® Database, for ten consecutive years)				
Board Size	B-size	Total number of boards at the end of the year.	Arayssi et al. (2020); Zahid et al. (2020)	Thomson Reuters Eikon database
Board Meetings	B- ma	Average attendance meeting to the overall number of meetings.	Valls et al. (2019)	Thomson Reuters Eikon database
Board Cultural	B- Cultural	Percentage of Board who have different cultural backgrounds from the location of the headquarters.	Martinez et al. (2021)	Thomson Reuters Eikon database
Management Score	M.S.	Indicates the company's effectiveness and commitment to following the more effective corporate governance principles.	Komath et al. (2023)	Thomson Reuters Eikon database
Size	Total Assets	Total Assets are anything tangible or intangible that can be owned or controlled to produce value, which is held to have positive economic value and considered an asset.	Valls et al. (2019); Zahid et al. (2020)	Thomson Reuters Eikon database
Profit	ROE	ROE ratio is estimated by dividing net income by total Equity.	Batae et al. (2020; 2021); Alsayegh et al. (2020)	Thomson Reuters Eikon database
Profit	ROA	ROA ratio is estimated by dividing the firm's net income before financing costs by total assets.	Batae et al. (2020; 2021); Alsayegh et al. (2020); Orazalin (2019)	Thomson Reuters Eikon database
Leverage	[Total Debt to Equity]	The ratio of Total Debt as of the end of the fiscal period to Total Equity for the same period.	Qureshi et al. (2020); Wasiuzzaman and Wan Mohammad 2020)	Thomson Reuters Eikon database
Leverage	Total Debt to Total Capital	The ratio of Total Debt as of the end of the fiscal period to Total Capital for the same period.	Qureshi et al. (2020); Wasiuzzaman and Wan Mohammad 2020)	Thomson Reuters Eikon database
DIRECTIVE	EU Directive	A dummy variable. For years after 2017, the value is 1, and for previous years, 0.	Nicolo et al. (2021); Jackson et al (2020)	Thomson Reuters Eikon database

Source: Authors' results

4. Results

4.1 Descriptive results and correlation analysis

Our results, Table 3, appear as the descriptive statistic, and Table 4 is the correlation matrix of our sample. According to the descriptive statistic, the ESG score median is 61.54, with a minimum value of 0.62 and a maximum of 95.94. In addition, the environmental pillar has a median value of 58.60, with a minimal value of 0.00 and a maximum value of 99.14. The component of the social pillar from ESG has a median value of 65.01, with a minimum of 0.43 and a maximum of 98.30. Finally, the governance pillar has a median value of 58.91 from a minimum of 0.86 and a maximum of 98.73. We can conclude that the ESG score and environmental, social, and governance pillars have law-average value according to the European Directive's minimum requirements. Firms fail to the extent of all aspects of the three components of the ESG.

Also, it is crucial to note that the board size of firms contains an average of 10 members between minimum and maximum values of 1 and 25 members, respectively. Also, the average Board meeting attendance is high, with a median of 95.17. The minimum value of board meeting attendance is 0, and the maximum is 100. The "Board's gender diversity" variable represents the participation of females in the BoD, which is low, with a minimum value of 0 to a maximum of 75. The "Board cultural" is the percentage of board directors with different cultural backgrounds from the location of the headquarters and the values 4 and 100.

Table 3. Descriptive statistics

(A) All variables

Variables	Mean	Std. Dev.	Min	Max
ESG Score	61.5453	18.7003	0.6267	95.9440
Environmental Pillar Score	58.6063	24.4339	0	99.1444
Social Pillar Score	65.0131	22.1125	0.4323	98.3018
Governance Pillar Score	58.9129	21.7467	0.8666	98.7326
ESG Controversies Score	86.7801	26.4046	0.6172	100
Management Score	60.1022	27.1462	0.1552	99.9380
Board Size	10.5344	3.6582	1	25
Board Meeting	95.0907	6.9728	0	100
BGD	27.1545	13.4487	0	75
Board Cultural	33.9618	24.9497	4	100.0000

Variables	Mean	Std. Dev.	Min	Max
log of Total Assets	9.7654	0.6546	6.3802	11.7292
ROA	0.0682	0.1197	-1.1399	2.4932
ROE Total Equity	0.1240	0.8545	-28.3111	24.0986
Total Debt to Total Equity	1.7910	33.2658	0	2.284.7510
Total Debt to Total Capital	0.4561	2.3099	0	146.6000

(B) Dummy variable DIRECTIVE

Directive	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total	%
0	538	538	538	538	0	0	0	0	0	0	2152	40%
1	0	0	0		538	538	538	538	538	538	3228	60%
Total	538	538	538	538	538	538	538	538	538	538	5380	100%

Source: Authors' results

Furthermore, the "Management score" variable, which indicates the firm's effectiveness and commitment towards following the more effective corporate governance principles, has a minimum of 0.15 and a maximum of 99.94. The controversies score has a minimum value of 0.617 and a maximum value of 100. The controversy score shows the firm's exposure to ESG controversies and the negative impact reflecting adverse events in the global media. 6.38, and the maximum score is 11.72. "ROA" and "ROE" profitability ratios also have median scores of 0.06 and 0.12, respectively.

The "Leverage ratio" of total debt to total Equity is 1.79, and the total debt to total capital ratio is 0.45. As we can conclude from the descriptive statistic table, the variables' minimum and maximum value ranges are high. The high difference between the minimum and maximum values may indicate that not all firms have incorporated ESG principles.

Table 4 describes the correlation matrix among dependent and independent variables. Also, in Table 4, the significant values for each variable appear. More specifically, as we can observe from the correlation matrix, ESG scores are strongly positively correlated with the three components of the ESG pillars. ESG score and ESG controversies are weakly negatively correlated as the ESG Controversies score has a negative impact on the ESG score. Also, the ESG score is correlated with variables "Management Score," "Board Meeting," " BGD," "Board Cultural," "Log of Total Assets," and "ROA."

Also, the "environmental pillar," "Board meetings," "ROE Total Equity," "Total Debt to Total Equity," and "Debt to Total Capital" show no linear correlation in the

models used. The environmental pillar score correlates most significantly with the social pillar score and the Log of total assets. So, as a firm's size grows, then the firm applies ESG principles. Furthermore, environmental social pillars and "ESG controversies" are weakly negatively correlated. Both environmental and social pillar components positively correlate with "Management Score," " BGD," "Log of Total Assets," and "ROA." The social pillar has not correlated with variables "Board Cultural," "ROE," "Total Equity," "Total Debt to Total Equity," and "Total Debt to Total Capital."

Governance, the third component of ESG, has a strong positive correlation with the management score, and the governance pillar has negatively correlated with the ESG Controversies score. Variables of "Board meetings," " BGD," "Board cultural," and "Log of Total Assets" are positively correlated to ESG. In contrast, variables such as "ROA," "ROE, " "Total Equity, " "Total Debt to Total Capital," and "Total Debt to Equity" have not correlated with the governance pillar.

ESG Controversies Score has been weakly correlated with Management Score, BGD, log total assets, ROA and Total Debt to Total Equity. There is no correlation between ESG Controversies Score and ROE Total Equity, Board Meeting. Management Score weakly correlates with variables "Board Meetings", " GD," "Board Cultural," and "Log of Total Assets". Also, there is no correlation between profitability and leverage ratios. The Variable "Board Meetings" negatively correlates only with log total assets and BGD. There is no relationship between Board culture, profitability and leverage ratios. " BGD " is negatively correlated with "Board Cultural" and weakly positively correlated with log total assets and profitability ratios. There is no correlation between leverage ratios. Variable "Board Cultural" correlated with log total assets and ROA, and there is no correlation with profitability and leverage ratios. The variable "Log Total Assets" is correlated with ROA and ROE Total Equity, with no correlation with leverage ratios. The profitability ratio "ROA" is correlated with "ROE" and "Total Debt to Total Equity" variables. The "ROE" variable is correlated only with "Total Debt to Total Capital."

According to Nicolò *et al.* (2021), the sample has no multicollinearity problem as all the independent variables have correlation values lower than 0.8, as appeared in the correlation matrix (Table 3).

Table 4. Correlation Matrix

	ESG Score	Environmental Pillar Score	Social Pillar Score	Governance Pillar Score	ESG Controversies Score	Management Score	Board Meeting	BGD	Board Cultural	log total assets	ROA	ROE Total Equity	Total Debt to Total Equit	Total Debt to Total Capital
ESG Score	—													
Environmental Pillar Score	0.855 ***	—												
Social Pillar Score	0.897 ***	0.725 ***	—											
Governance Pillar Score	0.651 ***	0.335 ***	0.379 ***	—										
ESG Controversies Score	-0.275 ***	-0.240 ***	-0.247 ***	-0.180 ***	—									
Management Score	0.566 ***	0.255 ***	0.303 ***	0.951 ***	-0.151 ***	—								
Board Meeting	0.070 ***	0.005	0.017	0.205 ***	-0.018	0.191 ***	—							
BGD	0.396 ***	0.318 ***	0.341 ***	0.303 ***	-0.098 ***	0.283 ***	0.051 ***	—						
Board Cultural	0.010	-0.072 ***	-0.005	0.121 ***	-0.019	0.144 ***	0.005	-0.180 ***	—					
Log of Total Assets	0.572 ***	0.567 ***	0.516 ***	0.275 ***	-0.427 ***	0.222 ***	-0.085 ***	0.192 ***	0.060 ***	—				
ROA	-0.055 ***	-0.079 ***	-0.069 ***	-0.010	0.072 ***	0.001	0.030	0.039 **	0.040 *	-0.190 ***	—			
ROE	0.017	0.003	0.004	0.015	0.004	0.016	-0.004	0.041 **	-0.021	-0.069 ***	0.705 ***	—		
Total Debt to Total Equity	-0.002	0.000	0.016	-0.025	-0.047 ***	-0.024	-0.013	-0.001	-0.024	0.001	-0.036 *	-0.019	—	
Total Debt to Total Capital	0.000	-0.006	0.007	-0.004	0.003	-0.013	-0.008	0.010	-0.023	-0.014	-0.019	-0.086 ***	0.098 ***	—

Note. * p < .05, ** p < .01, *** p < .001

Source: Authors' results

4.2 Results of regression analysis

According to our results, the models of "ESG" with the three elements and ESG Controversies Score appeared statistically significant. The lowest value of R-squared is 24% in the model of "ESG Controversies Score," and the highest value is 89% in the model of governance pillar. So, the model of the dependent variables has a strong relationship, and the independent variables of "ESG" and "ESG Controversies" score can be interpreted as at least 24%.

Also, we estimate variance inflecting factors (VIF) to test the independent variables for collinearity, and the findings appear in Table 4. The values of VIF in our sample rank between 1.04 and 1.73 and are under the critical value of 10, so the multicollinearity is not a critical problem (Zampone *et al.*, 2021).

BGD is positively associated with all the dependent variables (i.e., ESG models). The most substantial effect of BGD is seen on the Environmental Pillar Score (Equation 2), with a coefficient of 0.2663486. The same result was confirmed by Yarram *et al.* (2021), Uyar *et al.* (2020), and Valls *et al.* (2019). Furthermore, Fernandez *et al.* (2019) support that a healthy corporate governance structure has to be based on synthesis regarding members' diversity. Both women's and men's gender can participate as board directors of firms. So, the adequate combination of both genders can lead to improved discussions and decision-making on the Board. Yarram *et al.* (2021), Manita *et al.* (2018), Rao *et al.* (2016), and Hillman *et al.* (2007) are some of the researchers who combine the stakeholder theory and resource dependence theory and conclude the possible relationship between the variety of the two genders in a synthesis of ESG disclosure and the Board.

In model 1 of the ESG score, we can interpret the statistical significance of BGD; there are some more significant results. More specifically, we can observe that the EU Directive positively correlates with the ESG score. Also, the "Management score" and "Log of Total Assets" positively connect with the ESG score. The variable "Management score" indicates the company's effectiveness and commitment towards following the more effective corporate governance principles; the more significant the firm becomes; the better interest is acquired in applying ESG principles.

Model 2 regressed the Environmental Pillar Score with the eleven independent variables. According to our results, the EU Directive, management score, Board culture, and Log of total assets are the significant variables. Also, we can observe that all the above variables have a positive significant relationship except Board culture. Board culture has a negative association with the Environmental Pillar Score. So, we can conclude that the different cultural backgrounds are adversely associated with the Environmental Pillar Score.

The independent variable of the Social Pillar Score is regressed with Model 3. The Social Pillar Score is a positive significance of the: "EUDirective," "Management Score," "Log Total Assets," and the "Leverage" equals "Total Debt to Total Capital".

Table 5. Results in ESG scores

Variables	Equation 1 (ESG overall)	Equation 2 (Environmental Pillar Score)	Equation 3 (Social Pillar Score)	Equation 4 (Governance Pillar Score)	Equation 5 (ESG Controversies Score)	VIF (1/VIF)
EU Directive	3.7397*	2.7312 *	6.3218 *	1.5008 *	3.0338*	1.20 (0.83)
	(0.4834)	(0.7791)	(0.6855)	(0.2795)	(1.1130)	
Management Score	0.2484 *	0.04269*	0.0527 *	0.7342868 *	-0.0110	1.24 (0.80)
	(0.0097)	(0.0156)	(0.0137)	(0.0056)	(0.022396)	
Board Size	0.0857	0.0207	0.1411	0.0295	0.0575	1.62 (0.61)
	(0.0791)	(0.1276)	(0.1122)	(0.0457)	(0.1822)	
Board Meeting	0.0609 *	0.0898	0.0326	0.0797 *	0.2486*	1.07 (0.93)
	(0.0339)	(0.0547)	(0.0481)	(0.0196)	(0.0781)	
BGD	0.1901 *	0.2663*	0.2453 *	0.0113*	0.1215 *	1.29 (0.77)
	(0.0194)	(0.0314)	(0.0276)	(0.0112)	(0.0448)	
Board Cultural	0.0117	-0.0504*	0.0017	-0.0042	0.0104	1.19 (0.83)
	(0.0095)	(0.0154)	(0.0135)	(0.0055)	(0.0219)	
log total assets	12.1711 *	18.8579 *	14.3257 *	2.3818 *	23.3374 *	1.73 (0.57)
	(0.4455)	(0.7180)	(0.6317)	(0.2576)	(1.0257)	
ROA	4.689	3.1071	2.5377	2.7976	2.6336	1.32 (0.75)
	(-2.7373)	(4.4115)	(3.8815)	(1.5828)	(6.3015)	
ROE Total Equity	0.56872	0.5427	0.9614	0.1563	0.5843	1.26 (0.79)
	(0.5024)	(0.8097)	(0.7124)	(0.2905)	(1.1566)	
Total Debt to Total Equity	0.0297	0.0220	0.0501	0.0104	0.0835 *	1.19(0.84)
	(0.0190)	(0.0306)	(0.0269)	(0.0109)	(0.0437)	
Total Debt to Total Capital	-2.971	2.9940	6.4903*	0.3633	2.8646	1.04 (0.96)
	(1.1883)	(1.9151)	(1.68505)	(0.6871)	(2.7356)	
_cons	84.0564 *	141.7196 *	-89.2949*	16.8042 *	336.108 *	
	(5.0934)	(8.2086)	(7.2223)	(2.9451)	(11.7253)	
Observations	2663	2663	2663	2663	2663	
R-squared	0.5459	0.3605	0.3474	0.8954	0.2452	

Source: Authors' results

Model 4 describes the last element of ESG, the Governance Pillar Score. The EU Directive, Management Score, Board Meeting, BGD, and log total assets have a significant positive association with the Governance Pillar Score.

Finally, we regress the ESG Controversies Score (model 5). In this model, the significant variables are "EU Directive," "Board Meeting," "Log of Total Assets," and the "Total Debt to Total Equity."

Overall, we can conclude that all models' significant variables are EUDirective and log total assets. Also, the "BGD" variable is positively significant with the "ESG score," "Environmental Pillar Score," "Social Pillar Score," "Governance Pillar Score," and "ESG Controversies Score". This result reflects the stakeholder's interest in the improvement of non-financial reporting. Investors, regulators, governance, firms, employees, researchers, and society are the interest parties for ESG and GD. The relationship between ESG and GD reflects the responsibility, sustainability, and ethical issues shared by the stakeholders who share an interest in a more sustainable world. Also, we can determine that the variable of the logarithm of total assets is significant. The size of the firm is crucial in the application of ESG and the participation of women on board. Larger firms have more incentives to increase women's participation on board and improve environmental-social-governance disclosure. The study's regression analysis and models show that the EU Directive is a crucial variable influencing ESG ratings, supporting and reinforcing this conclusion. The analysis found that the implementation of EU Directive 2014/95/EU. It has positively influenced companies' ESG practices, as evidenced by its statistical significance in all regression models. Implementing EU Directive 2014/95/EU has a discernible and statistically significant impact on European companies' environmental, social, and governance practices.

The "Management Score" is significant with all the models of "ESG" except the "ESG Controversies Score. "The "Board Cultural" variable is associated only with the Environmental Pillar Score. The "Total Debt to Total Capital" is associated with the "Social Pillar Score." The "Governance Pillar Score" and "ESG Controversies Score" are significantly related to the "Board Meeting." Finally, the "ESG Controversies" Score is significant with "Total Debt to Total Equity".

5. Discussion

In other words, the study's findings suggest that legislative measures, such as the European Directive 2014/95/EU, have the potential to play an essential role in promoting and advancing corporate ESG practices. It is crucial and effective in getting companies to prioritise ESG issues and increase their transparency regarding non-financial information. The statistical significance of the Directive in the models used in the study underscores this importance and effectiveness.

According to our results, we confirm that the ESG score (overall) has a positive and significant association with the three components of ESG (Table 4). This result confirms the H0 and is in the same line with previous researchers (Yarram *et al.*, 2021; Wasiuzzaman *et al.*, 2020; Uyar *et al.*, 2020), and it can be explained with both theories (stakeholder and resource dependence theory). So, women's participation in the Board helps the wide acceptance of stakeholders as women are more sensitive to sustainability issues and show more interest in society's welfare (Wasiuzzaman *et al.*, 2020; Arayssi *et al.*, (2020). So, transparency and accountability are more robust with more GD. This result will incentivise the European Union policymakers for sustainable corporate governance by permitting women to be in decision-making positions with a long-term sustainable corporate vision. The European Directive shows an aspect of women's participation on boards as the appointment of women may reduce the gap in non-financial information between firms and investors.

In contrast, the ESG score has a significant negative relationship with ESG controversies (Table 4). We use the ESG score and ESG controversies as the weighted average to provide a comprehensive evaluation of the impact of sustainability and corporate conduct. ESG controversies score interprets the negative impact reflected by social media. So, the negative relation H_{0d} is accepted.

According to each component model of ESG (environmental, social, governance), Table 5 shows a significant positive association between GD and the three components of ESG disclosures. This result supports the hypotheses H0a, H0b and H0c, and it follows previous researchers (Zahid *et al.*, 2020; Uyar *et al.*, 2020). Overall, EU policy and company size (i.e., Log of Total Assets) were significant in all models, and b BGD positively affected the ESG score, Environmental Pillar Score, Social Pillar Score, Governance Pillar Score and ESG Controversies Score. In the Environmental Pillar Score model, BGD has the most significant influence, which is consistent with the results of previous studies. Yarram *et al.* (2021), Uyar *et al.* (2020), and Valls *et al.* (2019) reached the same conclusion as previous researchers and confirmed it. The results of Equation 2 confirm the need for women's participation on the Board for proactive strategies to improve the company's environmental performance and related disclosures (Wasiuzzaman *et al.*,2020). Wasiuzzaman *et al.*,2020 confirm that GD is a crucial corporate governance mechanism and permits the company to address environmental threats better and increase board sensitivity to climate change and pollution. In addition, Fernandez *et al.* (2019) support the idea that a successful corporate governance structure must be built on a synthesis of diversity.

Women's participation on the Board can also address social issues according to the results from equation 3. This result was confirmed by Manita *et al.* (2018), who support that the higher percentage of women's participation on the Board can improve

the company's social disclosure and lead the companies to cooperate with stakeholders and respond to their needs about corporate social achievements. In addition, the Social Pillar Score is significant with the company's financial leverage, represented by the ratio of total debt to total capital. This result suggests that companies with higher leverage may have different social practices than those with lower leverage.

With equation 4, we confirm that the higher women's participation on the Board can lead the companies to stimulate higher transparency in the governance issues. The heterogeneity is a board synthesis to improve decision-making and discussion (Jizi,2017). In addition, women's participation on the Board increases the level of independence of the Board and improves the empowerment of the monitoring ability of the firm's government mechanism (Arayssi *et al.* 2020). Overall, these factors affect positive strategies and policies in government disclosure levels.

Despite having a diverse board in terms of gender, there is no positive impact on the ESG Controversies Score, meaning that the diversity does not reduce the company's involvement in ESG-related controversies or mitigate their impact. So, the negative relation H0d is accepted. Also, the Management Score, which evaluates the company's management practices, significantly affects all the ESG models except for the ESG Controversies Score. This state suggests that the quality of management influences the overall ESG performance but not necessarily the company's involvement in controversies. However, the Governance Pillar Score, which evaluates a firm's governance practices, is significantly correlated with the ESG Controversies Score and the frequency of board meetings. This evidence suggests that better governance practices and more frequent board meetings may reduce the company's involvement in controversies. Also, the company's financial leverage is critical in calculating the ESG Controversies Score, implying that companies with different leverage levels may have further involvement in ESG-related controversies.

Wasiuzzaman *et al.* (2020) support a positive association between ESG score and GD, with the environmental score having a higher influence than social and governance scores. In the same survey, the social score did not have a significant impact, and the governance score had a lower impact on GD.

The difference between our research and Wasiuzzaman *et al.* (2020) is that we support the idea that women's participation on the Board can improve ESG disclosures in three components of ESG (Environmental, Social, and governmental).

With the other control variables, we can support that among the ESG models, only the Environmental Pillar Score is related to the cultural diversity on the Board. This effect indicates that cultural diversity on the Board may positively impact the firm's environmental performance.

ESG reporting refers to disclosing a company's non-financial practices related to environmental, social, and governance issues. The study contributes to the ongoing discussion on the impact of BGD and other variables on ESG ratings and the need to develop a diverse and balanced corporate governance structure for more comprehensive and accurate ESG reporting. In particular, the study examines how ESG ratings are affected by the presence of women on corporate boards. Also, it emphasises the importance of board composition, GD, and other factors in shaping a company's ESG reporting practices.

6. Conclusion

This research paper discusses the results of a study to assess the relationship between GD on corporate boards and ESG scores in European companies following the adoption of European Directive 2014/95/EU. Data for the study came from Thomson Reuters' Eikon database and included information on all active companies in Western, Northern, and Southern Europe. A total of 5380 observations were collected for the study from a total of 20 European countries between the years 2013 and 2022. The study examined 11 control variables, including board size, board meeting attendance, board cultural diversity, management rating, total assets, profitability ratios (ROA, ROE), and debt ratios (total debt to equity and total debt to capital). This study used regression analysis to examine the relationship between the independent factors and ESG scores. This research supports the theory that equal numbers of male and female board members can lead to more productive discussions and decisions about ESG disclosures.

The study examined the results of five different ESG models, each of which was based on (a) an ESG score, where a positive correlation was found between GD, EU policy, management score, and log total assets, and (b) an environmental pillar score, where EU policy, management score, corporate culture, and log total assets were found to be significant variables. On the other hand, corporate culture had a negative impact on the Environmental Pillar Score, suggesting that different cultural origins may be a barrier to environmental disclosure. (c) Regarding the Social Pillar Score, positive significance was found for EU policy, management rating, Log total assets, and total debt to total capital. (d) Governance Pillar Score: EU policy, management rating, board meeting, and log total assets were positively significant for Governance Pillar Score; and (e) ESG Controversies Score: EU policy, board meeting, log total assets, and total debt to total capital were the significant variables.

Our results show a statistically significant relationship between ESG scores (including all three components plus the ESG Controversies score) and BGD. The results confirm the findings of previous studies that suggested that BGD has a positive impact on ESG rankings.

Our research shows that the implementation of EU Directive 2014/95/EU has a discernible and statistically significant impact on European companies' environmental, social, and governance practices. The results of the study's regression analysis and models, which show that the EU Directive is a crucial variable influencing ESG ratings, support and reinforce this conclusion. The analysis found that implementing EU Directive 2014/95/EU has positively influenced companies' ESG practices, as evidenced by its statistical significance in all regression models. In other words, the study found that the adoption of the Directive had a positive impact on ESG practices. This result may be because the Directive requires companies to disclose information unrelated to their financial situation. This state, in turn, incentivizes companies to improve their environmental, social, and governance practices and reporting. In addition, the greater openness resulting from mandatory disclosure can pressure companies to adopt more environmentally and socially responsible practices. Companies' performance in these areas is now visible to investors, consumers, and society.

Below are some of the limitations faced by our research. The first drawback of the study is the geographic area it covers. We focus on companies operating in Western, Northern, and Southern Europe; we do not include Eastern European countries. This limitation may affect the generalizability of the results, as cultural, economic, and regulatory differences in Eastern Europe could lead to different results regarding ESG practices and GD on boards. As a result, there is an opportunity to expand the scope of the study by including Eastern European countries to provide a more comprehensive perspective on the relationship between BGD and ESG practices across Europe.

The second weakness is that other important control variables, such as balance sheet ratios, are missing from the study. A company's balance sheet ratios may be crucial for financial performance and health indicators. They could provide more insight into the relationship between BGD, ESG practices, and other factors that might influence this relationship. This limitation could be overcome in a later study by including ratios as control variables to understand better the factors that affect the relationship between BGD and ESG practices.

Data availability

All data underlying the results are available as part of the article, and no additional Source data are required.

Grant information
The authors declared that no grants were involved in supporting this work.

Competing interests
No competing interests were disclosed.

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