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Article

How Much Does the Board Composition Matter? The Impact of Board Gender Diversity on CEO Compensation

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Abstract: The notion that female directors are better disposed to protect shareholders' interests has brought boardroom gender diversity into the limelight. Echoing these emerging trends, this paper analyzes the relationship between board gender diversity, i.e., proportion of female directors on the corporate board, and Chief Executive Officer's (CEO) compensation. Consistent with conjecture, the analysis suggests that large and diversified corporate boards are the main determinants of CEO compensation. Furthermore, longer-tenured CEOs who also serve as board chairperson receive higher total compensation and bonuses than their counterparts do. Into the bargain are corporate performance proxied by return of assets (ROA) and firm attributes, i.e., firm size and institutional ownership, which have divergent but direct implications for CEO compensation.

Keywords: board composition; board gender diversity; CEO compensation; FTSE350; UK



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1. Introduction

Chief Executive Officer (CEO) compensation is a topical yet controversial issue [1–4]. Despite the widespread civic attention and rigorous academic inquiry, the nexus between executive compensation, governance mechanisms, and corporate outcomes remains unraveled. Contemporaneously, the remarkable increase in executive compensation has brought the CEO compensation thesis under intense scrutiny by various stakeholders. Mounting pressure from academic work/research, which is supplemented by the mainstream media, has resulted in civic pressure on the corporate elite as well as on the regulators to curb the unprecedented trends in executive compensation. Consequently, regulatory agencies around the world have either introduced new regulations or have amended the existing ones to tackle the issue of executive compensation. The "Binding Say-on-Pay" in Switzerland [5] and the "say-on-pay" rule in the UK and the USA [6] are some of the notable examples.

Despite the regulatory initiatives, the ratio of CEO compensation to the average salary of employees in the UK, Germany, Canada, and Japan, is 84, 147, 204, and 67 times, respectively (see also ref. [7]). In this vein, ref. [8] notes that CEOs' salaries are 350 times more than workers' salaries in the US, where CEOs' total pay exceeds USD 7000 per hour, compared to an average of USD 20 per hour for ordinary workers. Ref. [9] further notes that CEO compensation has risen 940 per cent since 1978, whereas the typical worker/employee has received a 12 per cent salary increase during the same period.

Due to the separation of ownership and control, agents' interests must be aligned with those of the shareholders to mitigate the principal–agent problem. This is particularly the case for publicly traded companies as the alleviation of the agency problem in public listed companies has been the focal point of discussion [10,11]. Executive compensation is an integral part of the agency contract. The contract must be structured, agreed, and executed in a fashion that incentivizes and encourages agents to work in the best interests of the principal, i.e., shareholders' wealth maximization. To safeguard their economic and other interests, shareholders erect controlling mechanisms in the form of a corporate board who accepts the responsibility to be a vigilant monitor of agents' actions. Corporate governance

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scandals such as Enron and WorldCom in the USA and the deceitful bankruptcy of Italian Parmalat, along with the recent financial crises, have all resulted in increased calls for a vigilant corporate board.

An emerging literature stream scrutinizes the relationship between corporate governance features and CEO compensation (see ref. [8], among others). Particularly, board attributes such as board size and board gender diversity, i.e., proportion of female directors on the board, are considered important determinants of CEO compensation. The main thesis in these studies rests upon the notion that boards of directors are responsible to set the economic rewards in the form of compensation packages for managers such as the CEO. Therefore, board composition including its construct, i.e., independence and composition in terms of diversity, have direct implications for agency costs and CEO compensation is a main element of such costs.

Sustainability literature points to the significance of boardroom gender diversity for sustainable organic growth. Ref. [12], for instance, observes that European firms with a higher fraction of female directors on their corporate boards submit superior ESG (environmental, social, and governance) performance relative to their counterparts. The study further concludes that board gender diversity positively relates with sustainability disclosure, improves best management practices, and enhances stakeholders' trust, which translates into higher firm valuation.

Others, such as ref. [13], warn that CEOs endeavor to circumvent board control in an effort to maximize their financial rewards, i.e., pay. These arguments allude the notion that corporate board composition and construct have direct bearing for agency costs. Against this backdrop, this study analyzes how corporate boards' delegation mechanisms affect CEO compensation.

Given the contractual significance, boards tend to link CEO compensation with firm performance whereas CEOs strive to strike this condition down. Earlier research, e.g., refs. [8,11], note that CEOs have the tendency to lure higher economic benefits for themselves when firms perform better relative to the market. This is a natural phenomenon, which is at the core of agency theory and largely referred to as the principal–agent problem [11].

Prior research, informed by the resource dependence theorem, recognizes the significance of human capital in gaining and sustaining a competitive advantage in today's knowledge-intensive era [7] and further argues that companies must strive to attract talented individuals, especially those who are at the core of corporate upper echelons, including executives and top managers such as CEOs, by offering attractive economic benefits. Other research warns that top managers with powerful organizational positions, e.g., longer-tenured dual-CEOs, directly affect agency costs [14]. Correspondingly, the study considers the impact of CEO traits on CEO compensation.

Factors such as shareholder activism, recognition of female directors as effective leaders, i.e., phenomenon of glass-ceiling, calls to increase women's representation on corporate boards, and changes in regulations to maintain one-third board-gender-diversity, highlight the significance of this topic and its timeliness for an empirical investigation.

Furthermore, due to the separation of ownership and control, shareholders, especially minority shareholders (relative to institutional- and block-shareholders), demand diversified boards both in terms of gender and skillset diversity. Corporate boards dominated by outside directors while maintaining higher gender diversity have strong bearing from the market. Board diversity sends positive signals to the market: higher board gender diversity and independence enhances market confidence. Since minority shareholders are not involved in the day-to-day functioning of the companies, they perceive outside directors as custodians of their interests. Such directors would equally ensure that an independent and diversified board of directors would ensure that the agents work in the best interest of the shareholders and do not exploit firm resources for personal benefit, thereby reducing agency costs such as CEO compensation.

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Against this backdrop, the main purpose of this paper is to empirically investigate the effects of board gender diversity on CEO compensation. This test is particularly important for publicly listed firms in which there is a clearer separation of ownership and control, thus the tendency of principal–agent problem is higher in such firms, as narrated by agency theory [15].

In essence, this study provides additional insights with respect to the determinants of CEO compensation by addressing the following questions. First, to what extent does the corporate board attributes influence CEO compensation? Second, is corporate performance a determinant of CEO compensation? Third, to what extent do CEO traits affect their compensation related to corporate performance? Fourth, to what extent is CEO compensation explained by the firm-related attributes?

To address the above-extended questions, the study exploits a unique hand-built dataset, which is drawn from various sources such as corporate reports, annual reports, bulletins, company websites, executive/personal websites, corporate archives, and other publicly available sources such as newspapers, etc., belonging to 297 FTSE350 constituent firms, for the period 2011–2019. Additionally, the study supplements, compares, and contrasts the collected data with other datasets such as Bloomberg and DataStream to confirm the data accuracy.

The analysis suggests that large and diversified corporate boards have direct implications for agency costs proxied by CEO pay package. The analysis further suggests that longer-tenured CEOs who also serve as a board chairperson receive higher total compensation and bonuses. Into the bargain, corporate performance is proxied by return of assets (ROA) and firm attributes, i.e., firm size and institutional ownership, which have divergent but direct implications for CEO compensation. These insights have direct bearing for a variety of stakeholders operating in financial markets, regulatory agencies, and/or the academic sphere, both in the UK and beyond.

2. Research Hypotheses

2.1. Pay for Performacne

Much of the empirical research links agents' economic rewards to corporate performance outcomes, i.e., the pay-for-performance theorem [3,15]. However, the existing empirical studies have reported mixed results on the phenomenon [10]. Ref. [14] notes a positive link between corporate performance outcomes and CEO pay, whereas ref. [16] denies such association. As a result, the debate on the matter remains lively.

The mixed results can be explained by the fact that the aforementioned studies used different datasets, took samples from different countries, varying time periods, sectors/companies, used different firm performance proxies, and operationalized compensation differently. While a large portion of the existing literature considers one aspect, i.e., CEO total compensation, this study departs from this narrow focus to include segregated elements of CEO compensation: salary and bonus awards to tease out the extent to which corporate performance outcomes explain agency costs. More formally, the study extends following hypotheses:

Hypothesis 1 (H1). *Corporate performance outcomes explain CEOs' total compensation.*

Hypothesis 1.1 (H1.1). Corporate performance outcomes explain CEOs' salary-based compensation.

Hypothesis 1.2 (H1.2). Corporate performance outcomes explain CEOs' bonus-based compensation.

2.2. Board Attributes and CEO Compensation

2.2.1. Board Diversity

Board gender diversity, i.e., proportion of female board of directors to the total board size, is considered an important dethronement in scheming agents, i.e., CEOs' compensation. Despite the calls for higher female representation at the board-level, the actual

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proportion of female directors remains low. Ref. [6] notes that nearly 5% of Fortune 500 companies still have no female directors on the board, while nearly 30% of companies have only one female director.

Recognizing the significance of female directors' contributions in corporate decision-making, ref. [2] notes that the presence of female directors helps the board to make better decisions when dealing with complex issues. The authors further add that gender diversity improves corporate governance and firm performance. Ref. [1] further contends that gender differences influence corporate strategic choices in which female directors tend to get more involved with corporate decision-making processes than their male counterparts do. Female directors thus are more vigilant in supervising and monitoring the actions of agents such as CEOs [1].

Ref. [17], for instance, notes that female directors can motivate the board to consider a wider range of issues and potential solutions, including decisions about CEO compensation. Considering their exposure to the social environment, female directors are likely to determine CEO compensation based on the social and communal aspects. They may strive to influence the board of directors and consider these standards when setting CEO compensation.

A review of the existing literature suggests that gender diversity has direct implications for CEO salary levels and the factors considered by the board to determine salary, such as CEOs' personal and professional traits, i.e., education, experience, etc. Diversified boards consider firm performance when setting CEO compensation, including performance-based bonuses or equity options. Accordingly, the study expects board diversity to have a negative effect on CEO compensation.

Hypothesis 2 (H2). *Board diversity reduces CEOs' total compensation.*

Hypothesis 2.1 (H2.1). *Board diversity reduces CEOs' salary-based compensation.*

Hypothesis 2.2 (H2.2). Board diversity reduces CEOs' bonus-based compensation.

2.2.2. Board Size

Board size is one of the most commonly used corporate governance attributes in prior studies. From a resource dependency perspective, it is argued that a larger board is able to control and advise the agent on divergent matters relating to corporate strategic preferences and outcomes. The counter argument is that larger boards reduce efficiency in decision making and are thus detrimental for corporate strategies and outcomes. Given the nature of these arguments and consistent with the earlier empirical studies conducted in the context of the UK [8], this alludes that larger corporate boards are detrimental for agency costs. Put more formally:

Hypothesis 3 (H3). *Large corporate boards increase CEOs' total compensation.*

Hypothesis 3.1 (H3.1). Large corporate boards increase CEOs' salary-based compensation.

Hypothesis 3.3 (H3.2). *Large corporate boards increase CEOs' bonus-based compensation.*

2.2.3. Board Independence

Closely related to the debate above are two additional board attributes, namely, board independence and frequency of board meetings.

Board independence that is the proportion of non-executive directors (NED-ratio) is an important pillar of publicly traded companies [7]. The proxy is used to monitor the agents' actions to reduce agency costs. Non-executive directors, being outsiders, would bring a set of talents which are essential to run the company in the best interests of the shareholders. Being outsiders, these directors are expected to play a vital role in structuring

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a fair compensation package for the CEO. Therefore, NED-ratio is expected to relate positively with CEO compensation:

Hypothesis 4 (H4). Corporate boards dominated by outside directors increase CEOs' total compensation.

Hypothesis 4.1 (H4.1). Corporate boards dominated by outside directors increase CEOs' salary-based compensation.

Hypothesis 4.2 (H4.2). Corporate boards dominated by outside directors increase CEOs' bonusbased compensation.

2.2.4. Board Meeting Frequency

The monitoring role of corporate boards is enhanced in public listed companies, and has direct implications on the demand for time and effeteness of the board. Board meeting frequency, i.e., number of board meetings during a fiscal year, is an important aspect for effective monitoring by the board. A higher frequency of board meetings allows the board of directors greater opportunity to receive feedback and discuss corporate affairs in a timely manner. Linking this to CEO compensation, frequent board meetings allow sufficient room for discussion and agreement on remuneration packages for the executives. Therefore, frequency of bard meetings is expected to relate positively with CEO compensation proxies:

Hypothesis 5 (H5). Frequency of board meetings increases CEOs' total compensation.

Hypothesis 5.1 (H5.1). Frequency of board meetings increases CEOs' salary-based compensation.

Hypothesis 5.2 (H5.2). Frequency of board meetings increases CEOs' bonus-based compensation.

2.3. CEO Traits and CEO Compensation

2.3.1. CEO Role Duality

CEO role duality is when the CEO also assumes the role of a board's chair. From an agency perspective, absolute power, in the form of role duality, bestowed upon the incumbent CEO would lead to principal–agent problem [10,15]. Proponents of the management power theory further reason that a powerful CEO would have direct sway on the functioning and decision-making mandate of the corporate board [16]. Arguably, power CEO, i.e., when a CEO takes direct control of the boardroom agenda, would result in higher agency cost. More formally:

Hypothesis 6 (H6). CEO role duality increases CEOs' total compensation.

Hypothesis 6.1 (H6.1). CEO role duality increases CEOs' salary-based compensation.

Hypothesis 6.2 (H6.2). CEO role duality increases CEOs' bonus-based compensation.

2.3.2. CEO Tenure

Closely linked to role duality is CEO tenure: number of years since the CEO assumed the current role. The arguments are based on the notion that longer-tenured CEOs gain internal knowledge of the organization and tend to capitalize on their tenure and corporate knowledge to affect the corporate board and tend to strive for higher financial rewards [10]. Accordingly, the study tests the following hypotheses:

Hypothesis 7 (H7). *Longer-tenured CEOs get higher total compensation.*

Hypothesis 7.1 (H7.1). Longer-tenured CEOs get higher salary-based compensation.

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Hypothesis 7.2 (H7.2). Longer-tenured CEOs get higher bonus-based compensation.

2.3.3. Executive Diversity

In recent years, the increase in the number of female executives has led to some literature showing that gender plays an important role in CEO compensation. These research works suggest that the existence of female executives among company executives reduces the degree of manipulation of financial reports. Other researchers believe that women are more risk-averse and more likely to abide by codes of ethics. Ref. [18] shows evidence that companies with a higher proportion of female executives have lower agency costs. They further argue that in less competitive markets, firms with weak external governance mechanisms can potentially benefit from the higher proportion of female executives. The literature establishes the significance of executive diversity as a potential determinant for corporate decision-making. Consequently, executive diversification is included in the analysis, linked with the following hypotheses:

Hypothesis H8 (H8). *Executive diversity explains CEOs' total compensation.*

Hypothesis 8.1 (H8.1). *Executive diversity explains CEOs' salary-based compensation.*

Hypothesis 8.2 (H8.2). *Executive diversity explains CEOs' bonus-based compensation.*

2.4. Firm Characteristics and CEO Compensation

2.4.1. Firm Size and Leverage

The relationship between firm size and CEO compensation have long been tested. Ref. [19], for instance, argues that in controlled organization the size of the company can predict the total salary, bonus, and basic salary of CEOs; thus, firm size is an important determinant of CEO compensation. Firm complexity increases as the company grows in size; therefore, large and complex organizations require executives with higher expertise to manage their complex business structures and operations.

Recent studies show that firm size has a strong influence on CEO compensation. Others contend that changes in CEO compensation largely depends on firm size in which large-sized companies pay higher compensation, especially in cash bonuses. Likewise, ref. [20] submits that cash compensation and equity-based compensation are positively related with firm size.

The literature agrees that large and complex firms tend to pay higher CEO compensation. Arguably, CEOs may demand higher compensation to manage large and complex organizations. Accordingly, the study extends the following hypotheses:

Hypothesis H9 (H9). CEOs' total compensation is high in large firms.

Hypothesis 9.1 (H9.1). CEOs' salary-based compensation is high in large firms.

Hypothesis 9.2 (H9.2). *CEOs' bonus-based compensation is high in large firms.*

For firm leverage, the study expects an inverse relationship. More formally:

Hypothesis H10 (H10). *Firm leverage reduces CEOs' total compensation.*

Hypothesis 10.1 (H10.1). *Firm leverage reduces CEOs' salary-based compensation.*

Hypothesis 10.2 (H10.2). *Firm leverage reduces CEOs' bonus-based compensation.*

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2.4.2. Institutional Ownership

Institutional ownership is another key determinant of CEO compensation. Recent research notes that centralized ownership is for institutional owners to better supervise executive compensation, and with the increasing concentration of institutional ownership, institutional investors use their influence to determine CEO incentives. Research notes that firms with more concentrated institutional ownership, however, negotiate lower CEO salaries, options, and total compensation. However, they find a significant negative relationship between State ownership and CEO compensation. Similarly, ref. [19] reports that the total compensation of family member CEOs of family holding companies is lower than that of external CEOs.

On the other hand, ref. [10] argues that the lower the institutional ownership, the greater the power of the CEO. Greater CEO power will affect boards' decisions on CEO compensation. However, if the institutional shareholders dominate the firms, CEO compensation is relatively reduced. Based on this discussion, the study argues that listed companies dominated by institutional shareholders as the major or black shareholders tend to negotiate lower compensation for CEOs compared to their counterparts.

Hypothesis H11 (H11). *Institutional ownership reduces CEOs' total compensation.*

Hypothesis 11.1 (H11.1). *Institutional ownership reduces CEOs' salary-based compensation.*

Hypothesis 11.2 (H11.2). *Institutional ownership reduces CEOs' bonus-based compensation.*

2.4.3. Firm Risk (Beta) and Current Ratio

CEO compensation can largely be attributed to firm risk or beta. Ref. [15] reports a negative relationship between firm beta and CEO compensation, however, the study did not find a significant relationship between risk and variable pay. Likewise, ref. [4] posits that high-risk firms tend to pay higher CEO compensation given the complex nature of their business. Taken together, firm beta is predicted to relate positively with CEO compensation.

Hypothesis H12 (H12). Firm risk (beta) increases CEOs' total compensation.

Hypothesis 12.1 (H12.1). *Firm risk (beta) increases CEOs' salary-based compensation.*

Hypothesis 12.2 (H12.2). Firm risk (beta) increases CEOs' bonus-based compensation.

Current ratio is yet another important aspect with the potential to influence CEO compensation. Since current ratio suggests a company's ability to pay its short-term debt, usually payable with a year, the CEO would strive to maintain such short-term liabilities.

Hypothesis H13 (H13). *Current ratio decreases CEOs' total compensation.*

Hypothesis 13.1 (H13.1). *Current ratio decreases CEOs' salary-based compensation.*

Hypothesis 13.2 (H13.2). *Current ratio decreases CEOs' bonus-based compensation.*

3. Research Data

3.1. Data and Sampling

To account for the technological developments, improvement of management capabilities, and the improvement and change of laws and regulations in the past decade, the study intends to use longitudinal data, including latest available observations. With those motives in mind, the sampling and data collection exercise began by identifying the firms listed on the London Stock Exchange (LSE). Further search narrowed these down to non-financial firms. Financial firms are excluded as they follow different reporting mechanisms and the

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nature of their business. The sample was further trimmed down by removing firms with incomplete or insufficient data. The final sample consists of 117 firms for the 2011–2019 period. Data on corporate governance, i.e., board attributes and CEO traits, was obtained from 953 annual reports. This is supplemented by financial data collected from various sources including Bloomberg, DataStream, corporate archives, and other publicly available sources, while verifying the hand-collected data on governance attributes.

3.2. Dependent Variables

As discussed previously, the study uses three different proxy measures: CEO total compensation, CEO salary, and CEO bonuses, to account for agency costs paid to top managers such as the CEOs in the sample firms.

3.3. Independent Variables

Four sets of independent variables are used. First, firm performance, measured by return of assets (ROA) and Tobin's Q (TQ), which is consistent with the existing literature in measuring corporate performance. However, the study includes Tobin's Q (the Q-ratio) as an alternative measure for further analysis (results are reported in Section 4.5). Second, board attributes including board diversity, board size, board independence, and board meeting frequency. Third, CEO traits including CEO role duality, CEO tenure, and executive diversity. Furthermore, firm control variables included in the analysis include firm size, leverage, institutional ownership, firm risk (beta), and current ratio, i.e., the variance of a firm's stock price relative to its market portfolio, and institutional ownership (proportion of outstanding shares held by institutional investors). Variable definitions along with their operationalization are provided in Table 1.

Table 1. Summary of operationalization of the variables and descriptive statistics.

Panel A	P	Panel B: Descriptive Stats									
Variable Name	Operationalization	Acronym	Mean	Std. Dev.	Min.	Max.					
Dependent variables											
CEO compensation:											
CEO total compensation	Log of total CEO compensation	CEOComp.	15.09	0.79	12.89	17.21					
CEO salary-based compensation	Log of total CEO salary	CEOSal.	13.67	0.37	12.83	14.67					
CEO bonus-based compensation	Log of total CEO bonuses	CEOBon.	13.74	1.13	11.05	15.67					
Independent variables											
Corporate performance:											
Return on assets	Net income available to stockholder/average total assets	ROA	6.45	7.26	-8.83	31.97					
Tobin's Q	Market value of equity + book value of liabilities/book value of assets	Q-ratio	2.56	7.08	0.82	53.04					
Board attributes:											
Board gender diversity	Ratio of women on the board to total board size	Board diversity	22.96	9.84	0	45.45					
Board size	Total directors on the corporate board	Board size	10.72	2.319	6	17					
Board independence	Ratio of non-executive directors (NEDs) to total board size	NED-ratio	67.21	11.83	41.67	86.67					
Board meeting frequency	Total number of board meeting during a fiscal year	BMF	8.59	3.01	4	21					

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Table 1. Cont.

Panel A	A: Operationalization of Variables	P	Panel B: Descriptive Stats										
Variable Name	Operationalization	Acronym	Mean	Std. Dev.	Min.	Max.							
CEO traits:													
CEO role duality	A dummy variable equals 1 if the CEO chairs the board, and zero otherwise	CEO duality	0.01	0.01	0	0							
CEO tenure	Total number of years as CEO	CEO tenure	5.21	4.759	0.17	27							
Executive diversity	Ratio of women in executive positions in the firm	Exe. diversity	12.34	12.69	0	50							
Firm specific attributes:													
Firm size	Log of total short- and long-term assets	Firm size	9.74	1.91	5.74	14.26							
Firm leverage	Debt to equity ratio	Leverage	1.58	1.04	0.28	4.21							
Institutional ownership	Proportion of outstanding shares held by institutions to total outstanding shares	Inst. ownership	91.23	21.44	41.13	138.19							
Firm beta	Variance of a firm's stock price relative to its market portfolio	Beta (risk)	1.09	5.04	-12.01	16.35							
Current ratio	Ratio of current assets to current liabilities	Cur-ratio	1.56	1.87	0.41	4.36							

4. Analysis and Results

4.1. Descriptive Statistics

The average values of CEO compensation proxies have the following values 15.01, 13.67, and 13.74 as illustrated in Table 1. The min. and max. values of -8.83 and 31.97 with an average value of 6.45 show the firm profitability trends measured by ROA, whereas the average Q-ratio of 2.56 illustrates the average market value of the sampled firms during the study period.

Turning to the board attributes, it can be seen that the female board of directors represent one-fourth of the corporate boards included in our sample, whereas the average corporate board size is approximately 10, represented by 67% outside directors. On average, the sampled board have had 9 meetings during the fiscal year. As for the CEO attributes, only a fraction of the sample have powerful CEOs and the average CEO-tenure is approximately 5 years. Diversity at the executive level is relatively low, at 12.34, compared to female representation at the board level. Firm attributes have the following means values, 9.74, 1.58, 91.23, 1.09, and 1.56, illustrating the general trends during the study period. The correlation matrix presented in Table 2 along with the VIF scores show no concerns of multicollinearity.

Table 2. Correlation matrix.

	VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1. CEOComp.		1.00															
2. CEOSal.		0.4793															
CEOBon.		0.3873	0.2776														
4. ROA	1.4	0.0263	-0.2173	-0.0984													
5. Q-ratio	1.9	-0.0188	0.0008	-0.0095	-0.0406												
6. Board diversity	1.1	0.2394	0.3204	0.1699	0.0583	-0.0055											
7. Board size	2.4	0.3694	0.4714	0.263	-0.2382	-0.0316	0.0789										
8. NED-ratio	1.7	-0.0285	0.0253	-0.0271	-0.0391	-0.0096	0.0082	-0.0565									
9. BMF	1.6	0.0134	0.0085	0.0331	-0.0017	-0.0474	0.0379	0.0541	0.1253								
10. CEO duality	1.8	0.0274	-0.0072	0.0566	-0.0237	-0.0087	-0.0694	0.0059	-0.0257	0.001							
11. CEO tenure	2.1	0.1342	-0.1545	0.0682	0.1139	-0.0236	0.0127	0.0876	-0.0131	-0.0002	0.0337						
12. Exe. diversity	1.9	0.0979	0.202	0.0508	-0.0215	-0.0357	0.3768	0.0487	-0.0137	-0.0126	0.0346	-0.1742					
13. Firm size	1.2	0.4086	0.4172	0.2825	-0.443	-0.0048	0.2062	0.3458	-0.0286	0.0282	-0.0475	-0.1313	0.1534				
14. Leverage	1.3	-0.0265	-0.0075	0.0237	0.0222	-0.0039	0.0397	0.0009	0.0461	0.2572	-0.0507	-0.0112	0.0043	0.0252			
15. Inst. ownership	1.3	-0.2832	-0.2962	-0.161	0.0174	0.0399	-0.146	-0.3797	0.0309	-0.0093	0.0187	-0.1402	-0.011	-0.3445	-0.0292		
16. Beta (risk)	1.1	0.0453	0.087	0.0332	-0.0636	0.0138	-0.0882	0.0616	-0.0136	0.0123	0.0286	-0.0331	0.0654	0.0876	-0.003	0.0214	
17. Cur-ratio	1.3	0.0233	-0.0052	0.0249	-0.0552	-0.048	0.0264	0.0354	-0.2216	-0.1076	0.0232	0.014	-0.0052	0.0239	-0.2454	-0.0227	0.0812

Notes: See Table 1 for variables' definitions. Variables significant at p < 0.05 and p < 0.01 are in bold.

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4.2. Econometric Modelling

The study uses various versions of Equation (1) to analyze the determinants of CEO compensation. Moreover, robustness tests based on generalized method of moments (GMM) produced similar results, confirming the econometric choice (results are available upon request). Econometrically, Equation (1) is as below:

CEO compensation = $\alpha + \beta_1$ firm performacne + β_2 board attributes + β_3 CEO traits + γ firm attributes + ε (1)

where CEO compensation has three proxy measures for total CEO compensation, salary, and bonuses. Firm performance is measured using ROA and Q-ratio. Board attributes include board diversity, size, independence, and frequency of board meeting. CEO traits include role duality, tenure, and executive diversity. Firm-specific attributes include firm size, leverage, institutional ownership, firm beta, and current ratio. Lastly, ε is the error term, α is the constant, and β and γ are the vectors of coefficient estimates.

4.3. Determinants of Total CEO Compensation

The analysis starts with examining the determinants of total CEO compensation. Results are reported in Table 3. Results for Model 1 are extracted using Equation (1). As can be seen in column two of Table 3, there is a significant positive relationship between ROA and total compensation. The statistically significant positive relationship at the 1% level across models suggests that firm profitability, i.e., ROA, is a key determinant of total CEO compensation. Thus, hypothesis H1 is accepted.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
			Middel (3)	Middel (4)	Wiodei (5)	Wiodei (6)	Wiodei (7)	Wiouei (6)
ROA	0.0252 ***	0.0218 ***	0.0231 ***	0.0231 ***	0.0230 ***	0.0231 ***	0.0235 ***	0.0236 ***
Board diversity		0.0116 ***	0.0135 ***	0.00810**	0.00813**	0.00811 **	0.00278 **	0.00351 **
Board size		0.0482 ***	0.0404 **	0.0289	0.0291	0.0290	-0.0104	-0.0380
NED-ratio		-0.000617	0.000665	0.000586	0.000603	0.000558	0.000695	-0.00413
BMF		-0.0198	-0.0695	-0.0691	-0.0682	-0.0671	-0.0735	-0.0757
CEO duality			0.723 ***	0.720 ***	1.493	2.637 ***	2.647 ***	2.633 ***
CEO tenure			0.00397	0.00362	0.00362	0.00384	-0.0617	-0.0642
Exe. diversity			1.674 *	1.655 *	1.651 *	1.654 *	1.589 *	1.579 *
Board-diversity ×				0.000513 *	0.000510 *	0.000510 *	0.000972*	0.000888 *
Board-size				0.000313				
Board-size × NED-ratio					-0.0773**	-0.258***	-0.258 ***	-0.260 ***
Board-diversity ×								
Board-size ×						0.00367 *	0.00361 *	0.00379 *
CEO-duality								
Board-size ×							0.00607	0.00632
CEO-tenure							0.00007	0.00032
Board-size ×								
CEO-tenure ×								0.000445*
CEO-duality								
Firm size	0.176 ***	0.124 ***	0.109 ***	0.109 ***	0.109 ***	0.109 ***	0.111 ***	0.111 ***
Leverage	-0.0467	-0.0374	-0.0783*	-0.0797 *	-0.0802*	-0.0794*	-0.0784*	-0.0776*
Inst. ownership	-0.00665 ***	-0.00538 ***	-0.00258	-0.00251	-0.00251	-0.00250	-0.00235	-0.00234
Beta (risk)	0.00278	0.00571	0.00187	0.00171	0.00156	0.00176	0.00275	0.00270
Cur-ratio	0.00286	-0.00140	3.45e - 05	0.000148	0.000264	0.000234	-0.000138	-3.65e-05
Constant	13.90 ***	13.60 ***	13.45 ***	13.57 ***	13.57 ***	13.56 ***	13.97 ***	14.28 ***
Adj. R ²	0.247	0.256	0.239	0.237	0.236	0.238	0.237	0.356
Observations	953	953	953	953	953	953	953	953

Table 3. Determinants of total CEO compensation.

Notes: See Table 1 for variables' definitions. Robust t-statistics in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

Model 2 measures the impact of board attributes on total CEO compensation. The analysis suggests a statistically significant positive relationship at the 1% level between board diversity, board size, and total CEO compensation. Thus, hypotheses H2 and H3 are accepted. However, the statistically weak insignificant results for the board independence, i.e., NED-ratio and board meeting frequency, do not provide enough evidence to support or oppose hypotheses H4 and H5. Model 3 analyzes the impact of CEO traits on total CEO compensation. All CEO traits relate positively with total CEO compensation at the 1% level of statistical significance. Thus, hypotheses H6 and H7 are accepted. Similarly, hypothesis H8 is accepted as executive diversity relates positively with total CEO compensation at the 10%

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level. As for the relationship between firm-specific attributes and total CEO compensation, the analysis suggest that firm size (positively) and institutional ownership (negatively) relate with total CEO compensation. Thus, hypotheses H9 and H11 are accepted. There is not enough statistical support for the remaining hypotheses H10, H12, and H13.

To strengthen the validity of the observed results, further interaction analysis is performed using the Equation (1). Results are reported across Models 4–8. The analysis suggests that large and diversified boards favor total CEO compensation and even so when the board is chaired by the CEO, i.e., CEO role duality. Similarly, large boards chaired by a dual CEO with longer tenure tend to relate positively with total CEO compensation. However, large independent boards have the opposite effect.

4.4. Determinants of CEO Salary-Based Compensation

To determine the determinants of CEO salary-based compensation, the study repeats the analysis reported in Section 4.2. Equation (1) is used with similar set of independent variables and CEO salary as the dependent variable. As can be seen in column two of Table 4, there is a statistically significant positive relationship between ROA and total compensation at the 10% level. However, the results are not consistent across models. Thus, hypothesis H1.1 is accepted with a lesser degree of statistical significance.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
ROA	0.00236 *	0.000185	0.000922	0.000897	0.000901	0.000999
Board diversity		0.00783 ***	0.00955 ***	0.00567 **	0.00566 **	0.00563 **
Board size		0.0233 ***	0.0342 ***	0.0260 *	0.0259 *	0.0258 *
NED-ratio		0.000991	0.00187 **	0.00182 **	0.00181 **	0.00174 *
BMF		0.00751	0.0119	0.0122	0.0118	0.0137
CEO duality			0.459 ***	0.457 ***	0.159	1.981 ***
CEO tenure			-0.0183 ***	-0.0185 ***	-0.0185 ***	-0.0182***
Exe. diversity			0.719 *	0.704 *	0.706 *	0.710 *
Board-diversity ×				0.000368 *	0.000369 *	0.000370 *
board-size				0.000308	0.000309	0.000370
Board-size \times NED-ratio					-0.0298	-0.258
Board-diversity ×						0.00585 ***
Board-size × ČEO-duality						0.00363
Firm size	0.118 ***	0.0900 ***	0.0725 ***	0.0725 ***	0.0726 ***	0.0729 ***
Leverage	-0.00838	-0.00826	-0.00511	-0.00609	-0.00591	-0.00466
Inst. ownership	-0.00220 ***	-0.00162 ***	-0.00146 **	-0.00142*	-0.00142*	-0.00140 *
Beta (risk)	0.00241	0.00434 **	0.00317 *	0.00305	0.00311	0.00342 *
Cur-ratio	-0.00585	-0.00642	-0.00379	-0.00371	-0.00375	-0.00380
Constant	12.74 ***	12.46 ***	12.42 ***	12.51 ***	12.51 ***	12.51 ***
Adj. R ²	0.401	0.451	0.502	0.502	0.501	0.501
Observations	953	953	953	953	953	953

Table 4. Determinants of CEO salary-based compensation.

Notes: See Table 1 for variables' definitions. Robust t-statistics in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

As before, Models 2 measures the impact of board attributes on CEO salary-based compensation. The analysis suggests a statistically significant positive relationship at the 1% level between board diversity, board size, and total CEO compensation. Thus, hypotheses H2.1 and H3.1 are accepted. However, the statistically weak insignificant results for board independence, i.e., NED-ratio and board meeting frequency, do not provide enough evidence to support or oppose hypotheses H4.1 and H5.1.

Similarly, Model 3 analyzes the impact of CEO traits on CEO salary-based compensation. CEO role duality is positive but not statistically significant, thus, there is not enough statistical support to accept or reject hypothesis H6.1. Interestingly, CEO tenure relates negatively with CEO salary-based compensation at the 1% level of statistical significance. Thus, hypothesis H7.1 is rejected. However, hypothesis H8.1 is accepted as executive diversity relates positively with CEO salary-based compensation.

As for the relationship between firm-specific attributes and total CEO compensation, the results are similar to those observed above, except for firm beta which is significant at 5% in the positive direction, thus, hypotheses H9.1, H11.1, and H12.1 are accepted while

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there is not enough statistical support for the remaining hypotheses H10.1 and H13.1. Results of the interaction analysis confirm the earlier argument that large and diversified boards are the main determinant of CEO salary-based compensation, even so when a dual-role CEO leads the board. However, large and independent boards relate negatively with CEO salary-based compensation.

4.5. Determinants of CEO Bonus-Based Compensation

Finally, to determine the determinants of CEO bonus-based compensation, the study repeats the analysis reported in Section 4.2. Equation (1) is used with similar set independent variables and CEO bonuses as the dependent variable. As can be seen in column two of Table 5, there is no statistically significant relationship between ROA and CEO bonus-based compensation, therefore, there is not enough support to accept or reject hypothesis H1.2.

	Tá	ab	le	5.	Ι)e	te	rn	ni	na	ar	nt	s	0	f (Cl	EC)	bc	n	u	s-	b	as	se	d	. (O	m	р	en	ıs	sa	tio	or	١.	
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	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
ROA	-0.00442	-0.00852	-0.00953	-0.00963	-0.00965	-0.00996
Board diversity		0.0129 ***	0.0101 *	0.00302 *	0.00296 *	0.00262 *
Board size		0.0643 ***	0.0566 **	0.0281 *	0.0287 *	0.0290 *
NED-ratio		-0.00253	-0.00178	-0.00201	-0.00196	-0.00217
BMF		0.0133	0.0254	0.0276	0.0306	0.0338
CEO duality			1.354 ***	1.348 ***	3.662	8.840 ***
CEO tenure			-0.0264 **	-0.0278 **	-0.0278 **	-0.0260 *
Exe. diversity			-0.802	-0.828	-0.838	-0.829
Board-diversity ×				0.00125 *	0.00124 *	0.00122 *
board-size				0.00123	0.00124	0.00122
Board-size \times NED-ratio					-0.231 *	-1.037 ***
Board-diversity ×						0.0164 ***
Board-size × CEO-duality						0.0104
Firm size	0.144 ***	0.0738 **	0.0718	0.0716	0.0714	0.0717
Leverage	0.0149	0.0262	-0.0238	-0.0280	-0.0297	-0.0247
Inst. ownership	-0.00403 ***	-0.00255 *	0.00253	0.00266	0.00266	0.00272
Beta (risk)	-0.00663	-0.00325	0.00134	0.000840	0.000334	0.00140
Cur-ratio	0.0120	0.00453	0.00938	0.00985	0.0102	0.00970
Constant	12.71 ***	12.44 ***	12.24 ***	12.55 ***	12.54 ***	12.52 ***
Adj. R ²	0.063	0.074	0.031	0.029	0.027	0.025
Observations	953	953	953	953	953	953

Notes: See Table 1 for variables' definitions. Robust t-statistics in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

Models 2 measures the impact of board attributes on CEO bonus-based compensation. The analysis suggests a statistically significant positive relationship at the 1% level between board diversity, board size, and CEO bonus-based compensation. Thus, hypotheses H2.2 and H3.2 are accepted. As before, the statistically weak insignificant results for board independence, i.e., NED-ratio and board meeting frequency, do not provide enough evidence to support or oppose hypotheses H4.2 and H5.2.

Likewise, Model 3 analyzes the impact of CEO traits on total CEO compensation. CEO role duality and CEO tenure relate positively with CEO bonus-based compensation at the 1% level of statistical significance. Thus, hypotheses H6.2 and H7.2 are accepted. However, there is not enough statistical support to accept or reject hypothesis H8.2.

As for the relationship between firm-specific attributes and CEO bonus-based compensation, the results are largely the same as observed in the Table above for total CEO compensation. Thus, hypotheses H9.2 and H11.2 are accepted, whereas there is not enough statistical support for the remaining hypotheses H10.2, H12.2, and H13.2. Results for the interaction variables are consistent and support the argument that large and diversified boards when led by a dual CEO relate positively with CEO bonus-based compensation, whereas independent and large corporate boards have the opposite impact.

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4.6. Further Analysis

Thus far, the study has used one performance proxy, return on assets (ROA). In this session the study performs further analysis by replacing ROA with market performance measure, Tobin's Q (the Q-ratio). Results are reported in Table 6.

Table 6. Further analysis.

	Model 1	Model 2	Model 3
Q-ratio	-0.00353	-0.00147	-0.00334
Board diversity	0.0164 ***	0.00965 ***	0.00882 **
Board size	0.0457 **	0.0343 ***	0.0546 ***
NED-ratio	-0.000445	0.00185 **	-0.00116
BMF	-0.106	0.0111	0.0440
CEO duality	0.577 ***	0.452 ***	1.349 ***
CEO tenure	0.0110	-0.0181 ***	-0.0293 *
Exe. diversity	1.460	0.703 *	-0.757
Firm size	0.0655 ***	0.0706 ***	0.0888 ***
Leverage	-0.0775	-0.00325	-0.0221
Inst. ownership	-0.00340 *	-0.00148 **	0.00300
Beta (risk)	0.00467	0.00341 *	0.000149
Cur-ratio	-0.00876	-0.00414	0.0131
Constant	14.12 ***	12.45 ***	11.95 ***
Adj. R ²	0.191	0.503	0.029

Notes: See Table 1 for variables' definitions. Robust t-statistics in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1.

The study uses the same equation, i.e., Equation (1), to perform further analysis with Q-ratio as an alternative measure of firm performance to extract Model 1, Model 2, and Model 3. The analysis suggests a negative relationship between the Q-ratio and CEO compensation proxy measures. However, the relationships are not statistically significant. The consistency in results across all models for board diversity and board size strengthen the argument that board gender diversity and board size are the main determinants of CEO compensation in the FTSE350 constituent firms. Results for the remaining variables are largely consistent.

5. Discussion of Results

The econometrics analysis reveals the determinants of agency costs proxied by CEO compensation. The statistically significant positive relationship between board diversity and CEO compensation proxies suggests that CEO compensation in UK publicly traded companies can largely be explained by their board composition, i.e., board gender diversity. These findings add to the argument that female representation at the corporate upper echelons does have important implications for corporate decision-making.

The consistent results across all three measures suggest that a higher fraction of females on boards of directors favorably influence diverse components of CEO compensation, echoing ref. [2] and others. As for the other board attributes, consistent with the arguments presented in Section 2, the analysis suggests that profitable firms represented by larger boards tend to offer higher rewards to the CEOs, supplementing earlier studies such as ref. [8], among others

Likewise, the analysis provides support for the pay-for-performance theorem [8,14], however, the alternative proxies for CEO compensation, i.e., salary and bonuses, do not provide strong statistical support for the notion. Additionally, results for CEO power, measured by CEO role duality and CEO-tenure, suggest that CEOs with strong organizational positions tend to draw higher compensation, echoing the arguments of ref. [15]. Interestingly, larger firms dominated by institutional owners offer higher (lower) compensation rewards.

6. Conclusions

The study draws a sample from FTSE350 constituent firms listed on the London Stock Exchange (LSE) for the 2011–2019 period to analyze the effects of board attributes

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and CEO traits on CEO compensation while controlling for firm related attributes. The study built a unique handpicked dataset, which is drawn from various sources such as corporate reports, annual reports, bulletins, company websites, executive/personal websites, corporate archives, and other publicly available sources such as newspapers, etc., to test the extended hypotheses. The study further supplements, compares, and contrasts the initially collected data with other datasets such as Bloomberg and DataStream. The analysis provides new and interesting insights and adds to the ongoing debate on CEO compensation [4,13].

Specifically, the analysis suggests that large and diversified boards determine CEO compensation. Large and diversified boards, i.e., those with a higher fraction of female directors, favor higher CEO compensation, supplementing [7,18] for board size and [17,18] for board diversity. These results enrich the existing literature by adding divergent insights to the ongoing intellectual debate on the phenomenon [7]. Similarly, results for CEOs' structural power within organizations advance the scholarly debate on the matter [14]. Overall, results observed in this study suggest that large and diversified corporate boards explain agency costs, i.e., rents paid to agents such as the CEO, against their services. Furthermore, CEOs with strong organizational positions are able to withdraw higher compensation in more highly profitable corporations [8,11], however, institutional ownership discourages higher CEO compensation.

These findings supplement the research analyzing the determinants and effects of sustainable CEO compensation [21]. In conclusion, this study notes that large and diversified boards are the main determinants of CEO compensation. Since boards of directors are responsible for negotiating agency contracts with the agents and are responsible for approving the economic benefits paid to the agents, large and diversified boards are more able to negotiate sustainable economic contracts with the agents.

Linking these arguments to the sustainability phenomenon, e.g., [12], which links board composition with sustainability and firm valuation, it is thus argued that large and diversified boards are vigilant observers: on one hand, they negotiate and offer sustainable CEO compensation packages to attract talented agents and, in doing so, they send strong signals to the CEO assuring them their economic safety, which further motivates them to work in the best interests of the shareholders.

Arguably, financially well-rewarded agents would strive to implement boards' strategies and agendas in an efficient manner to reap the sustainable organic growth. The study thus identifies this as a new avenue for future research to analyze the effects of sustainable CEO compensation contracts of corporate sustainability and valuation.

While the analysis remained focused on CEO compensation in publicly listed companies operating in the UK, future research may replicate this study on a different sample. Likewise, future research may consider using related attributes of board diversity in terms of skillsets, ethnicity, educational background, etc., for a more comprehensive analysis to lift the lid on boardroom diversity.

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