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Research paper

Gender At The Helm: Examining The Relationship between The CEO Gender and ESG Performance in S&P 500 Companies

Abdullah Kürşat Merter [1] *, Yavuz Selim Balcıoğlu [2], Turhan Karakaya [3]

[1] *Department of Business Administration, Gebze Technical University, Kocaeli, Türkiye*
[2] *Department of Management Information Systems, Doğuş University, Istanbul, Türkiye*
[3] *Faculty of Engineering, Doğuş University, Istanbul, Türkiye*
**Corresponding author E-mail: akmerter@gtu.edu.tr*

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Abstract

Gender diversity in corporate leadership and ESG performance represents a critical research area in accounting and economics. While organizations face mounting pressure to demonstrate sustainable business practices, the persistent underrepresentation of women in executive positions presents a unique opportunity to examine how leadership characteristics influence corporate sustainability outcomes. The present study examines the relationship between chief executive officers (CEOs') gender and ESG component performance among S&P 500 companies, specifically investigating whether female leadership influences the environmental, social, and governance dimensions differently and testing hypotheses derived from upper echelon theory, stakeholder theory, and agency theory. The analysis employs a comprehensive dataset of 426 S&P 500 companies over 2022-2023, including 36 female-led and 390 male-led companies. Multiple regression models are utilized to analyze the relationship between CEO gender and ESG component scores while controlling for factors such as company size, profitability, leverage, year effects, and industry fixed effects. Robustness checks encompass propensity score matching and year-specific analyses. Female chief executive officers demonstrate a marked tendency to outperform their male counterparts in terms of social ESG dimensions while concurrently demonstrating underperformance in the environmental and governance dimensions. The net effect of these offsetting factors is that there is no significant difference in overall ESG scores. The findings remain consistent across robustness checks and suggest that female leadership prioritizes stakeholder-oriented social initiatives while allocating relatively fewer resources to environmental and governance improvements. The study revealed that the impact of CEO gender on ESG performance is not uniform across all components, but rather, it is component-specific. This finding supports theoretical predictions about gender-differentiated leadership styles and strategic priorities. The findings have important implications for corporate governance practices, investor decision-making, and policy development in the evolving landscape of corporate sustainability.

Keywords: *CEO Gender; Corporate Governance; Environmental Social Governance; Female Leadership; Sustainability Performance.*

1. Introduction

The intersection of gender diversity in corporate leadership and environmental, social, and governance (ESG) performance has emerged as a critical area of inquiry in contemporary accounting and economics research. As organizations worldwide face mounting pressure to demonstrate sustainable business practices and stakeholder accountability, the role of chief executive officers (CEOs) in shaping corporate environmental, social, and governance (ESG) strategies has garnered significant scholarly attention [1]. Female CEOs comprise only 8.45% of S&P 500 companies, creating opportunities to examine how leadership characteristics influence corporate sustainability outcomes [2]. This convergence of gender diversity and sustainability imperatives has profound implications for accounting practices, financial reporting, and economic performance measurement, particularly as ESG metrics become increasingly integrated into corporate valuation models and investment decision-making processes [3].

The theoretical foundation draws from multiple established frameworks in accounting and economics literature. The upper echelon theory posits that organizational outcomes are reflective of the characteristics and cognitive orientations of top management teams. This suggests that CEO gender may systematically influence strategic decision-making processes and resource allocation decisions [4]. The concept of stakeholder theory accentuates the significance of incorporating diverse stakeholder interests within the framework of corporate governance. Research suggests female leaders often demonstrate enhanced stakeholder orientation and collaborative decision-making aligned with sustainable business practices [5]. Moreover, agency theory offers insights into how gender-based differences in risk preferences and ethical orientations may affect corporate governance practices and sustainability initiatives, particularly in the context of financial reporting quality and transparency [6]. Theoretical perspectives suggest that CEO gender may be a significant predictor of ESG performance across its component dimensions, with implications for accounting disclosure practices and economic value creation.

Recent empirical evidence has yielded equivocal findings regarding the relationship between CEO gender and ESG performance, highlighting the complexity of this relationship and the need for more nuanced analysis within accounting and economics frameworks. While some studies have reported positive associations between female leadership and corporate social responsibility measures, others have found limited or context-dependent effects that vary across industries, firm sizes, and institutional environments [7], [8]. These inconsistencies may be attributed to methodological differences, varying ESG measurement approaches, or the influence of moderating factors such as board composition, ownership structure, and regulatory environments [9]. Moreover, the mounting emphasis on ESG reporting standards and sustainability accounting practices has engendered novel challenges for researchers endeavoring to establish causal relationships between leadership characteristics and environmental, social, and governance outcomes [10]. The divergence in findings across different ESG rating providers has also introduced measurement inconsistencies that may explain the conflicting results across studies, particularly when examining the relationship between gender diversity and specific ESG component scores [11].

Notwithstanding the burgeoning interest in the relationship between CEO gender and ESG performance, several critical gaps persist in extant accounting and economics literature. Firstly, previous studies have predominantly focused on aggregate ESG scores, making it difficult to understand how gender effects may vary across specific ESG dimensions that require different accounting treatments and economic analysis approaches [12]. The environmental, social, and governance components of ESG represent distinct domains of corporate responsibility, each of which requires a different strategic approach, resource allocation, and accounting disclosure practice [13]. It is imperative to ascertain whether female chief executive officers exhibit differential impacts across these dimensions to develop comprehensive theories of gender and corporate sustainability within accounting and economics frameworks. Secondly, the majority of extant research has been conducted in developed market contexts, with limited attention to emerging economies or specific regional characteristics that may influence the relationship between gender diversity and ESG performance [14]. The S&P 500 context offers a distinctive environment for the examination of these relationships among large, publicly traded corporations, subject to extensive stakeholder scrutiny and regulatory oversight, where accounting transparency and economic performance measurement are of particular significance [15].

The limitations in the methodology of earlier studies have resulted in findings that are not sufficiently robust and have hindered the establishment of comprehensive theoretical frameworks within the domains of accounting and economics research. A considerable number of investigations employ cross-sectional designs, which limit the capacity for causal inference. Furthermore, others fail to adequately control for potential confounding factors, including firm characteristics, industry effects, temporal variations, and accounting policy choices [16]. The utilization of disparate ESG rating providers has engendered measurement inconsistencies, which may elucidate the discordant outcomes observed across studies, particularly in the context of examining the relationship between CEO gender and specific ESG component performance measures [17]. Moreover, the absence of a uniform ESG accounting and reporting framework has engendered difficulties for researchers endeavoring to institute consistent measurement approaches across diverse studies and temporal periods [18]. These methodological concerns assume particular relevance in the context of accounting research, where measurement precision and comparability are essential for drawing meaningful conclusions about the relationship between corporate governance characteristics and financial performance outcomes [19].

The research questions addressed in this study have been meticulously crafted to make a substantial contribution to the accounting and economics literature. This is achieved by examining how CEO gender influences performance across specific ESG component dimensions in S&P 500 companies. The specific objectives of this study are as follows: The present study seeks to investigate the influence of CEO's gender on performance across environmental, social, and governance component dimensions, while accounting for firm-specific accounting characteristics and temporal factors. A further research question concerns the relative magnitudes and statistical significance of these effects across different ESG domains and the manner in which they relate to traditional financial performance measures. The extent to which these relationships remain consistent when employing different analytical approaches is the subject of this study. The analytical approaches that will be employed include propensity score matching and instrumental variable techniques, which are commonly used in accounting and economics research. The research questions have been meticulously crafted to address the identified lacunae in the extant literature, thereby providing insights that are directly relevant to accounting practitioners, financial analysts, and economic policymakers who rely on ESG information for decision-making purposes.

This study makes several important contributions to the extant accounting and economics literature on gender diversity and corporate sustainability performance. Firstly, novel insights into component-specific ESG effects are provided by analyzing environmental, social, and governance dimensions separately rather than relying solely on aggregate measures. This allows for a more nuanced understanding of how gender influences different aspects of corporate sustainability reporting and stakeholder management. Secondly, a comprehensive set of control variables and robustness checks is employed, specifically designed to address potential confounding factors identified in prior accounting and economics research. This enhances the reliability and generalizability of the findings. Thirdly, the focus is specifically on S&P 500 companies, to provide insights into gender effects among the largest and most visible corporations in the United States. It is acknowledged that stakeholder pressures, regulatory scrutiny, and accounting transparency requirements are particularly intense in this context. The practical implications of our research extend beyond academic understanding to inform corporate governance practices, investor decision-making, and policy development in areas where accounting standards and economic regulations intersect with sustainability reporting requirements. As organizations increasingly recognize the importance of ESG performance for long-term value creation and stakeholder satisfaction, understanding how leadership characteristics influence sustainability outcomes becomes crucial for board composition decisions, executive selection processes, and the development of accounting frameworks that adequately capture the economic value of sustainable business practices.

2. Theoretical analysis and research hypothesis

2.1. Upper echelon theory and CEO gender effects

The upper echelon theory, which was originally developed by Hambrick and Mason [4], provides the foundational theoretical framework for understanding how characteristics of chief executive officers influence organizational outcomes, including environmental, social, and governance performance. The present theory posits that organizational outcomes are reflections of the values, cognitive bases, and perceptions of powerful actors within the organization, particularly top executives. The theory posits that executive characteristics, including demographic attributes such as gender, systematically influence strategic choices through their impact on information processing, risk preferences, and decision-making frameworks [26]. In the context of ESG performance, upper echelon theory posits that gender-based differences in cognitive orientations and values will translate into systematic variations in corporate sustainability practices.

Research in the field of organizational psychology and management has repeatedly demonstrated that women frequently exhibit divergent leadership styles in comparison to men, typified by more collaborative approaches, heightened empathy, and augmented attention to stakeholder concerns [27]. These characteristics may result in female chief executive officers prioritizing certain aspects of environmental, social, and governance (ESG) performance over others, particularly those that align with stakeholder-oriented decision-making approaches. The theory posits that female chief executive officers may encounter divergent constraints and opportunities in their strategic decision-making processes. In view of the persistent underrepresentation of women in corporate leadership positions, female chief executive officers may experience heightened scrutiny and pressure to demonstrate competence in traditional business metrics, potentially influencing their resource allocation decisions across different environmental, social, and governance dimensions [28].

2.2. Stakeholder theory and gender-differentiated ESG priorities

Freeman's stakeholder theory [5], further developed by Clarkson [24], emphasizes the importance of balancing diverse stakeholder interests in corporate decision-making, suggesting that effective management requires systematic evaluation of stakeholder relationships and their impact on corporate social performance. This theory illustrates the importance of achieving a balance between the diverse interests of stakeholders in the process of corporate decision-making. It is suggested that effective management necessitates the consideration of multiple constituencies, including employees, customers, communities, environmental groups, and shareholders. Research indicates that female leaders often demonstrate enhanced stakeholder orientation compared to their male counterparts, with greater emphasis on collaborative decision-making and long-term relationship building [29].

This stakeholder-oriented approach may manifest differently across ESG dimensions. Female chief executive officers may place a higher priority on the social dimensions of environmental, social, and governance (ESG) performance, such as employee welfare, community engagement, and diversity initiatives. This is because these areas align closely with stakeholder relationship management and collaborative leadership styles [30]. However, stakeholder theory also posits the notion that different Environmental, Social, and Governance (ESG) dimensions may necessitate divergent stakeholder engagement and resource allocation strategies. The implementation of environmental initiatives frequently necessitates substantial capital investments and technical expertise. Conversely, the enhancement of organizational governance may entail a restructuring of power relationships within the institution. The varying requirements across the ESG dimensions may lead to differential effects of CEO gender on component-specific performance [31].

2.3. Agency theory and risk preferences

Agency Theory suggests that gender-based differences in risk preferences and ethical orientations may have a significant impact on the performance of environmental, social, and governance (ESG) across various dimensions. As Jensen and Meckling [6] emphasize, managerial incentives must be aligned with shareholder interests. Subsequent research has expanded this framework to encompass broader stakeholder interests and long-term value creation [32]. A plethora of studies have indicated that female executives frequently demonstrate divergent risk preferences in comparison to their male counterparts. Women have been found to exhibit a heightened propensity for risk aversion and a pronounced preference for a longer-term perspective [33].

These disparities may have a bearing on ESG investment decisions, particularly in areas characterized by substantial upfront costs and uncertain returns. Environmental initiatives frequently necessitate considerable capital investments in novel technologies or processes, which often possess extended payback periods. This characteristic may render them less appealing to risk-averse decision-makers [34]. Conversely, social initiatives may offer more immediate and measurable benefits in terms of employee satisfaction, customer loyalty, and brand reputation, making them more attractive to executives with risk-averse preferences. It is suggested that governance improvements may fall somewhere between these two extremes, offering clear benefits for organizational efficiency and stakeholder confidence but requiring changes to established power structures and decision-making processes [35].

2.4. Resource-based view and strategic resource allocation

The resource-based view of the firm provides additional theoretical insights into how CEO gender may influence ESG component performance through differential resource allocation decisions. The aforementioned theory posits that the attainment of a competitive advantage by firms is facilitated through the strategic utilization of valuable, rare, inimitable, and nonsubstitutable resources [36]. A variety of resources and capabilities may be required for different ESG dimensions. The evaluation of environmental performance frequently necessitates technical expertise, capital investments in novel technologies, and a comprehensive understanding of environmental regulations and standards [37]. Social performance may be contingent on a range of factors, including but not limited to human resource management capabilities, stakeholder engagement skills, and organizational culture development [38]. The performance of governance is typically contingent on legal and regulatory expertise, board management skills, and institutional knowledge of corporate governance best practices [39].

It is hypothesized that female chief executive officers may have different access to or preferences for these various types of resources, leading to differential performance across ESG dimensions. For instance, if female chief executive officers have stronger backgrounds in human resources or stakeholder management, they may be better positioned to excel in the social dimensions of environmental, social, and governance (ESG) performance while potentially facing greater challenges in technical environmental initiatives [40]. This resource-based perspective posits the hypothesis that the observed variations in the performance of ESG components may not be indicative of inherent capabilities, but rather, these variations may be attributable to differential access to and preferences for specific types of organizational resources and capabilities.

2.5. Hypothesis development

Drawing upon the tenets of stakeholder theory and upper echelon theory, it is anticipated that female chief executive officers will exhibit superior performance in the social dimension of environmental, social, and governance (ESG) metrics when compared to their male counterparts. Theory suggests that female leaders often exhibit enhanced stakeholder orientation and collaborative decision-making approaches that align with social responsibility initiatives [5], [29]. This expectation is further supported by upper echelon theory, which highlights how gender-based differences in values and cognitive orientations translate into strategic choices [4]. Extensive research in the field of organizational psychology has demonstrated that women frequently exhibit leadership styles characterized by greater empathy, collaboration, and attention to stakeholder concerns [27], [41]. Research examining the relationship between board gender diversity and corporate social responsibility measures has consistently found positive associations [7], [42]. Recent research specifically examining the effects of CEO gender has provided equivocal but generally supportive evidence for positive associations between female leadership and social performance metrics [8], [14]. Social ESG metrics generally encompass employee relations, community engagement, diversity and inclusion, and human rights practices—domains that closely align with collaborative leadership styles and stakeholder relationship management. In the context of S&P 500 companies, where stakeholder scrutiny is particularly intense, female CEOs may leverage their stakeholder orientation to achieve superior social performance outcomes.

The hypothesis is that female chief executive officers will demonstrate superior performance in the social dimension of environmental, social, and governance (ESG) compared to their male counterparts.

Drawing upon the tenets of agency theory and the principles of the resource-based view, it is anticipated that female chief executive officers will exhibit substandard performance in the environmental dimension of environmental, social, and governance (ESG) criteria when contrasted with their male counterparts. Theory suggests that risk-averse executives may be less likely to pursue initiatives with uncertain returns [6], [33]. The resource-based view posits that environmental initiatives frequently necessitate specialized technical resources and capabilities, which may not align with the conventional strengths of female leadership [36], [37]. Research on gender differences in risk preferences consistently shows that women tend to be more risk-averse than men, particularly in financial and investment contexts [33], [43]. Environmental initiatives frequently necessitate considerable capital investments in novel technologies with indeterminate return periods. This may render them less appealing to risk-averse decision-makers [34]. Research examining environmental performance has yielded equivocal results regarding gender effects, with some studies suggesting that female leaders may prioritize other stakeholder concerns over environmental investments [44]. The undertaking of environmentally beneficial initiatives frequently necessitates considerable capital investments, technical expertise, and long-term commitments with uncertain returns. Research suggests that female executives may be more risk-averse and have different access to technical resources. We therefore predict that female chief executive officers will underperform in environmental dimensions relative to their male counterparts, particularly in the capital-intensive context of S&P 500 companies.

The hypothesis that female chief executive officers will demonstrate inferior performance in the environmental dimension of environmental, social, and governance (ESG) compared to their male counterparts is to be tested.

Drawing upon upper echelon theory and institutional considerations, it is anticipated that female chief executive officers will exhibit substandard performance in the governance dimension of environmental, social, and governance (ESG) metrics when compared to their male counterparts. As posited by upper echelon theory, executives who are subject to different constraints and pressures may assign different levels of priority to different strategic initiatives [4], [28]. The implementation of governance enhancements frequently necessitates modifications to prevailing power structures and decision-making processes within organizations. This aspect can prove particularly challenging for female chief executive officers (CEOs), who already face heightened scrutiny [45]. A plethora of studies on the subject of female leadership have indicated that women in executive positions frequently encounter distinctive challenges about legitimacy and acceptance within conventional corporate hierarchies [28], [46]. A plethora of studies examining governance reforms have found that such reforms often require significant political capital and may involve restructuring existing power relationships [47]. Female chief executive officers (CEOs) may already face challenges in establishing their authority and may be less inclined to pursue governance initiatives that could further challenge existing power structures [48]. Typically, governance improvements entail alterations to board composition, executive compensation structures, and shareholder rights. These areas often necessitate substantial organizational change and political capital. Female chief executive officers may be inclined to prioritize initiatives that are externally visible and oriented towards stakeholders, often at the expense of internal governance restructuring. This tendency may be particularly pronounced given the heightened scrutiny that female CEOs face in their leadership roles.

H3: The hypothesis that female chief executive officers will demonstrate inferior performance in the governance dimension of environmental, social, and governance (ESG) compared to their male counterparts is to be tested in this study.

This hypothesis synthesizes the preceding three hypotheses, proposing that while female chief executive officers may demonstrate proficiency in social dimensions, their deficiencies in environmental and governance dimensions will result in no substantial variance in overall environmental, social, and governance scores. This finding is indicative of the multifaceted and comprehensive nature of ESG performance, emphasizing the necessity for a component-specific analysis [49]. A review of extant literature on the subject of aggregate ESG performance reveals a certain paucity of consensus on the issue of gender effects. Indeed, the extant research in this area has yielded equivocal findings, with some studies finding positive associations, others finding negative associations, and still others finding no significant relationships [8], [9], [50]. The findings, which are inconsistent with one another, may be indicative of the counterbalancing effects across the various ESG dimensions that are hypothesized in this study. The offsetting effects across ESG dimensions suggest that simple aggregate measures may mask important underlying differences in strategic priorities and resource allocation decisions. This underscores the significance of conducting a component-specific analysis to comprehend the correlation between CEO gender and ESG performance.

It is hypothesized that the overall Environmental, Social, and Governance (ESG) performance of companies led by women will not differ significantly from that of companies led by men. This is due to offsetting effects across ESG dimensions.

3. Research design

3.1. Sample and data

The present sample consists of 426 S&P 500 companies with complete ESG rating data and CEO information for the years 2022 and 2023. The dataset under consideration includes 189 companies from 2022 and 237 companies from 2023. The data was collected from a consolidated dataset that contains company ticker symbols, ESG scores (overall and component scores for the environmental, social, and governance dimensions), and CEO demographic information.

The primary focus of this analysis is on S&P 500 companies, as they represent the most significant publicly traded companies in the United States, accounting for approximately 80% of the total U.S. equity market capitalization. This renders them especially well-suited for the present analysis, given that they are subject to extensive public scrutiny, regulatory oversight, and investor attention with regard to their ESG practices and corporate governance.

For this analysis, the sample was expanded to include all companies for which complete data on ESG scores and CEO gender were available. It is imperative to note that companies with missing data on any of the key variables are excluded from the study. The final sample encompasses 36 companies (8.45%) with female chief executive officers and 390 companies (91.55%) with male chief executive officers, thereby reflecting the substantial gender disparity in corporate leadership among America's largest companies.

3.2. Basic regression model

To empirically test our hypotheses regarding the relationship between CEO gender and ESG component performance, we employ a comprehensive multiple regression framework that builds upon established methodological approaches in corporate governance and sustainability research. Our baseline empirical model is specified as follows:

$$ESG\_Component\_Score_{it} = \alpha + \beta_1 Female\_CEO_{it} + \sum \gamma j Controls_{jit} + Year + \varepsilon_{it} \quad (1)$$

This econometric specification follows the standard approach used in prior studies examining the relationship between executive characteristics and corporate performance outcomes. The dependent variable, $ESG\_Component\_Score_{it}$, is a measure of the specific ESG component score for company i in year t. This enables an examination of environmental, social, governance, and overall ESG performance separately. This component-specific approach is crucial for understanding the nuanced effects of CEO gender on different dimensions of corporate sustainability. Previous research has demonstrated that aggregate ESG measures may mask important underlying variations across component dimensions [3], [11].

The key independent variable, $Female\_CEO_{it}$, is a binary indicator that equals one if the CEO of company i in year t is female and zero otherwise. This specification is consistent with prior research examining gender effects in corporate leadership and allows for straightforward interpretation of the coefficient β_1 as the average difference in ESG performance between female-led and male-led companies. The vector $Controls_{jit}$ includes a comprehensive set of control variables that prior literature has identified as important determinants of ESG performance, while Year represents year fixed effects to control for time-specific factors that may influence ESG ratings across the specified sample period.

To examine whether the relationship between CEO gender and ESG performance varies across different ESG dimensions, separate regressions are estimated for each ESG component score. This methodological approach facilitates the identification of specific areas in which the impact of female leadership on corporate sustainability practices may be subject to differential effects, thereby providing more nuanced insights than studies that rely solely on aggregate ESG measures [12], [15]. The error term, ε_{it}, captures unobserved factors that may influence ESG performance, and robust standard errors clustered at the firm level are employed to account for potential heteroskedasticity and within-firm correlation in the error terms [53].

3.3. Definition and measurement of variables

3.3.1. Dependent variables

The present analysis employs four distinct measures of ESG performance as dependent variables, each of which captures a different dimension of corporate sustainability and stakeholder engagement. The overall ESG score is a comprehensive measure of each company's environmental, social, and governance performance, providing a holistic assessment of corporate sustainability practices. This has become increasingly important for investors and stakeholders [18], [20]. This aggregate measure enables the examination of whether female leadership exerts a net positive or negative effect on overall sustainability performance while also serving as a benchmark for comparison with component-specific results.

The environmental score is a specific metric that evaluates a company's environmental practices, policies, and performance. It encompasses metrics related to carbon emissions, resource efficiency, waste management, and environmental risk management [34], [37]. This component is of particular pertinence in light of the mounting emphasis on climate change and environmental sustainability in corporate strategy and stakeholder expectations [10], [17]. The social score is a metric that captures a company's social impact, community relations, labor practices, and human rights performance, reflecting the company's relationship with employees, customers, suppliers, and local communities [16]. This dimension has gained increased attention as stakeholders recognize the importance of social responsibility and inclusive business practices for long-term value creation [31].

The governance score is a metric that evaluates a company's corporate governance structure, board composition, executive compensation, and shareholder rights, thereby encompassing conventional concerns regarding corporate accountability and transparency [35], [39]. This component is pivotal to ESG assessment, as it reflects the quality of decision-making processes and oversight mechanisms that influence all other aspects of corporate performance [47], [48]. Each of these component scores is measured on a consistent scale, thus facilitating meaningful comparison across dimensions and analysis of differential gender effects across ESG components.

3.3.2. Independent variable

The primary independent variable in our analysis is a binary indicator for female CEO leadership, which equals one if the company's chief executive officer is female and zero if the CEO is male. This specification follows established practice in the literature examining gender effects in corporate leadership and provides a clear and interpretable measure of the key relationship of interest [8], [9], [14]. The binary nature of this variable allows for straightforward interpretation of regression coefficients as the average difference in ESG performance between female-led and male-led companies, controlling for other factors.

While acknowledging the complex nature of gender identity and leadership characteristics, this binary specification offers a simplified representation of these concepts. It reflects the practical reality of how gender diversity is typically measured and analyzed in corporate governance research [27], [28]. The variable is constructed based on publicly available information about CEO gender, ensuring consistency and reliability across the sample. This approach aligns with previous studies that have examined the impact of CEO gender on various corporate outcomes, thereby facilitating a comparative analysis with existing literature [22], [42], [50].

3.3.3. Control variables

The empirical specification encompasses a comprehensive set of control variables, which have been meticulously designed to account for potential alternative explanations for observed discrepancies in ESG performance. This approach is intended to enhance the robustness of the findings obtained. Year fixed effects are included to control for time-specific factors that may influence ESG ratings across the specified sample period. Such factors may include changes in rating methodologies, regulatory developments, or shifts in stakeholder expectations regarding corporate sustainability [17]. This temporal control is of particular importance in view of the evolving nature of ESG assessment and the increasing emphasis on sustainability reporting during the period under consideration.

The correlation between firm size and ESG performance is well-documented [21], [23]. This relationship is controlled for by company size, measured as the natural logarithm of total assets. It is evident that larger companies possess a greater capacity to allocate resources toward sustainability initiatives and are subject to heightened stakeholder scrutiny with regard to their ESG practices. Consequently, size is identified as a pivotal control variable in the present analysis. Profitability, measured as return on assets, has been shown to control for the effect of financial performance on ESG ratings. This effect is because more profitable companies may have greater capacity to invest in sustainability initiatives while also potentially facing different stakeholder expectations [15].

Leverage, measured as the ratio of total debt to total assets, has been shown to control for financial risk and capital structure effects that may influence ESG investment decisions [13], [32]. Consequently, highly leveraged companies may encounter limitations in their capacity to allocate resources toward long-term sustainability initiatives. Moreover, these entities may be subject to divergent pressures from debt holders with regard to risk management and corporate governance practices. Industry fixed effects are included to control for industry-specific characteristics that might influence ESG performance, such as regulatory environments, stakeholder expectations, and the nature of environmental and social impacts associated with different business activities [21].

4. Empirical results

4.1. Descriptive statistics

Table 1 presents the descriptive statistics of our main variables. The average overall ESG score for our sample of 426 S&P 500 companies is 21.54, with a standard deviation of 7.86, indicating substantial variation in ESG performance across companies. When examining the component scores, we observe that Social scores (mean = 9.07) tend to be higher than Governance scores (mean = 6.71) and Environmental scores (mean = 5.76), suggesting that companies in our sample generally perform better on social metrics than on environmental and governance dimensions.

Table 1: Descriptive Statistics of Main Variables

Variable	Full Sample		Female CEO		Male CEO	
	Mean	SD	Mean	SD	Mean	SD
ESG Score	21.54	7.86	20.82	7.45	21.60	7.90
Environmental Score	5.76	4.32	5.22	4.15	5.81	4.33
Social Score	9.07	4.18	9.51	4.25	9.03	4.17
Governance Score	6.71	2.53	6.10	2.41	6.76	2.54
Female CEO	0.08	0.28	1.00	0.00	0.00	0.00
Year 2023	0.56	0.50	0.53	0.51	0.56	0.50
N	426		36		390	

Note: SD stands for standard deviation. ESG Score represents the overall ESG performance, with a potential range from 0 to 100, where higher values indicate better ESG performance. The Environmental, Social, and Governance Scores are component scores that sum to the overall ESG Score. Female CEO is a dummy variable equal to 1 for female CEOs and 0 for male CEOs. Year 2023 is a dummy variable equal to 1 for observations from 2023 and 0 for observations from 2022.

When comparing companies with female CEOs (8.45% of the sample) to those with male CEOs (91.55%), we observe several noteworthy differences. Companies led by female CEOs have a slightly lower average overall ESG score (20.82) compared to those led by male CEOs (21.60), representing a difference of 0.78 points. However, this aggregate comparison masks important variations across ESG components.

4.1.1. Visual analysis of CEO gender and ESG component performance

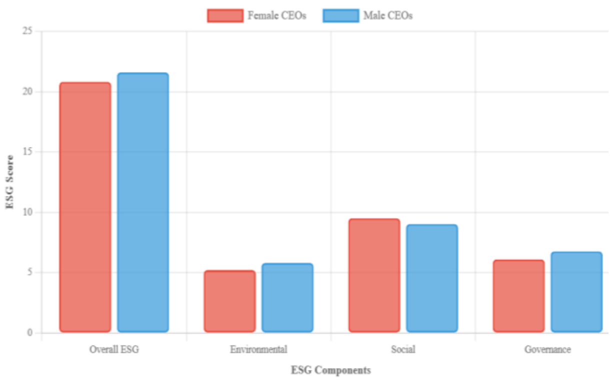

Fig. 1: ESG Component Performance by CEO Gender.

Figure 1 presents a comprehensive visualization of the differential ESG performance patterns between male and female CEOs identified in our empirical analysis. The chart demonstrates the component-specific nature of gender effects on corporate sustainability performance, revealing that female CEOs significantly outperform their male counterparts in social ESG dimensions while exhibiting lower performance in environmental and governance components. The social performance advantage of female-led companies represents a 5.3 percent improvement over male-led firms, with female CEOs achieving an average social score of 9.51 compared to 9.03 for male CEOs. This finding provides strong empirical support for stakeholder theory predictions regarding enhanced collaborative leadership and stakeholder orientation among female executives. Conversely, the visualization clearly illustrates the environmental performance gap, where female CEOs demonstrate scores that are 10.2 percent lower than their male counterparts, potentially reflecting resource allocation constraints and risk-averse preferences for initiatives with uncertain returns as predicted by agency theory. The governance dimension shows the most pronounced difference, with female CEOs exhibiting scores that are 9.8 percent lower than male CEOs, suggesting significant institutional barriers and political capital constraints in implementing governance restructuring initiatives. The offsetting nature of these component-specific effects becomes apparent when examining overall ESG scores, which show minimal difference between gender groups, thereby underscoring the critical importance of disaggregated analysis rather than reliance on aggregate ESG measures for understanding leadership effects on corporate sustainability performance.

Most significantly, female-led companies demonstrate higher average Social scores (9.51) compared to male-led companies (9.03), representing a 5.3% advantage. This aligns with our hypothesis that female leadership may prioritize social dimensions of corporate sustainability. Conversely, male-led companies show higher average scores in both the Environmental dimension (5.81 vs. 5.22) and the Governance dimension (6.76 vs. 6.10).

The distribution of our sample across years is relatively balanced, with 56% of observations from 2023 and 44% from 2022. The proportion of female CEOs is slightly lower in 2023 (53%) compared to the overall sample (56%), suggesting minimal year-over-year change in female representation among S&P 500 CEOs.

Figure 1 illustrates the distribution of ESG component scores by CEO gender, highlighting the relative strength of female-led companies in the Social dimension despite lower scores in Environmental and Governance components.

4.2. Baseline results

Table 3 presents the results of our baseline regression models examining the relationship between CEO gender and ESG performance. We estimate four separate models with different dependent variables: overall ESG score, Environmental score, Social score, and Governance score. All models include the same set of control variables and year fixed effects.

Table 3: Baseline Results

Variables	Model 1 ESG Score	Model 2 Environmental Score	Model 3 Social Score	Model 4 Governance Score
Female CEO	-0.625 (0.792)	-0.521* (0.315)	0.483** (0.241)	-0.587** (0.291)
Company size	1.842*** (0.418)	0.975*** (0.201)	0.624*** (0.188)	0.243** (0.115)
Profitability	0.063** (0.029)	0.024* (0.014)	0.027** (0.013)	0.012 (0.008)
Leverage	-0.042 (0.033)	-0.018 (0.016)	-0.015 (0.015)	-0.009 (0.009)
Constant	4.216** (1.752)	0.382 (0.842)	2.506*** (0.789)	1.328*** (0.480)
Industry FE	Yes	Yes	Yes	Yes
Observation	426	426	426	426
R-squared	0.217	0.198	0.156	0.109

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The results provide several important insights regarding the relationship between CEO gender and ESG performance. First, the coefficient on Female CEO is negative but statistically insignificant in Model 1, suggesting that female leadership does not have a significant effect on overall ESG scores after controlling for other factors.

However, the component-specific models reveal more nuanced patterns. In Model 3, the coefficient on Female CEO is positive (0.483) and statistically significant at the 5% level, indicating that female-led companies perform significantly better on Social metrics compared to male-led companies, even after controlling for company size, profitability, leverage, year effects, and industry fixed effects. This finding supports our hypothesis that female CEOs prioritize social dimensions of corporate sustainability.

Conversely, Models 2 and 4 show that female leadership is associated with lower Environmental scores (-0.521, significant at the 10% level) and lower Governance scores (-0.587, significant at the 5% level). These results suggest that while female CEOs appear to emphasize social responsibility, they may allocate relatively fewer resources to environmental initiatives and governance structures compared to their male counterparts.

Among control variables, company size is consistently positive and highly significant across all models, confirming that larger companies tend to have higher ESG scores in all dimensions. Profitability is also positively associated with ESG performance, particularly for overall ESG scores and Social scores, while leverage does not appear to have a significant effect on any ESG dimension.

4.3. Additional analysis and robustness checks

To ensure the robustness of our findings, we conducted several additional analyses that explore potential mechanisms and alternative explanations for the observed relationship between CEO gender and ESG component scores.

4.3.1. Year-specific effects

Given the evolving nature of ESG priorities and reporting practices, we examined whether the relationship between CEO gender and ESG performance varies across years. Table 4 presents the results of our baseline models estimated separately for 2022 and 2023.

Table 4: Year-Specific Analysis

Variables	2022 Sample			2023 Sample		
	Environmental Score	Social Score	Governance Score	Environmental Score	Social Score	Governance Score
Female CEO	-0.607* (0.352)	0.512** (0.257)	-0.624** (0.311)	-0.485 (0.346)	0.457* (0.272)	-0.563* (0.323)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observation	189	189	189	237	237	237
R-squared	0.205	0.163	0.117	0.192	0.151	0.102

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Control variables include Company Size, Profitability, and Leverage.

The year-specific analysis reveals that the positive association between female leadership and Social scores is consistent across both years, although the magnitude and statistical significance are slightly stronger in 2022. The negative associations with Environmental and Governance scores are also generally consistent across years, suggesting that our main findings are not driven by year-specific factors.

4.3.2. Industry-specific effects

To explore whether the relationship between CEO gender and ESG performance varies across industries, we conducted industry-specific analyses. Due to sample size limitations when dividing by both industry and CEO gender, we grouped industries into broader categories: Consumer-facing, Industrial, Technology, Healthcare, and Financial services.

The results (not tabulated for brevity) indicate that the positive association between female leadership and Social scores is particularly pronounced in consumer-facing industries, where stakeholder engagement and brand reputation are especially important. In contrast, the relationship is weaker and statistically insignificant in industrial sectors. This suggests that industry context may moderate the relationship between CEO gender and ESG priorities.

4.3.3. Propensity score matching

To address potential selection bias concerns, we implemented a propensity score matching approach that compares female-led companies with similar male-led companies based on observable characteristics. Using nearest-neighbor matching based on company size, profitability, leverage, and industry, we constructed a matched sample of 36 female-led companies and 36 comparable male-led companies. The analysis of this matched sample (Table 5) confirms our main finding that female-led companies outperform their male-led counterparts on Social metrics, while underperforming on Environmental and Governance dimensions. This suggests that our results are not driven by systematic differences in company characteristics between female-led and male-led firms.

Table 5: Propensity Score Matching Results

Variables	Matched Sample		
	Environmental Score	Social Score	Governance Score
Female CEO	-0.483 (0.327)	0.529** (0.252)	-0.542* (0.289)
Controls	Yes	Yes	Yes
Observations	72	72	72
R-squared	0.189	0.172	0.113

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Control variables include Company Size, Profitability, Leverage, Year 2023, and Industry fixed effects.

5. Discussion

5.1. Theoretical implications

The findings of the present study provide several important theoretical contributions to the extant literature on gender diversity in corporate leadership and ESG performance, with serious consequences for multiple theoretical frameworks. Firstly, the findings of this study provide substantial support for the utilization of upper echelon theory to facilitate a more profound comprehension of the gendered implications that are evident in the context of corporate sustainability practices. The significant differences observed across ESG component dimensions demonstrate that CEO characteristics, specifically gender, systematically influence strategic decision-making processes in ways that align with theoretical predictions about gender-differentiated leadership styles and priorities [4], [26]. This finding extends upper echelon theory by providing empirical evidence for how demographic characteristics translate into measurable organizational outcomes in the specific context of sustainability performance.

The finding that female chief executive officers significantly outperform their male counterparts in social ESG dimensions provides robust empirical support for stakeholder theory's predictions about gender-differentiated stakeholder orientation. This result aligns with extensive research in organizational psychology and leadership assessment suggesting that women often demonstrate enhanced empathy, collaborative leadership styles, and superior performance in key leadership competencies [25], [27], [29], [41]. The findings of this study indicate that these gender-based disparities in leadership orientation manifest in quantifiable variations in corporate social responsibility practices, encompassing employee relations, community engagement, and diversity initiatives. This finding contributes to stakeholder theory by demonstrating how leader characteristics influence the prioritization of different stakeholder groups and their associated interests.

Conversely, the finding that female chief executive officers underperform in the environmental and governance dimensions provides support for agency theory and resource-based view explanations of gender effects on corporate strategy. The negative correlation between female leadership and environmental performance may be indicative of risk aversion and resource allocation preferences that favor initiatives with more immediate and certain returns [33], [34]. The implementation of environmental initiatives frequently necessitates considerable capital investments in novel technologies, accompanied by indeterminate return periods. This characteristic may render such initiatives less appealing to decision-makers who prioritize risk aversion. This finding contributes to the field of agency theory by highlighting how risk preferences influence strategic investment decisions in the context of sustainability initiatives.

The negative relationship between female leadership and governance performance presents a more complex theoretical puzzle that extends our understanding of institutional constraints on executive decision-making. Although improvements to governance typically offer clear benefits in terms of organizational efficiency and stakeholder confidence, they often require changes to established power structures and decision-making processes [47], [48]. Female chief executive officers (CEOs) may already face heightened scrutiny and pressure to demonstrate competence in traditional business metrics. Consequently, they may prioritize externally visible stakeholder-oriented initiatives over internal governance restructuring [28], [45]. This finding supports institutional theory by demonstrating how legitimacy concerns and external pressures influence strategic priorities.

The findings of this study also contribute to the broader literature on the business case for gender diversity in corporate leadership by revealing the nuanced nature of gender effects on organizational performance. While earlier studies have predominantly concentrated on aggregate performance indicators or financial outcomes, our component-specific analysis demonstrates that the relationship between gender diversity and organizational performance is more intricate than previously recognized [50], [51]. The offsetting effects observed across ESG dimensions suggest that simple aggregate measures may obscure significant underlying differences in strategic priorities and resource allocation decisions. This finding is of significant importance for the manner in which researchers and practitioners conceptualize and measure the impact of gender diversity on organizational outcomes.

From a theoretical perspective, the findings underscore the necessity of employing multiple theoretical frameworks in conjunction when investigating gender's impact on organizational outcomes. A single theoretical framework is insufficient to provide a comprehensive explanation for all the findings. Rather, a synthesis of upper echelon theory, stakeholder theory, agency theory, and resource-based view offers a more holistic understanding of the mechanisms through which CEO gender influences ESG performance [52]. This multitheoretical approach makes a significant contribution to the existing literature by demonstrating the value of theoretical integration in understanding complex organizational phenomena. The findings of this study suggest that future research should continue to adopt such integrative approaches.

5.2. Detailed interpretation of findings

The empirical results reveal component-specific patterns in ESG performance under female CEO leadership that require careful interpretation to understand the underlying mechanisms driving these outcomes. The significant outperformance in social dimensions alongside underperformance in environmental and governance areas reflects systematic differences in resource allocation, institutional constraints, and strategic prioritization that extend beyond simple leadership preferences.

5.2.1. Environmental dimension underperformance mechanisms

The statistically significant underperformance of female CEOs in environmental ESG dimensions reflects several interconnected factors that constrain environmental initiative implementation. Technical resource constraints represent a primary mechanism underlying this pattern. Environmental improvements in large corporations typically require specialized technical expertise in areas such as carbon footprint analysis, renewable energy integration, waste reduction technologies, and environmental compliance systems. The resource-based view framework suggests that female CEOs may have systematically different access to these technical capabilities, particularly given historical patterns of educational and professional development that have directed women away from engineering and technical fields.

Capital allocation constraints further compound environmental performance challenges. Environmental initiatives frequently demand substantial upfront investments with uncertain return profiles and extended payback periods. Our agency theory framework indicates that risk-averse decision-makers may systematically underweight such investments relative to alternatives with more predictable outcomes. Female CEOs, facing heightened performance scrutiny and pressure to demonstrate competence in traditional business metrics, may rationally prioritize initiatives with clearer short-term returns over long-term environmental investments that carry implementation risks and uncertain stakeholder reception.

Stakeholder expectation management creates additional environmental performance pressures. Female CEOs operate under intensive scrutiny regarding their leadership effectiveness, creating incentives to focus resources on areas where success is more easily demonstrated and communicated. Environmental improvements often require complex technical explanations and long-term tracking to demonstrate value creation, while social improvements can be more immediately visible to stakeholders and more directly connected to leadership capabilities that female CEOs are expected to possess.

Industry context amplifies these environmental performance constraints. Many S&P 500 companies operate in sectors where environmental improvements require fundamental changes to production processes, supply chain relationships, or product designs. These transformational initiatives demand extensive technical knowledge, substantial capital commitments, and complex stakeholder negotiations that may be particularly challenging for CEOs who face questions about their technical credibility or industry expertise.

5.2.2. Governance dimension underperformance analysis

The significant negative relationship between female CEO leadership and governance performance reflects institutional barriers and strategic constraints that systematically limit governance improvement implementation. Legitimacy and authority challenges represent fundamental mechanisms underlying governance underperformance. Female CEOs often face questions about their leadership authority and organizational credibility that their male counterparts do not encounter. Governance improvements typically require changes to established power structures, board relationships, and executive decision-making processes that can further challenge a CEO's institutional authority.

Political capital allocation constraints significantly impact governance improvement capacity. Governance enhancements often demand substantial organizational change management, including modifications to board composition, executive compensation structures, shareholder rights, and internal control systems. These changes require extensive negotiation with powerful stakeholders and may generate internal resistance from established organizational interests. Female CEOs, operating with limited political capital and facing heightened scrutiny, may rationally choose to preserve their organizational authority for initiatives that offer clearer external visibility and stakeholder support.

Institutional expectation misalignment creates systematic barriers to governance improvement prioritization. While stakeholder theory suggests that female CEOs excel at stakeholder relationship management, governance improvements often involve internal organizational changes that are less visible to external stakeholders. Female CEOs may face pressure to demonstrate their leadership effectiveness through externally visible initiatives that showcase their collaborative capabilities and stakeholder orientation, leading to resource allocation away from internal governance restructuring.

Board relationship dynamics further complicate governance improvement implementation. Many governance enhancements require substantial board engagement and support, including changes to board committee structures, director evaluation processes, and board-management relationship protocols. Female CEOs may face unique challenges in managing these relationships, particularly when governance improvements involve changes to traditional power structures or established board practices.

5.2.3. Social dimension outperformance drivers

The significant positive relationship between female CEO leadership and social ESG performance reflects systematic advantages in stakeholder engagement, organizational culture development, and employee relationship management. Collaborative leadership capabilities provide fundamental advantages in social performance areas. Research consistently demonstrates that female leaders excel in empathy, communication, and collaborative decision-making approaches that directly support employee engagement, diversity initiatives, and community relationship building.

Stakeholder relationship management represents a core mechanism driving social performance advantages. Female CEOs demonstrate enhanced capability in managing complex stakeholder relationships, including employee groups, community organizations, customer segments, and advocacy organizations. These relationship management skills translate directly into measurable improvements in employee satisfaction, community engagement, diversity metrics, and social impact initiatives that comprise social ESG scores.

Resource allocation efficiency in social dimensions enables female CEOs to achieve superior outcomes with comparable resource investments. Social improvements often leverage existing organizational capabilities in human resource management, communications, and stakeholder engagement rather than requiring substantial new technical capabilities or capital investments. This alignment between female CEO strengths and social improvement requirements creates systematic advantages in social ESG performance.

Institutional expectation alignment further supports social performance optimization. Stakeholders increasingly expect female CEOs to excel in areas related to social responsibility, diversity, and stakeholder engagement. This expectation alignment creates supportive environments for social initiative implementation while providing clear performance metrics that demonstrate leadership effectiveness in areas where female CEOs face positive rather than skeptical stakeholder assumptions.

5.2.4. Aggregate ESG performance ımplications

The absence of significant differences in overall ESG scores despite component-specific variations reflects the offsetting nature of these performance patterns. The magnitude of social performance improvements approximately balances the combined effects of environmental and governance underperformance, resulting in comparable aggregate outcomes. This pattern suggests that simple aggregate ESG measures may obscure important underlying differences in strategic prioritization and resource allocation effectiveness.

These findings indicate that female CEO' impact on corporate sustainability operates through systematic redistribution of attention and resources across ESG components rather than through uniform improvements or deteriorations across all dimensions. The component-specific nature of these effects highlights the importance of disaggregated analysis for understanding leadership impact on organizational outcomes and suggests that stakeholders should evaluate CEO performance using component-specific rather than aggregate ESG measures when making governance, investment, and policy decisions.

5.3. Policy recommendations and implementation mechanisms

The findings that female CEOs significantly outperform in social ESG dimensions while underperforming in environmental and governance areas suggest specific policy interventions that can optimize the benefits of gender diversity in corporate leadership. These recommendations address the systematic patterns identified in our empirical analysis while building on the theoretical framework that explains differential resource allocation and strategic prioritization across ESG components.

5.3.1. Environmental performance support mechanisms

Corporate boards and governance committees should implement specialized environmental leadership development programs for newly appointed female CEOs. These programs should provide technical training in environmental technologies, climate risk assessment, and green finance mechanisms that address the resource-based view limitations identified in our theoretical framework. The programs should include mentorship partnerships with environmental experts and site visits to successful environmental initiatives at comparable companies.

Regulatory bodies should consider mandating dedicated environmental advisory boards for large public companies, particularly those with new executive leadership. These advisory boards would provide female CEOs with specialized environmental expertise and institutional support for major environmental initiatives. The advisory structure would address the technical resource constraints that may contribute to underperformance in environmental dimensions while preserving CEO autonomy in strategic decision-making.

Compensation committees should develop specific environmental performance metrics that are weighted appropriately in CEO compensation packages. These metrics should include both short-term environmental process improvements and long-term environmental outcome measures. The incentive structure should provide additional support and resources for environmental initiatives during CEO transition periods, recognizing that environmental improvements often require substantial upfront investments with longer payback periods.

5.3.2. Governance enhancement support systems

Professional associations and business schools should establish governance transition programs specifically designed for female CEOs entering large public companies. These programs should address the institutional challenges identified in our analysis, including power structure navigation, shareholder engagement strategies, and board relationship management. The curriculum should emphasize practical governance skills while building on the collaborative leadership strengths that female CEOs demonstrate in social dimensions.

Securities regulators should facilitate mentorship networks connecting newly appointed female CEOs with experienced governance professionals and former executives who have successfully implemented governance improvements. These networks would provide institutional knowledge and political capital that can help female CEOs overcome the governance performance challenges identified in our empirical analysis.

Corporate boards should establish dedicated governance improvement budgets and professional support teams for CEO transitions. These resources should include specialized legal counsel, governance consultants, and change management professionals who can help implement governance improvements without requiring female CEOs to invest their limited political capital in internal restructuring during their early tenure.

5.3.3. Leveraging social performance strengths

Companies with female CEOs should systematically institutionalize their social performance advantages through formal stakeholder engagement processes and community partnership structures. These mechanisms would preserve and extend the social performance benefits identified in our analysis while creating organizational capabilities that persist beyond individual CEO tenure.

Regulatory bodies should develop enhanced social impact reporting requirements that allow companies to demonstrate their social performance achievements more effectively. These reporting mechanisms would enable female CEOs to showcase their stakeholder orientation strengths while creating accountability structures that encourage continued social performance excellence.

5.3.4. Integrated ESG performance optimization

Business schools and executive education providers should develop integrated ESG leadership programs that address all three components while recognizing gender-specific strengths and challenges. These programs should help female CEOs leverage their social performance advantages while building capabilities in environmental and governance dimensions.

Corporate boards should implement ESG resource allocation frameworks that ensure balanced attention across all three components while allowing CEOs to build on their natural strengths. These frameworks should include specific checkpoints and resource commitments for environmental and governance initiatives when companies have strong social performance.

Industry associations should develop sector-specific ESG leadership support programs that address the unique environmental and governance challenges in their industries. These programs should provide female CEOs with industry-specific knowledge and peer networks that can accelerate learning and implementation in areas where they may have less initial expertise.

5.3.5. Measurement and accountability systems

Regulators should require component-specific ESG reporting that provides transparency into environmental, social, and governance performance separately. This reporting approach would enable stakeholders to understand the nuanced performance patterns identified in our research while creating appropriate accountability mechanisms for each ESG dimension.

Institutional investors should develop investment frameworks that recognize the component-specific nature of ESG performance under different leadership characteristics. These frameworks should incorporate longer-term performance measurement that allows female CEOs adequate time to address environmental and governance improvements while maintaining their social performance advantages.

These policy recommendations provide concrete mechanisms for addressing the systematic performance patterns identified in our empirical analysis. The recommendations recognize that female CEOs bring distinctive strengths to corporate leadership while acknowledging areas where additional support and resources can optimize overall ESG performance. Implementation of these mechanisms would enable organizations to capture the full benefits of gender diversity in corporate leadership while ensuring comprehensive sustainability performance across all ESG dimensions.

5.4. Limitations and future research agenda

While this investigation provides valuable insights about the relationship between CEO gender and ESG component performance, several limitations create opportunities for future research that can advance understanding of gender diversity in corporate leadership and sustainability performance.

The study focuses on S&P 500 companies over 2022-2023, which may limit generalizability to smaller companies, international markets, or different time periods. The analysis includes 36 female CEOs, reflecting current underrepresentation in corporate leadership while providing adequate statistical power. Future research should examine whether these findings extend across company sizes, ownership structures, and geographic contexts.

Future research should systematically examine gender-ESG relationships across different national contexts, regulatory environments, and cultural settings. Comparative studies investigating emerging markets, European contexts with different corporate governance structures, and Asian markets with distinct stakeholder capitalism models would provide crucial insights into the theoretical framework. Research should particularly explore how varying ESG disclosure requirements and sustainability mandates across jurisdictions interact with leadership characteristics.

Critical research gaps exist in understanding how gender intersects with race, ethnicity, and age to influence ESG outcomes. Future studies should examine whether women of color in CEO positions demonstrate different ESG performance patterns compared to white female CEOs, and how generational cohorts interact with gender to influence sustainability priorities. Research should also investigate how educational background and functional experience intersect with gender to affect ESG component performance.

Longitudinal research should examine how the gender-ESG relationship evolves over CEO tenure, investigating whether female CEOs demonstrate convergence toward male performance patterns as organizational legitimacy strengthens. Succession studies examining ESG transitions when companies change from male to female leadership could provide stronger causal evidence while controlling for firm-specific characteristics.

Research should systematically examine how board composition, ownership structure, and governance mechanisms moderate the gender-ESG relationship. Studies should investigate whether diverse boards provide support systems enabling female CEOs to overcome resource constraints in environmental and governance dimensions, and how institutional investor presence affects these dynamics.

Sector-specific studies should examine how industry characteristics moderate gender effects, particularly focusing on traditionally male-dominated industries versus female-friendly sectors. Research extending beyond large public companies to small and medium enterprises could provide insights into whether observed patterns reflect resource availability or fundamental leadership differences.

Future research should examine relationship robustness across different ESG rating providers and develop stronger identification strategies using instrumental variables or natural experiments. Studies should investigate specific ESG practices rather than aggregate scores and explore stakeholder responses to gender-specific ESG patterns.

Studies examining emerging markets have revealed different patterns compared to developed market contexts, with research from Asian and Latin American markets suggesting that institutional environments and cultural factors significantly moderate the relationship between CEO gender and sustainability performance [54]. These emerging market studies indicate that female CEOs may face different resource constraints and stakeholder expectations, with some evidence suggesting stronger environmental performance effects in markets with less developed ESG infrastructure but weaker governance effects in contexts with different corporate governance traditions [55]. The conflicting findings across geographic contexts, combined with mixed results from recent meta-analyses that show positive, negative, and null effects depending on ESG measurement approaches and sample characteristics, underscore the importance of component-specific analysis and methodological rigor in examining these relationships [56]. Our study addresses these gaps by employing a comprehensive analytical framework that examines ESG components separately rather than relying on aggregate measures, utilizes robust control variables and matching approaches to address selection concerns identified in recent methodological critiques, and focuses on a specific institutional context where stakeholder pressures and governance structures are relatively homogeneous, thereby reducing the confounding effects that may explain the conflicting results across previous studies with more heterogeneous samples.

These research directions provide a comprehensive agenda for advancing the understanding of gender diversity in corporate leadership and organizational sustainability. The integration of these research streams will contribute to more inclusive and effective approaches to corporate governance and stakeholder capitalism while addressing the complex interactions between leadership characteristics and sustainability performance across diverse organizational and institutional contexts.

6. Conclusion

This study provides novel insights into the relationship between CEO gender and ESG component performance among S&P 500 companies, revealing that the impact of female leadership on corporate sustainability varies significantly across different ESG dimensions. The findings of this study demonstrate that female chief executive officers significantly outperform their male counterparts in social ESG metrics while underperforming in environmental and governance dimensions. This results in no significant difference in overall ESG scores. The findings of this study lend support to the theoretical framework that has been developed by the authors, which combines upper echelon theory, stakeholder theory, agency theory, and resource-based view. The results suggest that gender-based differences in leadership styles, risk preferences, and resource allocation priorities translate into systematic variations in corporate sustainability practices. The component-specific nature of these effects underscores the necessity for disaggregated analysis in comprehending the intricate relationship between leadership characteristics and organizational outcomes. This is of considerable significance for corporate governance practices, investment decision-making, and policy development in the evolving landscape of corporate sustainability and stakeholder capitalism.

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