

# Women on Board and ESG Performance: Insights from the Italian Utilities Sector

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## Abstract

The purpose of this paper is to investigate the relationship between gender diversity and environmental, social and governance (ESG) performance in the Italian utilities sector. The study examines whether the presence of women on the board of directors (BoD) is related to ESG dimensions. We analyzed a sample of 482 utility companies for the period 2018-2022 and we developed an econometric model applying unbalanced panel regression data with firm fixed effects and controls per year. Within a multivariate regression model, the authors considered the ESG score provided by Refinitiv Eikon to test the research hypotheses. Findings show that the presence of women on board of directors improves ESG performance when a critical mass of female board members (at least three) is reached. A critical threshold of female directors also positively influences the scoring of environmental and social pillars. From a managerial perspective this study draws attention to BoD composition encouraging utility companies to define internal corporate governance mechanisms thoroughly. The overall findings support managers, policy makers and regulators on how to improve ESG performance through gender diversity on BoD. This paper offers an in-depth examination of the ESG practices of utility firms, and it attempts to bridge the gap in prior literature on the determinants of ESG performance in the Italian utilities sector. This study is the first that investigates the relationship between board gender diversity and ESG performance in such a context exploring how a critical mass of women on BoD affects ESG dimensions.

**Keywords:** Board gender diversity, ESG performance, utilities sector

## 1. Introduction

The topic of gender diversity is a pressing issue in the debate on the complexity of corporate governance (CG) principles for European companies. In this regard, regulators and standard-setters in several European countries embrace favorable regulations to appoint a certain percentage of female members on the board of directors (BoDs). The recent decade has witnessed increased female representation on corporate BoDs in Europe where some countries have enforced a gender quota of 40% for female participation on BoDs in the listed firms. The BoD is the primary internal governance mechanism, and it is responsible for setting corporate strategic directions and policies, including those regarding ESG performance. The BoD also plays a central role in integrating environmental and social issues along with corporate financial goals and especially directors are responsible for improving corporate responsibility and overseeing the achievement of ESG objectives (Khan et al., 2013; Rao & Tilt, 2016a,b; Cucari et al., 2018; Mohammadi et al., 2021). Hence, the composition and the characteristics of the BoD are crucial in defining strategic decision-making concerning ESG issues (Velte, 2016).

Given these premises, this paper aims to extend the knowledge about ESG performance and its possible explanatory factors in the context of utilities. Utility companies are more involved in addressing the ESG issues in the business model compared with other firms operating in non-environmental sectors. In this regard, utilities provide essential services to vital social needs of households and businesses as they are mainly engaged in offering essential public infrastructure and services like the generation and distribution of electricity, natural gas and water and the collection and treatment of waste for communities (Traxler & Greiling, 2019; Giacomini et al., 2020; Ligorio et al., 2022; Valenza & Damiano, 2023; Veltri et al., 2023; Venturelli et al., 2023). Hence, utility companies represent a valid context for studying the ESG purposes. Although the environmental and the social perspective of the utilities' business has gain increasing attention from scholars in recent years (Traxler &

Greiling, 2019; Cave & Wright, 2021), there is still much to investigate about the potential drivers of ESG performance in utility firms.

The present study examines the effect of gender diversity on the ESG behaviors of Italian utility companies. There is a gap in the literature on this topic since prior studies dedicated little attention to the investigation of both gender diversity on BoD and ESG performance in the utilities sector. This study aims to address the following research question: does female participation on BoD influence the ESG performance of utility firms in Italy? Particularly, in this context board diversity has not yet been inspected to verify how a critical mass of women on BoD affects different ESG dimensions. Hence, the paper pursues to fill this gap in the literature by testing how, if any, ESG pillars are influenced by a certain threshold of female directors. In doing so, this study extends the traditional research on CG and offers a primary picture of the potential relationship between board gender diversity and ESG performance in 482 Italian utility companies, through a panel data regression analysis of the sample over the period 2018-2022. The methodology applied for the analysis is based on unbalanced panel data with firm fixed effects and controls per year. In this regard, we evaluated the impact of board gender diversity on both the ESG framework and its individual pillars (environmental, social and governance) to reveal which dimensions of ESG performance are the most significant in the sample. The investigation demonstrates that a high female representation on the BoD positively affects the ESG performance of Italian utility firms. This study significantly contributes to the literature in three ways. Primarily, this is the first study inspecting the relationship between board gender diversity and ESG performance in the Italian utilities sector. Second, the paper investigates this topic applying the ESG score provided by Refinitiv Eikon database. Third, this study provides evidence for the critical mass theory concerning a certain threshold of female board members and its effect on ESG performance in utility firms.

The paper is organized as follows. Section 2 presents the literature review and hypotheses development. Section 3 defines the data sample and the research methodology, as well as it describes the statistical methods and the variables and predictors used in the econometric models. Section 4 presents and discusses the empirical results. Section 5 concludes the paper and describes the implications and limitations of the study as well as recommendations for further research.

## 2. Literature Review

There is a growing concern regarding gender diversity in executive and supervisory boards in terms of female representation in management bodies. Some European governments, e.g. France, Italy, Norway and Spain, have issued laws providing for gender quotas to include women in firms' top positions, while others, e.g. Austria, Germany and Ireland, have established a large representation of females in national corporate governance codes. This paper is especially relevant since in March 2020, the European Commission set out its 2020-2025 Gender Equality Strategy considering gender diversity a part of the overall governance of any institution as underlined by various international organizations. Moreover, in the last years, prior literature extensively examined gender diversity mainly owing to the international proposal of gender representation on BoDs to break the "glass ceiling" (Jalan et al., 2020). In this regard, how gender diversity on BoDs affects corporate performance has attracted the attention of researchers and practitioners (Velte, 2016) adopting multiple theories to frame this issue. Among these, academics proposed the critical mass theory (Kanter, 1977), the resource dependence theory (Davis & Cobb, 2010; Hillman et al., 2000) the agency theory (Shahbaz et al., 2020; Ullah et al., 2020) and the legitimacy theory (Deegan, 2019; Nuber & Velte, 2021) around the role of female directors in enhancing the effectiveness of the BoD.

### 2.1 Women on BoD and ESG performance

According to the resource dependence theory, board members provide critical resources to firms (Hillman & Dalziel, 2003), influencing corporate performance through their psychological characteristics, background, competencies, and experience (Kyaw et al., 2017; Manita et al., 2018). Regardless of whether they are men or women, board members' personal and professional skills are essential to good governance practices (Girardone et al, 2021). However, it is argued that female directors pay more attention to non-financial performance than men, who focus more on financial results while making decisions (Burgess & Tharenou, 2002; Post et al., 2015; Hollindale et al., 2019;). Accordingly, resource dependence theory can explain the association between gender diversity and ESG performance and in this regard prior literature stated that the critical resources of female board members help firms to be more engage in strategic decision-making to manage stakeholders' demands (Hillman and Dalziel, 2003; Post et al, 2015; Kyaw et al., 2017; Disli et al., 2022). The general perception about women on BoDs is that they can carry their sensitivity on environmental and social issues to management through sustainability practices.

Companies' sustainable behaviors are currently a pressing research question among scholars (Erin et al., 2022; Yadav & Prashar, 2022; Mehmood & De Luca, 2023; Venturelli et al., 2023) and previous studies examined the effect of board gender diversity on ESG performance in both non-financial and financial firms as well as in developed and emerging countries. Nevertheless, the evidence is mixed on this relationship. Some studies demonstrated a positive impact of female directors (McGuinness et al., 2017; Hollindale et al., 2019; Arayssi et al., 2020; Rockey & Zakir, 2020; Romano et al., 2020; Shakil et al., 2020; Wasiuzzaman & Wan Mohammad, 2020; Atif et al., 2021; Wang et al., 2021; Disli et al., 2022; Pareek et al., 2023) while other studies stated a negative effect (Cucari et al., 2018; Husted & de Sousa-Filho, 2019; Dang et al., 2021) or no significant associations (Manita et al., 2018).

For example, Girardone et al. (2021) postulated that board gender diversity is an important aspect of the ESG framework in creating long-term values for a firm. McGuinness et al. (2017) and Disli et al. (2022) proved that the presence of female directors fosters (Corporate Social Responsibility) CSR performance and similarly the empirical findings of Pareek et al. (2023) revealed a positive and significant relationship between women on BoD and ESG disclosure of Italian banks. In contrast, Manita et al. (2018) attested no significant relations between female directors and ESG disclosure while Birindelli et al. (2019) demonstrated that the relationship between women's ratio on BoD and bank's ESG disclosure is an inverted U-shaped.

There is few previous evidence on the relationship between board gender diversity and ESG performance in the utilities sector (Mehmood et al., 2023; Nicolò et al., 2023). Despite a vast amount of academic literature discussing ESG practices in private- and public-sector companies, the utilities industry remains a research field to be explored further (Slacik & Greiling, 2020; Eng & Fikru, 2022). Recently, scholars have increasingly examined utility firms and their sustainability issues (Arena et al., 2019) and mainly they inspected the environmental and social effects of the corporate business (Freedman & Stagliano, 2008; Frijns et al., 2013; Shima & Fung, 2019; Slacik & Greiling, 2020; Garcia-Meca & Martinez-Ferrero, 2021; Eng & Fikru, 2022; Imperiale et al., 2023). Nevertheless, the literature on ESG disclosure in Italy is few (Cucari et al., 2018) and no previous research investigated how females on BoDs affects ESG performance and its dimensions in the Italian utilities sector.

Based on the greater disclosure of ESG data by utility firms than other companies operating in less environmentally sensitive sectors (Elalfy et al., 2020) and based on the critical role of female directors in strategic decision-making process (Kyaw et al., 2017; Manita et al., 2018), we assume that board gender diversity can significantly influence the ESG performance of utility firms. Although prior literature on gender diversity and ESG performance in the utilities sector is limited and the empirical results are mixed in other financial and non-financial sectors, our research expectations are positive in line with the view of the resource dependence theory. Hence, we assume that board gender diversity has a significant positive effect on the ESG performance of the Italian utility companies.

Based on the literature review above, we develop the following research hypotheses:

*H1: There is a positive relationship between the presence of women on BoD and ESG performance*

## *2.2 Critical Mass of Women on BoD and ESG Performance*

In this study, we also regarded the theoretical underpinnings of the critical mass theory (Kanter, 1977) to study the relationship between board gender diversity and ESG performance. According to the critical mass theory, when the size of a minority group reaches a certain threshold (at least three), the interactions and the activities among the members of a group grow (Konrad et al., 2008; Torchia et al., 2011) and the subgroup can have a greater influence (Kanter, 1977).

In line with this assumption, prior literature examined the relationship between the critical mass of female board members and ESG performance but the results are mixed. Some studies reported a significant positive relationship between a certain threshold of female board members and ESG performance (Yadav & Prashar, 2022; Cambrea et al., 2023) while others revealed insignificant findings (Manita et al., 2018). Prior studies found conflicting results because of a non-linear relationship between board gender diversity and sustainability performance. For example, Glass et al. (2016) identified a weak statistically significant positive effect of female directors on sustainability practices, Deschênes (2015) verified a negative relationship between these variables while Alazzani et al. (2017) found no significant association.

More specifically, previous research findings stated that a critical mass of female directors leads to better CSR and environmental performance. For example, Cabeza-García et al. (2017) found that at least three female directors increase CSR disclosure. Yarram and Adapa (2021) examined the impact of a critical mass of women in

Australian BoDs on corporate social performance and they observed a significant positive correlation between the two variables. According to this evidence, Manita et al. (2018) showed that the relationship between board gender diversity and ESG disclosure is not statistically significant below the level of three female directors.

Following a deep survey of the existing literature on this topic, we observed a gap in the extant research because few studies have empirically investigated the relationship between the presence of women on BoD or in top management positions and ESG dimensions using the theoretical framework of the critical mass theory in Europe (Kanter, 1977; Saggar et al., 2021; Menicucci & Paolucci, 2022a,b; Pareek et al., 2023). There are very limited prior studies on the relationship between gender diversity and ESG performance in the utilities sector (Mehmood et al., 2023; Nicolò et al., 2023) and more specifically no previous evidence on this subject was found in the Italian utilities sector.

Based on the critical mass theory, we hypothesized that board gender diversity positively influences utility companies' ESG performance only when at least a significant threshold (a critical mass) of women is reached. Hence, we propose the following research hypothesis:

*H2: There is a positive relationship between a critical mass of women on BoD and ESG performance*

### **3. Data and Methodology**

#### *3.1 Sample Selection and Data Sources*

This paper investigates in depth the relationship between board gender diversity and ESG dimensions in the Italian utilities sector. To shed more light on this issue, we analyzed publicly available information on the CG structures of the largest utility companies headquartered in Italy in the period 2018-2022. As providers of essential public services such as energy, water supply, and waste collection systems, utility companies play a key role in satisfying a wide range of stakeholders' sustainable needs (Konrad et al., 2008; Giacomini et al., 2020). In recent years, the Italian utilities industry has undergone significant changes due to the constant market liberalization and deregulation. As a result, the reduction of entry and exit barriers has significantly increased the number of companies operating in this sector (Bresnihan, 2016; Kraft, 2018; Traxler & Greiling, 2019).

The sampling process starts by selecting the largest utilities with the higher turnover (over 600,000 euros) based on the data available on the AIDA Bureau Van Dijk database. Accordingly, data on ESG performance and governance attributes were collected on the Refinitiv Eikon hosted by Thomson Reuters database (Refinitiv, 2022b) since these data have frequently been used in previous studies (Aryssi et al., 2020; Nicolò et al., 2022).

Thus, an initial sample of 500 large utility firms (2,500 firm-year observations) emerged from the first step. All the utility companies were selected according to the Refinitiv Eikon business classification. Specifically, we considered utilities from five industries: electric utilities, independent power producers, natural gas utilities, water and related utilities, and multi-line utilities.

According to the selection procedure, our initial data set of utility companies had to fulfill the following assumptions:

- Are active during the period 2018-2022
- Have not been turned off or merged with other industrial or utility companies during the research period
- Have complete and relevant data for all the five consecutive years of the research period.

From the entire population of the largest Italian utility firms, we excluded any companies that did not satisfy the prerequisites listed above. Specifically, 18 utilities for which not all information is available (e.g. the ESG variables and governance data) were excluded. Hence, the final sample comprises 482 utilities all active and geographically localized in Italy and it consists of 2,410 firm-year observations from 2018 to 2022. The reason for selecting this period lies in data availability. Although Refinitiv Eikon data coverage extends to a longer time span, we opted for the 2018-2022 period because only a few utility companies had enough information available in the earlier years.

#### *3.2 Independent Variables*

Gender diversity is taken as an independent variable for the study for investigating how women on BoD can influence ESG performance of utility companies (Chams & García-Blandóm, 2019; Atif et al., 2021; Yarram & Adapa, 2021). According to previous research, we estimate gender diversity using the two following measures as proxy indicators of the predictor variable in the regression analysis:

1. the presence of females sitting on BoD (%Women) is measured by the number of women on BoD in relation to the total number of members on BoD (Carter et al., 2003; Cucari et al., 2018; Galbreath, 2018; Husted &

Sousa-Filho, 2019; Cordeiro et al., 2020; Joubert, 2020; Beji et al., 2021; Saggari et al., 2021; Wang et al., 2021; Imperiale et al., 2023).

2. the presence of at least three women (critical mass) is measured by a dummy variable (3Women), which is coded as 1 if the number of females on the BoD equals or exceeds the number of 3 and 0 otherwise (Manita et al., 2018; Lafuente & Vaillant, 2019; De Masi et al., 2021; Nuber and Velte, 2021; Yarram & Adapa, 2021; Yadav & Prashar, 2022).

Gender diversity variables are labelled, measured and referenced according to the prior literature in Table 1.

### 3.3 *Dependent Variables*

This study applies ESG score by Refinitiv Eikon data (Arayssi et al., 2020) to measure ESG performance as dependent variable. This databank has a strong and transparent procedure for ESG data available on its official website and it is frequently applied by researchers in studies concerning the industrial sectors. Following prior literature (Arayssi et al., 2020; Qureshi et al., 2020; Luo & Tang, 2022; Nicolò et al., 2022, 2023; Veltri et al., 2023), we use ESG score by Refinitiv as a proxy for the ESG performance of Italian utility firms.

We evaluated the impact of board gender diversity on both the overall ESG score and its individual pillars to verify which or which ones are the most affected by the presence of women on BoD. The comprehensive ESG score (ESG\_perf) reflects the company's weighted average of ESG scores and ESG controversies (captured from global media sources) to provide an overall assessment of the sustainable and societal impact of corporate conduct. The overall ESG score is expressed as percentage ranging from 0 to 100. The dependent variable ESG\_perf is measured using three ESG pillars (the environmental pillar (ENV\_perf), the social pillar (SOC\_perf) and the governance pillar (GOV\_perf)). A pillar is the weighted average of ten correlated dimensions, while each ESG dimension is composed by individual elements. Refinitiv database comprised a calculated score for each ESG dimension. Refinitiv scores are determined using specific set of weighted measures attributed to each ESG dimension and are obtained from verifiable publicly available information sources. To mitigate the limitations of using ESG scores from a single source (Refinitiv Eikon), each score is based on a standardized process which guarantees comparable information across the companies and the objectivity of the ESG scores (Refinitiv, 2022a, 2022b).

Refinitiv database contains 34 indicators relating to the environmental pillar score (ENV) and clustered in three dimensions: resource use efficiency (ENV\_Ru), emission and waste reduction (ENV\_Em) and environmental innovation (ENV\_In). The social pillar score (SOC) comprises 40 indicators and it is clustered in four dimensions: workforce (Soc\_Wf); human rights (Soc\_Hr); community (Soc\_Com) and product responsibility (Soc\_Prd). The governance pillar (GOV) embraces three dimensions: management and oversight (Gov\_Mo), stakeholder rights (Gov\_Shr) and CSR strategy (Gov\_Csr). ESG data used in this study are specified in Table 1.

### 3.4 *Control Variables*

Some control variables are included in the regression model due to their significant influence on ESG disclosure according to previous studies (Velte, 2016; Husted & Sousa-Filho, 2019; Albitar et al., 2020; Arayssi et al., 2020). The extant literature has revealed the existence of a relationship between performance and some board characteristics: board size (Cheng, 2008; Ahern & Dittmar, 2012), board independence (Disli et al., 2022; Imperiale et al., 2023; Nicolò et al., 2023) and CEO duality (Adams & Ferreira, 2009; Lewellyn & Muller-Kahle, 2012; A.A Zaid et al., 2020; Yadav & Prashar, 2022; Imperiale et al., 2023). Additionally, the CSR/sustainability committee serves as a check to verify whether female directors play a significant role in ESG decision-making to improve social and environmental practices (Eberhardt-Toth, 2017; Pucheta-Martínez & Gallego-Álvarez, 2019). In line with the existing literature on the determinants of CSR/ESG performance and its dimensions (Helfaya & Moussa, 2017; Buallay, 2020; Bhaskaran et al., 2021; Prashar, 2021), we also consider the following most widely studied firm-specific control variables to avoid biased results: firm size (SIZE), return on equity (ROE) and leverage (LEV) (Arayssi et al., 2016; Disli et al., 2022; Yadav & Prashar, 2022). Finally, we comprise one country-specific control variable: GDP growth (GDP) as a representative variable of macroeconomic dynamics. We used a macroeconomic specification as a control variable to face endogeneity issues that often appear in economics-based sustainable report research in the form of simultaneity, reverse causality, and correlated variables. Descriptions and formulas of the variables are presented in Table 1.

Table 1. Explanation of variables

Variable	Description Measure	Reference
<b>Dependent variables</b>		
ESG disclosure (ESG_perf)	Comprehensive scoring of the environment, social and governance performance by the weighted average of the ESG scores and ESG controversies (captured from global media sources). It is a combined indicator of ESG pillars (i.e. the environmental pillar (ENV), the social pillar (SOC), the governance pillar (GOV)), discounted for ESG controversies.	
Environmental performance (ENV_perf)	Comprehensive scoring of the environment performance by the average of its three dimensions (ENV_Ru (Resource use efficiency), ENV_Em (Emission and waste reduction), ENV_In (Environmental innovation)).	
Social performance (SOC_perf)	Comprehensive scoring of the social performance by the average of its four dimensions (SOC_Wf (Workforce), SOC_Hr (Human rights), SOC_Com (Community), SOC_Prd (Product responsibility)).	
Governance performance (GOV_perf)	Comprehensive scoring of the governance performance by the average of its three dimensions (GOV_Mo (Management and oversight), GOV_Shr (Shareholders rights), GOV_Csr (CSR strategy)).	
<b>Independent variables</b>		
<i>Board gender diversity variables</i>		
%Women	Percentage of women on BoD (number of female directors divided by total number of board members)	Barako and Brown (2008); Adams and Ferreira (2009); Amran et al. (2014); Galbreath (2016); Rao and Tilt (2016a,b); Cucari et al. (2018); Husted and de Sousa-Filho (2019); Arayssi et al. (2020); Cordeiro et al. (2020), Imperiale et al. (2020); Gerwing et al. (2022); Mehmood et al. (2023).
3Women	Dummy variable that takes value 1 if the firm's board has at least three women, 0 otherwise	Fernandez-Feijoo et al. (2014), Post et al. (2015), Ben-Amar et al. (2017), Liu (2018), Manita et al. (2018); Yadav and Prashar (2022).
<b>Control variables</b>		
Board size (B_size)	Total number of directors on the firm's board at the end of the fiscal year	De Andres et al. (2005); Laksmana (2008); Said et al. (2009); Michelon and Parbonetti (2012); Amran et al. (2014); Arayssi et al. (2020); Jizi et al. (2014, 2017); Wasiuzzaman et al. (2022); Imperiale et al. (2023); Mehmood et al. (2023).
Board independence (B_ind)	Percentage of independent or outside directors on the board	Chau and Gray (2010), Michelon and Parbonetti (2012); Jizi et al. (2014); Rao and Tilt (2016a,b); Husted and de Sousa-Filho, (2019); Arayssi et al. (2020); Wasiuzzaman et al. (2022); Imperiale et al. (2023); Mehmood et al. (2023); Nicolò et al. (2023).
CSR/sustainability committee (CSR_com)	Dummy variable equal to 1 if the firm has a CSR committee or a sustainability committee, 0 otherwise	Rao and Tilt (2012); Liao et al. (2015); Hussain et al. (2018); Husted and de Sousa-Filho (2019); Arayssi et al. (2020); Gerwing et al. (2022); Wasiuzzaman et al. (2022); Imperiale et al. (2023); Mehmood et al. (2023).
CEO duality (CEO_dual)	Dummy variable that equals to 1 if the CEO is chairman of the board and zero otherwise	Michelon and Parbonetti (2012); Jizi et al. (2014); Loukil et al., 2019; A.A Zaid et al., 2020; Arayssi et al. (2020); Imperiale et al. (2023); Mehmood et al. (2023); Nicolò et al. (2023).
Size (SIZE)*	Natural logarithm of Total assets of the firm (Euro)	Setó-Pamies (2015), Helfaya and Moussa (2017) Arayssi et al. (2020); Wasiuzzaman et al., 2022; Mehmood et al. (2023); Nicolò et al. (2023).
Return on equity (ROE)	Net income divided by the value of total shareholders' equity	Setó-Pamies (2015), Helfaya and Moussa (2017) Arayssi et al. (2020) Mehmood et al. (2023).
Leverage (LEV)	Total debt divided by total assets	Helfaya and Moussa (2017); Wasiuzzaman et al. (2022); Mehmood et al. (2023); Nicolò et al. (2023).
GDP per capita (GDP)*	Gross Domestic Product (GDP) per capita	Fernandez-Feijoo et al. (2014); Hu and Scholtens (2014).

\* Natural logarithmic transformations of the numerical (non index) variables.

### 3.5 Model

Equation 1 represents the estimation model for testing how gender diversity influences the overall ESG performance score (ESG\_perf). The Model 1 can be summarized as follows:

$$ESG_{perf} = \alpha_0 + \beta \text{ Gender diversity variables}_{i,t} + \gamma \text{ Control variables}_{i,t} + \varepsilon_{i,t} \quad (1)$$

where  $i$  refers to a utility company;  $t$  refers to the year and  $\varepsilon_{i,t}$  is a stochastic error term. Gender diversity is defined as the above-described alternative female variables: %Women, 3Women. To quantify the effect of gender proxies on ESG performance, we also control for the variables that could potentially affect a utility company's operating. All the variables are listed in Table 1. To avoid endogeneity problems, the model employed one-year lagged independent variables.

We also consider alternatively the individual pillars of ESG performance as dependent variables. Hence, we develop three additional separate models (Model 2, Model 3, Model 4) for each ESG pillar (ENV\_perf, SOC\_perf, GOV\_perf). The Models are presented in the following regression equations:

$$ENV_{perf} = \alpha_0 + \beta \text{ Gender diversity variables}_{i,t} + \gamma \text{ Control variables}_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$SOC_{perf} = \alpha_0 + \beta \text{ Gender diversity variables}_{i,t} + \gamma \text{ Control variables}_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$GOV_{perf} = \alpha_0 + \beta \text{ Gender diversity variables}_{i,t} + \gamma \text{ Control variables}_{i,t} + \varepsilon_{i,t} \quad (4)$$

To test the research hypotheses, we estimate the linear regression models applying the ordinary least squares (OLS) method because of the general quality of minimized bias and variance (Greene, 2004). In line with Baltagi (2001), we used panel data, which offer more variability and less collinearity among the variables. The model has a few predictors and it controls for individual heterogeneity using fixed effects estimation with standard errors. The option of a fixed effects model rather than a random effects one is verified through the Hausman test (Baltagi, 2001). We also used the Breusch–Pagan test to check for residual heteroscedasticity. We eliminate firm-level heterogeneity using cross-sectional mean deviation data (Greene, 2004). Given the dynamic nature of our model, least squares estimation methods generate biased and inconsistent evaluations. Therefore, we use techniques for dynamic panel estimation to deal with the biases of our estimates. To handle issues related to endogeneity (Adams et al., 2010; Liang et al., 2013), exogenous changes from mandatory executive retirements in board characteristics were identified by applying difference-in-difference estimation techniques, as in Berger et al. (2014).

#### 4. Findings and Discussion

This section examines the impact of gender diversity variables on ESG performance. First, we present descriptive statistics and correlations. Then, we analyze the main estimation results, and then we examine some robustness checks.

##### 4.1 Descriptive Statistics

The descriptive statistics of the main variables for the entire sample are presented in Table 2.

Table 2. Descriptive statistics of the variables

	Min	Max	Mean	Median	Std. Dev.
<b>Dependent variables</b>					
ESG_perf	17.4524	63.7332	54.9295	47.3449	12.2542
ENV_perf	2.4958	59.7344	36.6972	40.3728	14.2153
SOC_perf	3.3182	75.5046	48.2357	50.1267	16.5133
GOV_perf	28.3255	71.5538	52.2548	50.2351	8.1223
<b>Independent variables</b>					
%Women	0	0.5460	0.3348	0.3115	0.1577
3Women	0	1	0.3170	0.3548	0.4946
<b>Control variables</b>					
Board size (B_size)	3	13	5.7504	5.1645	3.7681
Board independence (B_ind)	0	1	0.5485	0.5024	0.2834
CEO duality (CEO_dual)	0	1	0.2265	0.2348	0.3922
CSR/sustainability committee (CSR_com)	0	1	0.5433	0.5784	0.4728
SIZE	12.8641	22.2305	15.8232	16.8026	1.7566
ROE	-0.0730	0.3515	0.1514	0.0575	0.5761
LEV	0.0134	0.2187	0.0774	0.0825	0.0316
GDP	-13.5344	10.4067	0.0631	0.1887	3.7554

Panel data for the period 2018-2022

Our results show that, on average, the proportion of female directors on board is 33.48%. The value reveals that there is a considerable presence of women on BoDs of Italian utility companies. Nevertheless, this percentage is

low compared to the number of females on the BoDs of Italian industrial companies. Table 2 also shows that, on average, 31.70% of Italian utility companies have at least three females in the BoDs, suggesting that these firms tend to follow the government recommendations concerning minimum quotas for female representation on boardroom in publicly traded companies. The mean value of the comprehensive ESG performance score is 54.92, demonstrating that, on average, utility firms perform almost half of the score for ESG. In this regard, the value pinpoints that the economic, social, and environmental worth of these firms expose them to multiple community and institutional pressures to integrate ESG issues into their strategies and business models. The values regarding the ESG pillars outline that the governance dimensions have the highest score (52.25%) with a standard deviation (SD) of 8.12, following by the average score of the social dimensions (48.23) and the environmental dimensions (36.69). These results may be discussed considering the hybrid nature of the utility firms. Since utilities are environmentally sensitive firms, they need to balance different objectives from generating public value for the stakeholders' community and society to increasing shareholders' return.

Additionally, specific control variables are presented in Table 2. We observed that the mean value of board size for the full sample is 5.7504, indicating that the number of members is not plentiful. On average, 54.85% of the directors are independent and 33.48% of these are females. Further, in a subgroup of utility companies (39.22%), the CEO is also the chairman of the BoD, and in most cases (47.28%), the firm has established a specific CSR/sustainability committee. Regarding the firm-specific control variables, statistics indicates that the average size of utility companies (expressed as a natural logarithm) is about 15.82, the ROE is about 0.15, and the leverage is about 0.07.

Pearson correlations are calculated to check the relationships between the gender measures and explanatory variables. Table 3 shows the correlation coefficients between the variables involved in the regression model.

Table 3. Correlation matrix

Variables	ESG_perf	ENV_perf	SOC_perf	GOV_perf	%Women	3Women	B_size	B_ind	CSR_com	SIZE	ROE	LEV	GDP	VIF
ESG_perf	1.000	0.678**	0.792**	0.625**	0.255*	0.204**	0.216**	-0.020	0.033**	0.339**	-0.024	-0.135**	0.212***	
ENV_perf		1.000	0.701**	0.702**		0.173**	0.175**	0.035	0.099**	0.287**	-0.046	-0.142**		
SOC_perf			1.000	0.609**	0.100**	0.132*	0.143**	0.042	0.084**	0.197**	-0.004	-0.167**	0.121***	
GOV_perf				1.000	0.105*	0.021*	0.167**	0.016	0.188**	0.382**	-0.088*	-0.068*	0.113***	
%Women					1.000		-0.115**		0.256**	0.027	-0.030	0.006	0.114***	1.133
3Women						1.000	0.201**		0.221**	0.069	-0.074	0.0029	-0.076	1.087
B_size							1.000	0.151**	0.050	0.289**		0.015	-0.248	1.075
B_ind								1.000	-0.030	-0.091*	-0.103**	-0.055		1.138
CSR_com									1.000	0.162**	0.110**	0.007	0.457***	1.149
SIZE										1.000	-0.564**	0.509**	-0.163***	2.004
ROE											1.000	-0.435**	0.182	1.585
LEV												1.000	0.178***	1.496
GDP													1.000	1.687

\*, \*\*, and \*\*\* denotes level of significance at the 0.10, 0.05 and 0.01 levels, respectively. For description of variables refer to Table 1.

The matrix (Table 3) shows that the correlations between the variables are not strong. The value of variance inflation factors (VIF-test) reveals that multicollinearity is not a severe issue since it is found far below the critical value for all the explanatory variables. The correlation coefficients of the variables were lower than the threshold level of 0.90, demonstrating non-significant multicollinearity among the variables (Hair et al., 2006). The correlation coefficients indicate that the employed model is reliable and very satisfactory because there is not a high correlation between each of the variables even at its maximum degree.

#### 4.2 Regression Results

We perform estimations by using the overall ESG score and the measures of ESG pillars alternatively to observe the effects of the explanatory variables on the ESG performance of Italian utility companies. The results are recorded in Table 4.

Table 4. Panel regression results for predictors

	Model 1	Model 2	Model 3	Model 4
<i>Variables</i>	ESG_perf	ENV_perf	SOC_perf	GOV_perf
ESG_perf	-59.342(-5.774)***			
ENV_perf		-1.533(-0.117)		
SOC_perf			-52.94(-3.39)***	
GOV_perf				3.898(0.504)
<i>Independent variable</i>				
%Women	0.069(1.57)	0.005(0.722)	0.115(1.78)	0.039(1.14)
3Women	1.89(1.81)**	2.316(1.62)**	1.979(1.26)*	0.585(0.73)
<i>Control variables</i>				
B_size	0.157(0.877)	-0.003(-0.009)	0.398(1.50)*	0.035(0.27)
B_ind	0.006(0.222)	-0.025(-0.399)	-0.037(-0.70)	0.042(1.57)
CSR_com	2.942(3.733)***	0.993(0.904)	0.815(0.684)	0.427(0.70)
SIZE	16.046(8.66)***	4.697(1.83)*	15.778(5.60)***	8.522(5.97)***
ROE	0.129(2.21)**	0.074(0.833)	0.015(0.160)	0.008(0.192)
LEV	-0.643(-2.70)***	0.066(0.194)	-0.245(-0.69)	-0.452(-2.50)***
GDP	0.015(0.161)	0.003(0.138)	0.005(0.147)	0.007(0.126)
Fixed/Random effects	Fixed	Fixed	Fixed	Fixed
Adjusted R square	0.852	0.778	0.707	0.722
F statistics	40.34	25.48	17.69	18.17
Probability	<0.01	<0.01	<0.01	<0.01

N = 482 (number of Italian utility companies).  $\Sigma_i T_i N = 2,410$  (number of utility firm-year observations). *t* statistics are shown in parenthesis. The robust standard errors of the estimated coefficients are clustered at the firm level. \*, \*\*, and \*\*\* denotes level of significance at the 0.10, 0.05 and 0.01 levels, respectively. Model 1, Model 2, Model 3 and Model 4 correlate the percentage and the number of women on BoD (dependent variable) to the comprehensive ESG scoring, the environmental scoring, the social scoring and the governance scoring, respectively.

Table 4 summarizes the regression results for each Model. The presence of female directors in boardrooms has a positive effect on ESG performance but the impact is not statistically significant unlike prior evidence in literature (Velte, 2016). Results in Table 4 also indicate that firms with at least three female board members are better able to increase ESG performance. In fact, female directors have a significant positive impact (significance at 0.05 level) on the comprehensive ESG performance scoring (ESGperf) once the BoD achieves the critical threshold of three women. These findings are in contrast with H1 but confirm H2 and converge with the critical mass theory (Kanter, 1977) and previous literature (Manita et al., 2018; Lafuente & Vaillant, 2019; Qureshi et al., 2020; Yarram & Adapa, 2021; Yadav & Prashar, 2022). The presence of at least three women on BoD (critical mass) helps female directors to have their voices heard on the BoD and therefore their viewpoints are greatly respected in the decision-making process (Konrad et al., 2008; Torchia et al., 2011). Hence, a certain threshold of female directors exerts utility firms to focus more on strategic decision-making related to ESG issue and to improve sustainable initiatives.

Regarding ESG pillars, the results are mixed. We observe that the presence of women on BoD have no significant impact on all different ESG dimensions. On the contrary, a critical mass of females on the BoD positively influences the ESG pillars' scores but the statistical significance of these impacts depends on the selected pillar. Specifically, findings demonstrate that female directors on the BoDs improves environmental and social performance (significance at the 0.05 level and at the 0.10 level respectively) only beyond the threshold of three women (Atif et al., 2021; Lafuente and Vaillant, 2019). Hence, H3 is partially confirmed (for environmental and social pillars) because it is rejected for the governance pillar. The evidence indicates that female directors engage more in strategic issues concerning environmental and social matters (Disli et al., 2022; Velte, 2023) by their sustainable way of acting. (Kyae et al., 2017). Further, women directors exhibit a more participative leadership style in comparison to men directors (Eagly et al., 2003), aiding comprehensive discussions among the board members on environmental and social concerns (Bear et al., 2010). In this regard, the critical resources of female directors help utility firms in strategic decision-making that results in higher ESG performance (Manita et al., 2018).

Therefore, these results align with resource dependence theory and support extant literature (Kyaw et al., 2017; McGuinness et al., 2017; Manita et al., 2018; Arayssi et al., 2020; Romano et al., 2020; Shakil et al., 2020; Wasiuzzaman & Wan Mohammad, 2020; Pareek et al., 2021; Disli et al., 2022) by signifying female director's intellectual and interpersonal characteristics as critical resources for utility companies to attain the legitimate

ESG performance. Female board members' unconditional commitment to ethical and climate issues allows utility firms to address the ESG principles more sensibly. Hence, engaging more women on BoDs is not merely to tick the box of gender requirements but also it benefits Italian utility firms to improve the social board functions. The findings overcome the idea of a type of tokenism in which women are appointed to BoDs only to meet the regulatory requirement of a gender-balanced BoD (Saggar et al., 2021). Our findings are in line with the EU utilities sector whereas the representation of women on BoDs helps utility firms to act according to the Agenda 2030 in comparison to non-environmental sectors. The EU countries are adopting Agenda 2030 which is focused on gender equality to empower women in the decision-making process toward the sustainable development goals. Consistent with our results, the role of female members of BoD is crucial for EU utility firms in addressing sustainable initiatives and ESG issue according to the and Agenda 2030.

Finally, Table 4 illustrates data of the control variables. The results show that larger board size and higher board independence lead to higher ESG performance. Similarly, Table 4 shows that establishing a CSR/sustainability committee supports utilities' board in incorporating ESG dimensions into the corporate strategy. The presence of a specific CSR/sustainability committee focused on ESG issues, appears to be a good governance practice for utilities to improve ESG performance. Therefore, these results support resource dependency theory which states that the critical resources of directors, including their psychological characteristics, background and experience, are crucial to incorporate social and environmental issues in utilities' activities for implementing sound ESG practices. In line with several prior studies (Buallay, 2020; Sharma et al., 2020; Nicolò et al., 2023), the findings highlight that both firm size (SIZE) and economic performance (ROE) have a positive and statistically significant effect on the overall ESG score, at 0.01 and 0.05 respectively. Hence, empirical evidence reveals that high ESG performance is mostly achieved by large and more profitable utility companies (Baselga-Pascual et al., 2018) because they have affluent resources and workforce to invest in ESG activities. On the contrary, utility firms having high leverage show low ESG performance in accordance with previous literature (Velte, 2016; Manita et al., 2018; Arayssi et al., 2020).

To verify the robustness of the empirical results, we conduct a robustness test to ascertain whether the relationship between gender diversity and ESG\_perf is affected by the business model of the utilities. We re-estimate the main Models considering two clusters of utility companies by incorporating the classification of mono-utilities and multi-utilities firms in the econometric models. The estimates of these additional regressions are consistent with the results of the main analysis. Anyway, the less significant results for multi-utilities can be attributed to the low number of observations on which panel data analysis is run. The data sets of the robustness test for ESG estimations are not reported in tabular form in the interest of saving space and enhancing the readability of the paper. To obtain a broader view of the relationship between board gender diversity and ESG performance, we also re-estimate the Models by incorporating two different indicators. Table 5 presents these estimations. First, we include the age of board directors as an explanatory variable to verify that the gender effect is not age-related. The robustness analysis results confirm the main findings, which state that the presence of three or more female board members significantly and positively influences the overall ESG performance and the environmental and social pillars. Second, we consider the role of macroeconomic context by incorporating the employment as the level of registered employment in the Italian region where the utility firm is headquartered. The idea is to include an additional variable for the local economic environment, as well as for the global economic conditions of companies in every Italian geographical region. Our main findings are confirmed because female directors trigger higher ESG performance scores than their male counterparts.

Table 5. Robustness checks

	Model 1	Model 2	Model 3	Model 4
<i>Variables</i>	ESG_perf	ENV_perf	SOC_perf	GOV_perf
%Women	1.732(0.92)	1.034(0.64)	1.845(0.32)	0.768(0.82)
3Women	1.814(0.81)**	1.298(0.62)***	1.846(0.26)*	0.567(0.73)
Board age	0.0325	0.0061	0.0017	0.0524
Control variables	Yes	Yes	Yes	Yes
R-squared	0.4333	0.5324	0.3898	0.4129
%Women	1.846(0.92)	1.027(0.64)	1.826(0.32)	0.755(0.82)
3Women	1.972(0.83)**	1.395(0.62)***	1.748(0.26)*	0.577(0.73)
Employment	0.0014	0.0096	0.0058	0.0030
Control variables	Yes	Yes	Yes	Yes
R-squared	0.4533	0.5567	0.3557	0.4743

Notes. N = 482 (number of Italian utility companies).  $\Sigma_i T_i N = 2,410$  (number of utility firm-year observations).

Panel fixed effects (within) estimation (significant Hausman test). Firm-level clustered robust standard errors are in brackets.

\*, \*\*, and \*\*\* denotes level of significance at the 0.10, 0.05 and 0.01 levels, respectively.

## 5. Conclusions

Utilities companies produce, manage and distribute essential public services (i.e., energy, natural gas, water and waste collection) with the key purpose of maximizing profits and creating public value at the same time. Since the attention of policymakers, regulators and other stakeholders towards social and environmental issues has dramatically increased, ESG practices assume a crucial relevance for utilities to demonstrate compliance with institutional expectations and then to gain more legitimacy. The aim of this study is to investigate the relationship between board gender diversity and ESG performance in the Italian utilities sector. Empirical findings reveal a significant positive effect of female directors on ESG performance when a critical mass of women (at least three) is reached on BoD, in line with the critical mass theory. This certain threshold of female directors also positively impacts individual ESG pillars, i.e. the environmental and social dimensions. Hence, the presence of a critical mass of women on BoDs enables utility companies to act sustainably and then to focus more on strategic decision making related to ESG issues.

This study aims to fill the research gap concerning gender diversity in the utilities sector. In particular, the existing literature shows little empirical evidence focusing on the effect of board gender diversity on ESG performance in the utilities industry. Moreover, no prior study has specifically investigated this issue in the Italian utilities sector. Hence, our study contributes in several ways to the current literature on how the presence of females in BoDs influence ESG dimensions. Firstly, the utilities sector is an underexplored field although the academic debate on sustainability and ESG reporting has matured. To the best of our knowledge, current studies analyzing the relationship between CG variables and sustainability in utilities sector are new but limited and mainly deal with the ESG disclosure (and not ESG performance) (Mehmood et al., 2023; Nicolò et al., 2023). Hence, this paper offers novel insights into utilities' ESG practices. Secondly, this study is the first investigating the relationship between board gender diversity and ESG performance in the Italian utilities sector by means of the ESG score provided by Refinitiv Eikon database. Furthermore, our findings provide fresh empirical evidence on this topic by evaluating the effects on the different ESG pillars. In this regard, almost all prior investigations focused only on the composite ESG performance score (Chams & García-Blandón, 2019; Shahbaz et al., 2020; Sharma et al., 2020; Nicolò et al., 2023) and few studies explored which ESG dimensions are the most affected by the CG variables (Mehmood et al., 2023).

From a practical perspective, this study supports practitioners, policymakers and regulators in defining specific ESG disclosure practices for utilities to be compliant with environmental and social expectations arising from different stakeholders. Focusing on economic and policy implications, the findings support regulators and policymakers in defining sector-specific reporting standards that may encourage utilities to enhance transparency and accountability on ESG issues. In line with this, governments and regulators should reinforce the institutional pressure for utility companies to achieve sustainable targets according to Agenda 2030.

The study also draws attention to managerial implications regarding board composition. In particular, the findings encourage utility companies to identify their internal CG mechanisms properly, giving attention to an accurate selection of the female members on BoD. Specifically, utilities should increase the presence of female directors to promote greater sensitivity towards ESG issues and then to achieve high ESG performance.

This study has some limitations. Firstly, we measured ESG performance using scores retrieved from the Eikon Refinitiv database. The empirical analysis assumes that the Refinitiv ESG score is an effective measure of utilities' ESG performance. Nevertheless, the scores are largely obtained from different corporate public reporting (annual reports, corporate social responsibility (CSR) reports, company websites and global media sources). Hence, this database has potential limitations, such as subjectivity in scoring or the potential for reporting bias by companies. It would be interesting to examine the impact of gender diversity on ESG dimensions by adopting other ESG performance measures. For example, ESG performance can be evaluated by the use of Bloomberg database. Secondly, local economic conditions (i.e. the effect of local demand of utilities based on local-level population) could be a potential biases or a confounding factor affecting research's results to gain a fine-grained picture of the effects of gender diversity on ESG performance.

Additionally, the use of both a larger sample of utility companies and an extensive range of time to examine how ESG performance is affected by the presence of females on BoD is worth pursuing. To date, however, data availability remains an issue in these studies to increase the number of utilities' observations. Nevertheless, the limitations of this study provide opportunities for further research. First, future research may apply a different database (e.g. Bloomberg) to measure ESG performance and alternatively an automated software could be used to extract ESG information directly from non-financial reports. Second, future research efforts could concentrate also on other specific CG attributes (i.e. board size, board independence, CEO duality, the presence of a

CSR/sustainability committee) or it could focus on other diversity features and critical resources held by board members (e.g. nationality, seniority, background, experience and skills) in line with the resource dependence theory. Hence, widening the analysis to other CG mechanisms (e.g. other specific board diversity characteristics) would also be interesting. Although this is the first study regarding the effect of board gender diversity on ESG performance in the Italian utilities sector, the sample size could be enlarged to all Italian utility companies or otherwise to the listed utility firms in European countries to further contribute to the literature on the topic of ESG in the utilities sector. Future research could also conduct a comparative analysis between the different Italian geographical regions to ascertain whether the conclusions of this paper can be different among different areas. Furthermore, future studies could better control for contextual factors by incorporating different macro-economic variables.

#### **Informed consent**

Obtained.

#### **Ethics approval**

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#### **Data availability statement**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

#### **Data sharing statement**

No additional data are available.

#### **Open access**

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