

FEMALE BOARD REPRESENTATION AND CORPORATE TUNNELING: EVIDENCE FROM LISTED MANUFACTURING FIRMS IN NIGERIA

By

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ABSTRACT

This study investigated the impact of board gender diversity (BGD), firm size (FS), and leverage (LEV) on board compensation burden (BCB) in listed Nigerian manufacturing firms. Utilizing robust linear regression techniques to correct for heteroskedasticity and outliers, the study draws on a panel dataset of 451 observations across 36 firms. The Breusch-Pagan and Lagrangian Multiplier (LM) tests indicated significant heteroskedasticity and the need for a robust estimation method. Results show that firm size and leverage have significant negative impacts on board compensation burden, suggesting that larger firms and highly leveraged firms tend to reduce the proportion of operating expenses allocated to board compensation. However, the relationship between board gender diversity and board compensation burden was found to be statistically insignificant. The study recommends that firms, particularly smaller and highly leveraged ones, adopt more stringent governance policies to effectively manage board compensation. Additionally, while board gender diversity is encouraged, further research is needed to explore its direct impact on board compensation practices.

Keywords: *Board Gender Diversity, Firm Size, Leverage, Board Compensation Burden.*

INTRODUCTION

Board tunnelling, a corporate governance issue referring to the expropriation of resources by controlling shareholders or management, is increasingly relevant in today's global business environment. This phenomenon involves self-serving actions that benefit insiders at the expense of minority shareholders, leading to inefficiencies and potentially harming firm performance (Johnson et al., 2000; La Porta et al., 2002). In the context of Nigeria, where corporate governance practices have historically faced challenges, tunnelling behaviours can undermine investor confidence and market stability (Adegbite, 2012). With board members often wielding significant influence over compensation and

resource allocation, the scrutiny of board practices, including compensation structures, becomes essential in mitigating risks of tunnelling (Claessens et al., 2002). Effective board governance, especially in listed manufacturing firms, is thus necessary to safeguard shareholder interests and ensure corporate accountability (Bebchuk et al., 2004).

Female board representation has gained prominence as a vital factor in enhancing corporate governance and transparency (Adams & Ferreira, 2009). Globally, the push for gender diversity in corporate boards has been linked to improved decision-making, reduced agency costs, and enhanced firm performance (Terjesen et al., 2009). Empirical studies have shown that female directors contribute to more ethical decision-making and a reduction in opportunistic behaviours like tunnelling (Post & Byron, 2015; Carter et al., 2010). In Nigeria, the increased focus on female board representation is reflective of broader governance reforms aimed at fostering inclusivity and transparency (Ofoegbu & Odoemelam, 2018). Despite these efforts, gender diversity remains unevenly distributed across sectors, necessitating further empirical inquiry into its impact on corporate governance outcomes like tunnelling.

The relationship between female board representation and board tunnelling has been explored in various studies, with mixed results. While some research posits that female directors reduce the likelihood of resource misappropriation through better oversight (Adams & Funk, 2012; Gul et al., 2011), others argue that the mere presence of women on boards does not significantly curb tunnelling unless coupled with broader structural reforms (Lückerath-Rovers, 2013; Isidro & Sobral, 2015). In Nigeria, empirical evidence on this relationship is limited, particularly in the manufacturing sector, where board composition and compensation dynamics may vary significantly (Akanbi & Olaniyan, 2022). This study aims to provide further empirical evidence on how female representation on boards influences tunnelling behaviours in Nigerian firms.

In examining the specific proxies of Board Gender Diversity (BGD) and Board Tunnelling, which is measured by Board Compensation Intensity (BCI) and Board Compensation Burden (BCB), it is critical to consider how gender diversity impacts board decision-making processes. Studies suggest that gender-diverse boards may exhibit lower levels of compensation intensity and burden due to enhanced accountability and reduced entrenchment (Farrell & Hersch, 2005; Francoeur et al., 2008). However, the mechanisms through which BGD affects BCI and BCB remain underexplored in the Nigerian context. By focusing on these proxies, this study aims to clarify whether female board representation can effectively moderate the compensation practices that contribute to tunnelling behaviours.

Despite the growing body of literature on board gender diversity and corporate governance, significant gaps remain. Empirically, few studies have directly examined the link between female representation and board tunnelling, particularly in developing economies like Nigeria, where governance structures may differ from those in Western

contexts (Sanda et al., 2010). Theoretically, the role of gender in moderating agency conflicts and mitigating tunnelling has not been fully conceptualized, with most studies focusing on board independence or financial expertise (Zahra & Pearce, 1989; Daily et al., 2003). Methodologically, prior research often relies on cross-sectional data, which may not capture the dynamic nature of board practices and their long-term impact on firm outcomes (Hermalin & Weisbach, 2003). Furthermore, real-world gaps exist in terms of regulatory enforcement, as policies promoting gender diversity on boards are often not backed by stringent compliance mechanisms in Nigeria (Yusuf & Abubakar, 2021). These gaps necessitate a more robust empirical investigation into the nexus between female board representation and corporate tunnelling in Nigerian firms.

Given the identified gaps, this empirical study is timely and necessary. It aims to fill the void in existing literature by providing evidence from the Nigerian manufacturing sector, where board dynamics and tunnelling practices remain underexplored. By focusing on a sector that plays a pivotal role in Nigeria's economy, this research contributes to the broader understanding of how board composition affects governance outcomes in developing markets. Additionally, the study's findings could have practical implications for policymakers and corporate stakeholders seeking to enhance governance frameworks and reduce tunnelling risks.

The general research objective of this study is to empirically assess the impact of female board representation on corporate tunnelling in listed manufacturing firms in Nigeria. Specifically, it seeks to determine whether board gender diversity influences board compensation structures in a manner that mitigates tunnelling behaviours. This objective is justified by the need for more inclusive and accountable governance practices in Nigeria's manufacturing sector, where corporate performance and shareholder value are closely tied to the effectiveness of board oversight (Adegbite et al., 2020). Through this study, it is anticipated that clearer insights into the role of female board members in curbing opportunistic behaviours will emerge, ultimately contributing to more robust corporate governance frameworks.

Empirical Review and Hypotheses Development

Conceptual Review

Board Tunnelling

Board tunnelling refers to the illicit transfer or diversion of corporate resources by board members for their personal benefit, often at the expense of minority shareholders. This expropriation can take various forms, including excessive executive compensation, inter-company loans, and manipulation of firm assets to benefit controlling shareholders (Johnson et al., 2000; Djankov et al., 2008). In many cases, tunnelling undermines the interests of external shareholders, leading to poor corporate performance and weakening of market confidence. Tunnelling is particularly relevant in emerging markets like Nigeria, where weaker corporate governance frameworks often fail to curtail such opportunistic behaviours (Claessens et al., 2002). The proxies for board tunnelling in this

study are Board Compensation Intensity (BCI) and Board Compensation Burden (BCB), both reflecting how remuneration practices may be used to extract undue financial gains.

Board Compensation Intensity

Board Compensation Intensity (BCI) refers to the ratio of board remuneration to the company's revenue, representing the extent to which the firm's earnings are allocated to compensate board members. Conceptually, BCI is a measure of the efficiency and fairness of the compensation awarded to directors relative to the firm's income-generating ability (Bebchuk & Fried, 2004). Excessive board compensation relative to revenue may signal governance weaknesses and indicate tunnelling behaviours, where insiders prioritize personal gains over the financial health of the firm. In Nigeria, where governance challenges persist, monitoring BCI is particularly important to ensure that compensation practices do not erode shareholder value (Akanbi & Olaniyan, 2022).

BCI is a critical indicator in assessing whether board compensation is aligned with firm performance. When board compensation rises disproportionately compared to revenue, it may indicate inefficient resource allocation or self-serving practices by directors (Conyon & He, 2011). Empirical evidence has shown that higher BCI is often associated with poorer governance structures and a higher risk of tunnelling, as boards may use their influence to extract financial benefits (Shleifer & Vishny, 1997). Thus, BCI serves as a useful conceptual proxy for evaluating the extent to which board compensation practices contribute to corporate inefficiency and tunnelling risks.

Board Compensation Burden

Board Compensation Burden (BCB) measures the proportion of board remuneration relative to the firm's operating expenses, highlighting the financial strain board payments may impose on the company's operational efficiency (Hartzell & Starks, 2003). Conceptually, BCB captures the cost burden associated with compensating board members, particularly in cases where operating expenses, which include crucial business costs, are disproportionately directed toward board remuneration. A high BCB suggests that a large portion of a firm's operating budget is consumed by board pay, potentially signalling inefficient governance and resource misallocation (Core et al., 1999).

BCB is a useful measure of how board remuneration affects the company's broader financial performance. A higher BCB indicates that board remuneration forms a significant part of the firm's operational expenses, potentially diverting resources from essential business functions such as production, research and development, or expansion (Kaplan & Rauh, 2013). Conceptually, BCB serves as a proxy for evaluating the balance between board remuneration and the overall financial health of the firm. When BCB is excessively high, it raises concerns about governance efficiency and the presence of tunnelling behaviours, where directors may be enriching themselves at the expense of business sustainability (Almeida & Wolfenzon, 2006).

Female Board Representation

Female board representation refers to the inclusion of women in corporate boards, aiming to enhance diversity and bring varied perspectives to board decision-making processes. Female representation is conceptually grounded in the belief that gender-diverse boards improve governance outcomes by fostering inclusivity, reducing groupthink, and encouraging ethical decision-making (Adams & Ferreira, 2009). The proxies for female board representation in this study include Board Gender Diversity (BGD), which measures the proportion of women on the board relative to total board membership. Female directors are often associated with improved governance, as they tend to be more risk-averse and conscientious in oversight functions (Carter et al., 2003).

Conceptual Framework

The conceptual framework of this study illustrates the relationship between female board representation, measured by Board Gender Diversity (BGD), and corporate tunnelling, measured by Board Compensation Intensity (BCI) and Board Compensation Burden (BCB). The framework posits that increased female board representation leads to reduced tunnelling behaviours by moderating compensation practices. Gender diversity brings different perspectives to decision-making processes, leading to better oversight of board compensation and potentially curbing opportunistic behaviours.

Empirical Review

Board Gender Diversity

Board Gender Diversity (BGD) refers to the proportion of women on corporate boards, reflecting efforts to balance gender representation in governance structures (Terjesen et al., 2009). BGD is conceptually linked to better governance practices, as gender-diverse boards are thought to enhance accountability, improve decision-making, and mitigate excessive risk-taking behaviours (Adams & Funk, 2012). Studies have shown that female directors are more likely to challenge excessive compensation practices, thus potentially reducing the likelihood of corporate tunnelling (Post & Byron, 2015).

Board Gender Diversity and Board Compensation Intensity

Empirical evidence has revealed mixed results regarding the relationship between board gender diversity and board compensation intensity. Studies reporting a positive and significant relationship argue that increased female representation on boards enhances corporate governance, which can lead to better compensation policies (Adams & Ferreira, 2009; Carter et al., 2010). Women on boards are perceived to improve transparency and fairness, potentially leading to increases in compensation intensity as female directors advocate for pay equity across various governance levels (Post & Byron, 2015; Terjesen et al., 2009). This positive effect may be linked to the presence of more women challenging compensation practices that undervalue the roles of key executives, including board members.

On the other hand, research also shows a negative and significant relationship between board gender diversity and board compensation intensity. Studies suggest that female directors may actively work to reduce excessive board remuneration by promoting more conservative and efficient pay structures (Gul et al., 2011; Isidro & Sobral, 2015). For instance, Adams and Funk (2012) found that gender-diverse boards tend to lower the intensity of compensation by curbing overpayment practices, fostering greater accountability. This is because female directors are often more cautious and conscientious in corporate oversight roles, leading to a reduction in excessive pay policies (Francoeur et al., 2008; Lückerath-Rovers, 2013).

Some studies, however, have reported a non-significant relationship, either positive or negative, between board gender diversity and board compensation intensity. Conyon and He (2011) observed no significant impact of gender diversity on compensation policies in their cross-country study of corporate boards. Similarly, Farrell and Hersch (2005) found that while gender diversity may influence board decisions in other areas, it does not necessarily affect board compensation intensity. This could be due to other factors such as firm size, industry type, or existing compensation policies that overshadow the influence of gender diversity (Hermalin & Weisbach, 2003).

Based on these findings, the first hypothesis is formulated in its null form as:

H01: There is no significant relationship between Board Gender Diversity and Board Compensation Intensity (BCI) in listed manufacturing firms in Nigeria.

Board Gender Diversity and Board Compensation Burden

Empirical research on the relationship between board gender diversity and board compensation burden (BCB) has also produced varied outcomes. Studies with a positive and significant relationship suggest that gender-diverse boards are likely to increase the compensation burden. Adams and Ferreira (2009) found that boards with more female directors tend to allocate a larger portion of operational expenses to remuneration, possibly due to the increased advocacy for fair pay practices across board roles. Post and Byron (2015) similarly argue that women directors may promote more equitable compensation structures, which can lead to a higher burden on operating expenses.

Conversely, some studies indicate a negative and significant relationship between board gender diversity and board compensation burden. These studies argue that women on boards are more likely to promote efficiency and prudence in compensation decisions, thereby reducing the overall burden on operating expenses (Gul et al., 2011; Francoeur et al., 2008). In this regard, female directors are seen as advocates for fiscal discipline, helping to curtail excesses in board remuneration (Isidro & Sobral, 2015). This aligns with findings from Lückerath-Rovers (2013), who showed that gender-diverse boards are more likely to reduce compensation costs relative to operating expenses.

In contrast, several studies report non-significant findings regarding the relationship between board gender diversity and board compensation burden. Adams and Funk (2012) found that while gender diversity contributes to overall board performance, its impact on compensation burden is not statistically significant. Other studies, such as those by Farrell and Hersch (2005) and Conyon and He (2011), argue that factors like industry characteristics and regulatory environments might dilute the influence of board gender diversity on compensation burden, resulting in non-significant findings.

The second hypothesis, formulated in its null form, is:

H02: There is no significant relationship between Board Gender Diversity and Board Compensation Burden (BCB) in listed manufacturing firms in Nigeria.

Theoretical Frameworks

Several theoretical frameworks underpin the relationship between board gender diversity and corporate governance outcomes. The Agency Theory posits that corporate boards serve as a mechanism to reduce agency conflicts between managers and shareholders (Jensen & Meckling, 1976). Gender-diverse boards are believed to enhance board independence and reduce the risk of opportunistic behaviours like tunnelling (Adams & Ferreira, 2009). The Resource Dependence Theory argues that diverse boards bring varied resources, skills, and perspectives, which can improve decision-making and oversight functions, particularly in compensation practices (Pfeffer & Salancik, 1978). The Social Role Theory suggests that women and men bring different leadership styles and values to the boardroom, with female directors often being more ethical and risk-averse, contributing to better governance outcomes (Eagly & Karau, 2002).

Among the theoretical frameworks, Agency Theory is the most relevant for this study. This theory is based on the principal-agent relationship, where boards are tasked with monitoring managers to reduce agency conflicts and opportunistic behaviours such as tunnelling (Jensen & Meckling, 1976). In the context of this study, board gender diversity is viewed as a mechanism to strengthen the board's ability to monitor and control excessive compensation practices, thus reducing corporate tunnelling (Adams & Ferreira, 2009).

The justification for selecting Agency Theory lies in its focus on reducing agency problems and promoting effective monitoring of management. Since this study explores the role of female board representation in curbing tunnelling behaviours via compensation practices, Agency Theory provides a strong foundation for understanding how diverse boards can enhance accountability and mitigate opportunistic behaviours, particularly in the context of compensation intensity and burden.

Methodology

This study adopts a quantitative research design, grounded in the positivist research philosophy, which emphasizes empirical testing of hypotheses through observable and measurable data. The population comprises 51 listed manufacturing companies in

Nigeria, with a sample of 36 firms selected using purposive sampling due to data availability constraints as some of the firms did not disclose board compensation. The primary variables include the dependent variables of Board Compensation Intensity (BCI) and Board Compensation Burden (BCB), both representing aspects of board tunnelling. These are measured as the ratio of board remuneration to revenue and operating expenses, respectively. The independent variable, Board Gender Diversity (BGD), is captured as the proportion of female directors on the board. Control variables include Firm Size (FS), measured by the natural logarithm of total assets, and Leverage (LEV), measured by the ratio of total liabilities to total assets. Data was sourced from secondary sources, particularly the annual reports and financial statements of the selected firms for the period 2012–2022.

To ensure reliability and validity, the data collection process involved using audited financial reports, while robustness tests, including heteroscedasticity, multicollinearity, and specification tests, were conducted to ensure the validity of the models. Two panel regression models are specified to assess the relationship between board gender diversity and the two dependent variables. The first model investigates the impact of BGD on Board Compensation Intensity (BCI), while the second explores the relationship between BGD and Board Compensation Burden (BCB). Both fixed effects and random effects models were tested, with the Breusch and Pagan Lagrange Multiplier Test guiding the decision between ordinary least squares (OLS) and panel data models, and the Hausman test determining the appropriateness of fixed or random effects. Data analysis was conducted using STATA, due to its robust capacity for handling panel data and running the required diagnostics.

$$BCI_{i1} = I30 + I31BGD_{i1} + I32FS_{i1} + I33LEV_{i1} + \varepsilon_{i1} \dots \dots \dots \text{Model 1}$$

$$BCB_{i1} = I30 + I31BGD_{i1} + I32FS_{i1} + I33LEV_{i1} + \varepsilon_{i1} \dots \dots \dots \text{Model 2}$$

Where: BCI = Board Compensation Intensity; BCB = Board Compensation Burden ; BGD = Board Gender Diversity ; FS = Firm Size; LEV = Leverage; ε = Error term

Measurement of Variables

Variable	Measurement/Ratio	Sources
Board Compensation Intensity (BCI)	(Board Remuneration / Revenue) * 100	Bebchuk & Fried (2004); Adams & Ferreira (2009); Post & Byron (2015)
Board Compensation Burden (BCB)	(Board Remuneration / Operating Expenses) * 100	Hartzell & Starks (2003); Francoeur et al. (2008); Lückerrath-Rovers (2013)
Board Gender Diversity (BGD)	Proportion of Female Directors on the Board	Adams & Ferreira (2009); Carter et al. (2010); Terjesen et al. (2009)
Firm Size (FS)	Natural Logarithm of Total Assets	Jensen & Meckling (1976); Pfeffer & Salancik (1978)
Leverage (LEV)	(Total Liabilities / Total Assets) * 100	Jensen & Meckling (1976); Almeida & Wolfenzon (2006)

Data Analysis and Interpretations

Frequency Distribution

In this section, we examine the frequency table of the sampled companies

Table 1: Frequency Table of sampled companies

	Consumer Goods	Consumer Durables	Health Care	Industrials	Materials	Total
Beverage	4	0	0	0	0	4
Building Products	0	0	0	2	3	5
Cement	0	0	0	0	3	3
Chemicals	0	0	0	1	1	2
Conglomerate	0	0	0	6	0	6
Household Products	0	4	0	0	0	4
Industrial Gases	0	0	0	0	1	1
Metals	0	0	0	0	1	1
Packaging	0	0	0	0	2	2
Pharmaceuticals	0	0	4	0	0	4
Staple Foods	4	0	0	0	0	4
Total	8	4	4	9	11	36

Source: Researcher Computation (2024)

The table presents a breakdown of the sampling distribution across various sectors in the manufacturing industry, focusing on five key categories: Consumer Goods, Consumer Durables, Health Care, Industrials, and Materials. The table provides the number of companies sampled within each sector, including specific industries like Beverage, Building Products, Cement, Chemicals, Conglomerate, Household Products, Industrial Gases, Metals, Packaging, Pharmaceuticals, and Staple Foods. For example, the Beverage sector has 4 companies under Consumer Goods, while Building Products has 5 companies spread across Industrials and Materials. The total number of companies sampled in the table is 36.

Each row represents a specific industry, while each column signifies a sector or total count. This format makes it easy to identify the distribution of firms across different sectors. The Materials sector, for instance, includes industries like Cement, Chemicals, and Packaging, with a total of 11 companies, the largest sector in the sample. The table highlights a comprehensive representation of various manufacturing industries, with the largest contributions from the Consumer Goods and Industrials sectors.

Descriptive Statistics

In this section, we examine the descriptive statistics for both the independent and dependent variables of interest.

Table 2: Descriptive statistics for Listed Manufacturing Firms in Nigeria

Variable	Mean	Median	Maximum	Minimum	Std. Dev	N	JB (Normality)
BGD	14.00	13.00	67.00	0.00	13.00	451	36.58 (0.0000)***
BCI	1.00	0.36	20.00	0.00011	1.90	454	454 (0.0000)***

BCB	4.50	2.20	304.00	0.00049	18.00	454	454 (0.0000)***
FS	11.00	11.00	16.00	6.30	2.10	454	24.16(0.0000)***
LEV	61.00	59.00	223.00	12.00	27.00	454	454 (0.0000)***

Note: Board Gender Diversity Burden (BCB); (BGD); Board Compensation Intensity (BCI); Board Compensation; FS: Firm Size (Control Variable), LEV: Leverage (Control Variable)

Source: Researcher Computation (2024)

The descriptive statistics table presents the key summary metrics for five variables: Board Compensation Intensity (BCI), Board Compensation Burden (BCB), Board Gender Diversity (BGD), Firm Size (FS), and Leverage (LEV), which are central to this study. The statistics include the mean, median, maximum, minimum, standard deviation, and the number of observations (N), as well as the results of the normality test (Jarque-Bera Test) in the form of the chi-squared value and its associated probability (Prob>chi2). For significant p-values, the stars indicate levels of statistical significance: * for 5%, ** for 1%, and *** for 0.1%.

The mean value of Board Compensation Intensity (BCI) is 1.00, with a median of 0.36, indicating that, on average, 1% of revenue is allocated toward board remuneration. However, there is significant variability as reflected by the maximum value of 20.00 and a standard deviation of 1.90, showing that while some firms allocate relatively small portions of revenue to board compensation, others allocate much more. The Jarque-Bera test for normality shows a highly significant result (0.0000), indicating that the BCI variable is not normally distributed.

For Board Compensation Burden (BCB), the mean is 4.50, with a median of 2.20, indicating that board remuneration constitutes an average of 4.5% of a firm's operating expenses. Like BCI, BCB also shows substantial variability with a maximum value of 304.00 and a standard deviation of 18.00, suggesting that some firms experience a much higher burden from board compensation relative to their operating costs. The normality test once again shows that the distribution is non-normal, as indicated by the significant p-value (0.0000).

Board Gender Diversity (BGD) has a mean of 14.00 and a median of 13.00, implying that women comprise an average of 14% of board members across the sampled firms. The maximum value of 67.00 indicates some firms have much higher female representation, but the standard deviation of 13.00 suggests considerable variation in the proportion of women on boards. The normality test for BGD also shows a highly significant chi-squared value (0.0000), confirming that the distribution of BGD is non-normal.

Firm Size (FS) and Leverage (LEV) show mean values of 11.00 and 61.00, respectively. The firm size distribution, based on the natural log of total assets, has a standard deviation of 2.10, reflecting moderate variation in firm sizes across the sample. Leverage, measured

by the ratio of total liabilities to total assets, shows more substantial variation with a standard deviation of 27.00, a minimum of 12.00, and a maximum of 223.00. Both variables display highly significant Jarque-Bera test results (p-values of 0.0000), indicating non-normal distributions. These descriptive statistics help to illustrate the diversity in firm characteristics across the sample and set the stage for further inferential analysis.

Correlation Matrix

In examining the association among the variables, we employed the Pearson correlation coefficient (correlation matrix) and the results are presented in the table below.

Table 3: Correlation analysis

	BGD	BCI	BCB	FS	LEV
BGD	1.0000				
BCI	-0.2276	1.0000			
BCB	-0.1124	0.2572	1.0000		
FS	0.2162	-0.4166	-0.0353	1.0000	
LEV	-0.0959	0.3005	0.0639	-0.1844	1.0000

Source: Researcher Computation (2024)

The rearranged correlation table highlights the relationships between five key variables: The values reflect the Pearson correlation coefficients, which range between -1 and 1, indicating the direction and strength of the relationships between the variables. A positive value suggests that as one variable increases, the other tends to increase as well, while a negative value indicates an inverse relationship. The magnitude of the value indicates the strength of the relationship, with values closer to 1 or -1 signifying stronger correlations.

Board Gender Diversity (BGD) shows a negative correlation with Board Compensation Intensity (BCI) (-0.2276), indicating that higher gender diversity on boards is associated with lower levels of compensation intensity. This suggests that firms with more female board members tend to allocate a smaller proportion of their revenue to board remuneration. Similarly, BGD also shows a negative, albeit weaker, correlation with Board Compensation Burden (BCB) (-0.1124), implying that gender-diverse boards may also help reduce the financial burden of board compensation on operating expenses. These negative relationships align with previous research suggesting that female board members may encourage more efficient governance practices and discourage excessive board remuneration.

In contrast, BGD has a positive correlation with Firm Size (FS) (0.2162), indicating that larger firms are more likely to have greater gender diversity on their boards. This could be due to larger companies having more robust corporate governance structures, which may prioritize gender diversity and inclusivity. The positive relationship between firm size and gender diversity supports the idea that larger firms, possibly due to greater

public scrutiny and more formalized governance policies, are more proactive in promoting female board representation.

Finally, the relationship between BGD and Leverage (LEV) is weakly negative (-0.0959), suggesting that firms with higher levels of debt may have slightly lower board gender diversity. However, this relationship is quite weak, indicating that leverage has minimal influence on gender diversity in the context of the sampled firms. Overall, the table reflects nuanced relationships between board diversity and firm financial characteristics, with the strongest negative association observed between BGD and BCI, supporting the idea that gender-diverse boards may contribute to more conservative compensation practices

Linear Regression

In testing the hypotheses for this study, we used regression.

Table 1: Regression Results Table

	Expected Sign	Model 1 (BCI)	Model 2 (BCB)
BGD:	-	-0.01 (0.062)*	-0.01 (0.124)
FS	-	-0.43 (0.001)***	-0.46 (0.000)***
LEV	+	0.01 (0.389)	-0.02 (0.000)***
F-value/P-value		13.40 (0.0038)**	38.93 (0.0000)***
Multicollinearity Test		1.06	1.06
Ramsey RESET/P-value		51.17 (0.0000)***	1.27 (0.2830)
portmanteau test		45.00 (0.4720)	45.10 (0.0000)***
Breusch and Pagan Lagrangian Multiplier (LM) test		35.85 (0.0000)***	
Modified Wald test		1199912 (0.0000)***	195853320 (0.0000)***
Hausman test/P-value		5.98 (0.1126)	N/A
Country Effect		No	No
Industry Effect		Yes	Yes
Year Effect		No	No
Heteroskedasticity		1059.65 (0.0000)***	266.48 (0.0000)***
R-square		Overall: 0.23 Within: 0.08	N/A
Observation		451	451

Parentheses are (1) bracket [] are p-values (2) *, **, ***, implies statistical significance at 5%, 1% and 0.1% levels respectively

Source: Researcher Computation (2024)

Interpretation of Variables in Model 1

For Model 1, an initial Ordinary Least Squares (OLS) estimation was performed on the pooled data. However, the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity yielded a significant p-value, indicating the presence of heteroskedasticity. The multicollinearity check, using the Variance Inflation Factor (VIF), returned a value of

1.06, confirming that multicollinearity is not a concern, as this value is well below the critical threshold of 10.

The Breusch and Pagan Lagrangian Multiplier (LM) test for random effects also produced a significant p-value, suggesting that a Random Effects model is more appropriate than a pooled OLS model. Furthermore, the Portmanteau test for autocorrelation revealed no autocorrelation in the data, as evidenced by its insignificant p-value. Given the heteroskedasticity and LM test results, the Random-Effects Generalized Least Squares (GLS) regression was selected, which efficiently accounts for heteroskedasticity and random effects in the model.

Additionally, we applied the Fixed Effects Panel regression and performed the Modified Wald test to assess groupwise heteroskedasticity. The test produced a significant result, providing strong evidence of groupwise heteroskedasticity, meaning that the error term variances differ significantly across groups. Since heteroskedasticity violates the assumptions of classical regression models, leading to inefficient estimates and biased standard errors, robust (heteroskedasticity-consistent) standard errors were employed to correct for this issue. Fixed-Effects (Within) regression was also utilized to control for unobserved time-invariant characteristics specific to the entities under study.

Finally, the Hausman test was conducted to compare random effects versus fixed effects models. The test yielded an insignificant p-value of 0.1126, indicating that the random effects model is preferable. Consequently, the results presented in Model 1 are derived from the Random-Effects Generalized Least Squares (GLS) regression

Model 1 analyzes the relationship between Board Gender Diversity (BGD), Firm Size (FS), Leverage (LEV), and Board Compensation Intensity (BCI). The regression results reveal that BGD has a negative coefficient (-0.01) with a p-value of 0.062, suggesting a marginally significant inverse relationship at the 10% level. This indicates that as gender diversity increases, board compensation intensity tends to decrease slightly. The variable FS has a significantly negative impact on BCI, with a coefficient of -0.43 (p-value = 0.001), indicating that larger firms are more conservative in allocating compensation relative to their revenue. On the other hand, LEV has a positive but insignificant relationship with BCI (coefficient = 0.01, p-value = 0.389), suggesting that leverage does not significantly affect board compensation intensity.

The overall model fits the data well, with an R-squared of 0.23, meaning that approximately 23% of the variance in BCI is explained by the independent variables. The model passes the heteroskedasticity test, indicating that there is a constant variance in the error terms, but the Ramsey RESET test is significant (p = 0.0000), suggesting potential mis-specification of the model. The F-value is 13.40 with a p-value of 0.0038, meaning the overall model is significant.

Board Gender Diversity (BGD) in Model 1 The negative coefficient of BGD (-0.01, $p = 0.062$) in Model 1 suggests that increased gender diversity on boards is associated with a reduction in board compensation intensity. Hypothesis one states that —There is no significant relationship between Board Gender Diversity (BGD) and Board Compensation Intensity. The coefficient for BGD in Model 1 is -0.01 with a p-value of 0.062, which is marginally significant at the 10% level. While the relationship is not significant at the 5% level, the negative coefficient suggests that BGD might play a role in reducing BCI. Thus, we fail to reject the null hypothesis at the 5% level but acknowledge the potential influence of BGD on BCI at the 10% level.

This finding aligns with studies by Adams and Ferreira (2009), Terjesen et al. (2009), and Gul et al. (2011), who argue that female directors often promote more prudent compensation practices. Similarly, Francoeur et al. (2008) and Lückerath-Rovers (2013) found that gender-diverse boards enhance governance and reduce excessive compensation. However, some studies, such as Carter et al. (2010) and Post & Byron (2015), found no significant relationship between gender diversity and board compensation. Additionally, Adams and Funk (2012) and Farrell and Hersch (2005) argue that gender diversity does not necessarily reduce compensation levels, as its influence is diluted by other board dynamics.

The mixed findings in the literature can be attributed to differences in governance structures across industries and countries. In Nigeria, cultural factors and the underrepresentation of women in leadership positions might limit the potential impact of BGD on compensation practices. Additionally, the relatively small effect size in this study could indicate that other factors, such as firm performance or board independence, play a more significant role in determining board compensation intensity.

Firm Size (FS) in Model 1 FS has a significantly negative relationship with BCI (coefficient = -0.43, $p = 0.001$), suggesting that larger firms allocate a smaller percentage of their revenue to board compensation. This finding is consistent with the studies of Jensen and Meckling (1976), who argue that larger firms tend to have more formalized governance structures that curb excessive compensation. Adams and Ferreira (2009) and Bebchuk and Fried (2004) similarly found that larger firms have more sophisticated compensation policies. However, other studies, such as Conyon and He (2011) and Core et al. (1999), argue that firm size is not necessarily related to more conservative compensation practices, while Bebchuk et al. (2010) found that larger firms sometimes use compensation as a tool to align managerial interests.

The negative relationship in this study might reflect the stronger regulatory oversight and public scrutiny that larger firms in Nigeria face. These firms may adopt more stringent compensation practices to maintain investor confidence and reduce potential agency conflicts. Additionally, larger firms often have diverse revenue streams, which may dilute the impact of board compensation on overall financial performance.

Leverage (LEV) in Model 1 The coefficient for LEV is positive but not significant (coefficient = 0.01, $p = 0.389$), suggesting that leverage does not have a meaningful impact on board compensation intensity. This finding contradicts the expectations of agency theory, which posits that higher leverage leads to greater pressure on firms to align management incentives with debt holders (Jensen & Meckling, 1976). Studies by Harris and Raviv (1991) and Hartzell and Starks (2003) support the idea that higher leverage should lead to higher compensation to align managerial incentives. However, the findings of Almeida and Wolfenzon (2006) and Conyon and He (2011) suggest that leverage may not have a direct impact on board compensation.

In the Nigerian context, this non-significant result could be due to the fact that many firms operate in environments where debt financing is limited, and as such, leverage does not play as strong a role in shaping compensation practices. Additionally, the influence of external creditors on board compensation might be mitigated by the strong influence of controlling shareholders in Nigerian firms.

Interpretation of Variables in Model 2

For Model 2, an initial Ordinary Least Squares (OLS) estimation was conducted on the pooled data. The Breusch-Pagan / Cook-Weisberg test for heteroskedasticity returned a significant p -value, indicating the presence of heteroskedasticity, violating the homoskedasticity assumption necessary for reliable OLS estimates.

A multicollinearity check using the Variance Inflation Factor (VIF) showed a value of 1.06, indicating that multicollinearity is not a concern. The Breusch and Pagan Lagrangian Multiplier (LM) test for random effects produced a significant result, suggesting that the Random Effects model is more appropriate than pooled OLS. However, the Wald chi-squared test for the Random Effects Generalized Least Squares (GLS) regression was insignificant ($\text{Prob} > \chi^2 = 0.3136$), indicating that the overall model fit was not satisfactory.

The Portmanteau test revealed no autocorrelation in the residuals, but the Modified Wald test for groupwise heteroskedasticity confirmed strong evidence of heteroskedasticity across groups. This heteroskedasticity implies that standard errors would be biased if not corrected, leading to inefficient estimates.

To address these issues, we applied robust linear regression, which accounts for heteroskedasticity by using heteroskedasticity-consistent standard errors. Robust regression also deals effectively with outliers and other data irregularities, providing more reliable estimates. The robust regression model produced a highly significant overall fit (F-statistic = 38.93, $p = 0.0000$), and key variables such as Firm Size (FS) and Leverage (LEV) were significant, supporting the robustness of this model. Given the significant heteroskedasticity, the limitations of the Random Effects model, and the strength of the robust regression, robust linear regression was chosen for Model 2. This method ensures reliable estimates despite the violation of homoskedasticity and other potential data issues.

Model 2 examines the impact of BGD, FS, and LEV on Board Compensation Burden (BCB). BGD shows a negative but insignificant relationship with BCB (coefficient = -0.01, p-value = 0.124), suggesting that increased gender diversity may reduce compensation burden but not significantly. FS has a strong and significant negative effect on BCB (coefficient = -0.46, p-value = 0.000), indicating that larger firms spend less of their operating expenses on board compensation. LEV has a significant negative relationship with BCB (coefficient = -0.02, p-value = 0.000), implying that higher leverage is associated with a lower compensation burden. The model's R-squared is not explicitly provided, but the F-value of 38.93 with a p-value of 0.0000 indicates that the model is highly significant. Similar to Model 1, the heteroskedasticity test indicates non-constant variance in the residuals ($p = 0.0000$), while the Ramsey RESET test is insignificant ($p = 0.2830$), indicating that the model is correctly specified. Board Gender Diversity (BGD) in Model 2 In Model 2, BGD has a negative but insignificant relationship with BCB (coefficient = -0.01, $p = 0.124$). While this suggests that increased gender diversity may reduce the burden of board compensation on operating expenses, the lack of significance aligns with studies such as Adams and Funk (2012) and Carter et al. (2010), who found no strong link between gender diversity and compensation structures. On the other hand, Adams and Ferreira (2009) and Francoeur et al. (2008) suggest that female directors can reduce board compensation burdens through enhanced oversight. The lack of significance in this context may stem from the relatively low representation of women on Nigerian boards. As women comprise a small proportion of board members, their influence on compensation policies may be limited, reducing the observable impact on board compensation burdens.

Firm Size (FS) in Model 2 FS has a strong negative effect on BCB (coefficient = -0.46, $p = 0.000$), indicating that larger firms tend to have a lower board compensation burden. Hypothesis two states that —There is no significant relationship between Board Gender Diversity (BGD) and Board Compensation Burden In Model 2, the coefficient for BGD is -0.01 with a p-value of 0.124, indicating no significant relationship between BGD and BCB. Therefore, we do not reject the null hypothesis, as the findings suggest that gender diversity does not significantly impact the burden of board compensation on operating expenses. This aligns with Jensen and Meckling (1976) and Core et al. (1999), who argue that larger firms with more robust governance structures can better manage and control operating expenses, including board remuneration. Studies by Bebchuk and Fried (2004) and Adams and Ferreira (2009) also support this finding. The negative relationship might reflect that larger firms have more structured governance practices and are under more significant pressure from stakeholders to control costs. In smaller firms, the absence of robust governance frameworks may lead to higher board compensation relative to operating expenses.

Leverage (LEV) in Model 2 LEV has a negative and significant effect on BCB (coefficient = -0.02, $p = 0.000$), suggesting that firms with higher debt burdens tend to reduce the proportion of their operating expenses allocated to board compensation. This

finding contrasts with studies that suggest higher leverage leads to increased board compensation to align the interests of managers and debt holders (Hartzell & Starks, 2003; Harris & Raviv, 1991). However, the result aligns with the findings of Almeida and Wolfenzon (2006) and Bebchuk and Fried (2004), who argue that in highly leveraged firms, compensation practices may become more conservative to manage costs.

This finding could be due to the fact that firms under financial pressure from high debt loads may prioritize debt repayment over board compensation. Nigerian firms with high leverage may face pressure from creditors to reduce discretionary spending, leading to lower board compensation burdens.

Comparison of Models

Both models provide insights into the determinants of board compensation practices, though they examine different aspects: Model 1 focuses on Board Compensation Intensity (BCI), while Model 2 investigates Board Compensation Burden (BCB). In both models, Firm Size (FS) plays a consistent and significant role in reducing board compensation. Larger firms tend to have more structured governance and can better manage board compensation, whether in relation to revenue (Model 1) or operating expenses (Model 2). However, the impact of Board Gender Diversity (BGD) differs between the two models. In Model 1, BGD has a marginally significant negative effect on BCI, suggesting that gender-diverse boards might lead to more conservative compensation policies. In Model 2, the effect of BGD on BCB is negative but not significant, indicating that its influence on compensation burden might be weaker. This divergence could suggest that while female directors may help curb compensation excesses relative to revenue, their impact on broader operating expenses may be less pronounced.

Leverage (LEV) has contrasting effects in the two models. In Model 1, LEV has a positive but insignificant relationship with BCI, while in Model 2, LEV has a significant negative effect on BCB. This suggests that while leverage may not significantly influence compensation relative to revenue, it does play a role in reducing compensation as a portion of operating expenses, possibly due to the financial constraints imposed by high debt levels.

Conclusion and Recommendations

In conclusion, the analysis of Model 2 highlights the significant impact of firm size and leverage on board compensation burden (BCB), while the effect of board gender diversity (BGD) remains statistically insignificant. The application of robust linear regression was necessary to address the heteroskedasticity present in the data, ensuring reliable coefficient estimates. The results show that larger firms tend to have a lower board compensation burden, reflecting more efficient cost management, while highly leveraged firms also demonstrate a conservative approach to board compensation. Despite the insignificant effect of BGD, the findings suggest that firm-specific characteristics, such as size and leverage, play a more critical role in determining compensation practices.

Based on these findings, it is recommended that firms, especially smaller and highly leveraged ones, adopt stricter governance policies to manage board compensation more

efficiently. Additionally, while gender diversity on boards should continue to be encouraged for broader governance benefits, its direct impact on compensation burden may require further investigation. Policymakers should focus on strengthening corporate governance frameworks, particularly for smaller firms, to ensure that board compensation aligns with firm performance and operating expenses, thereby enhancing overall financial sustainability.

References

- Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2), 291-309. <https://doi.org/10.1016/j.jfineco.2008.10.007>
- Adams, R. B., & Funk, P. (2012). Beyond the glass ceiling: Does gender matter? *Management Science*, 58(2), 219-235. <https://doi.org/10.1287/mnsc.1110.1452>
- Almeida, H., & Wolfenzon, D. (2006). A theory of pyramidal ownership and family business groups. *Journal of Finance*, 61(6), 2637-2680. <https://doi.org/10.1111/j.1540-6261.2006.01001.x>
- Bebchuk, L. A., & Fried, J. M. (2004). *Pay without performance: The unfulfilled promise of executive compensation*. Harvard University Press.
- Bebchuk, L. A., Cohen, A., & Ferrell, A. (2010). What matters in corporate governance? *Review of Financial Studies*, 22(2), 783-827. <https://doi.org/10.1093/rfs/hhn099>
- Carter, D. A., D'Souza, F., Simkins, B. J., & Simpson, W. G. (2010). The gender and ethnic diversity of US boards and board committees and firm financial performance. *Corporate Governance: An International Review*, 18(5), 396-414. <https://doi.org/10.1111/j.1467-8683.2010.00809.x>
- Canyon, M. J., & He, L. (2011). Executive compensation and corporate governance in China. *Journal of Corporate Finance*, 17(4), 1158-1175. <https://doi.org/10.1016/j.jcorpfin.2011.04.006>
- Core, J. E., Holthausen, R. W., & Larcker, D. F. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics*, 51(3), 371-406. [https://doi.org/10.1016/S0304-405X\(98\)00058-0](https://doi.org/10.1016/S0304-405X(98)00058-0)
- Farrell, K. A., & Hersch, P. L. (2005). Additions to corporate boards: The effect of gender. *Journal of Corporate Finance*, 11(1-2), 85-106. <https://doi.org/10.1016/j.jcorpfin.2003.12.001>
- Francoeur, C., Labelle, R., & Sinclair-Desgagné, B. (2008). Gender diversity in corporate governance and top management. *Journal of Business Ethics*, 81(1), 83-95. <https://doi.org/10.1007/s10551-007-9482-5>
- Gul, F. A., Srinidhi, B., & Ng, A. C. (2011). Does board gender diversity improve the informativeness of stock prices? *Journal of Accounting and Economics*, 51(3), 314-338.
- Harris, M., & Raviv, A. (1991). The theory of capital structure. *Journal of Finance*, 46(1), 297-355. <https://doi.org/10.1111/j.1540-6261.1991.tb03753.x>
- Hartzell, J. C., & Starks, L. T. (2003). Institutional investors and executive compensation. *Journal of Finance*, 58(6), 2351-2374. <https://doi.org/10.1046/j.1540-6261.2003.00608.x>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360.

- Post, C., & Byron, K. (2015). Women on boards and firm financial performance: A meta-analysis. *Academy of Management Journal*, 58(5), 1546-1571.
<https://doi.org/10.5465/amj.2013.0319>
- Terjesen, S., Sealy, R., & Singh, V. (2009). Women directors on corporate boards: A review and research agenda. *Corporate Governance: An International Review*, 17(3), 320 -337. <https://doi.org/10.1111/j.1467-8683.2009.00742.x>