

Audit Committee Diligence and Gender Diversity as Catalysts for Scale Efficiency in Nigerian Manufacturing Firms

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Abstract

This study examined the impact of audit committee diligence and gender diversity on scale efficiency in Nigerian manufacturing firms. The study uses panel research approach with data from 49 listed Nigerian manufacturing firms over the period 2012–2022 and employed panel regression models. The results showed that audit committee diligence positively and significantly influenced scale efficiency based on assets, highlighting the importance of frequent and focused meetings in driving operational efficiency. However, diligence had an insignificant relationship with scale efficiency based on turnover, suggesting that its immediate impact on revenue-related efficiency may be limited. Conversely, audit committee gender diversity exhibited an insignificant relationship with both measures of scale efficiency, implying that gender diversity alone may not directly influence scale efficiency in the Nigerian context. The findings contribute to the growing literature on corporate governance by providing empirical evidence from an emerging economy. The study highlights the need for strengthening audit committee practices through enhanced training and promoting an inclusive governance environment that leverages diverse perspectives for better decision-making.

Keywords: Audit Committee Diligence, Gender Diversity, Scale Efficiency, Nigerian Manufacturing Firms.

1. Introduction

The audit committee plays a central role in promoting transparency, accountability, and financial integrity within corporate governance systems. It is tasked with monitoring internal control mechanisms, scrutinizing financial statements, and ensuring compliance with regulatory requirements. Chukwu & Garba, (2023) demonstrated that the interaction between audit committee independence and gender diversity significantly moderates firm-level efficiency outcomes. As firms strive to achieve operational excellence, the audit committee's configuration and performance have become focal points of academic and policy discourse (Adewole, Sule, & Farhan, 2020; Ibrahim, Thiruvadi, & Huang, 2021). Two critical characteristics—audit committee diligence and gender diversity—have increasingly been associated with firms' scale efficiency, which refers to the optimal utilization of inputs to generate maximum output.

Audit committee diligence, often measured by the frequency of meetings and the depth of engagement, signals the committee's active involvement in financial oversight. Empirical studies have shown that higher diligence correlates with stronger monitoring and better cost management practices (Farhan, Osazuwa, & Hassan, 2020; Hassan, Khan, & Mohiuddin, 2021). Regular meetings facilitate timely interventions in financial reporting issues and strategic governance decisions. For instance, Khan, Farhan, and Hassan (2022) demonstrated that diligent audit committees significantly reduced operational waste and inefficiencies in Nigerian manufacturing firms. However, the effectiveness of such diligence is also contingent on the quality of deliberations and technical expertise of members (Mohiuddin, Hassan, & Khan, 2021). In emerging markets like Nigeria, where institutional weaknesses

are prevalent, the actual impact of audit committee diligence on scale efficiency remains an open empirical question deserving deeper investigation.

Equally important is the role of gender diversity within audit committees. Gender-diverse committees are theorized to foster broader perspectives and encourage critical dialogue, which can enhance the quality of decision-making and financial control (Osazuwa & Hassan, 2021). Recent empirical studies suggest that female representation on audit committees improves financial transparency, enhances stakeholder confidence, and promotes ethical oversight (Adegbite & Olaniran, 2019; Osemeke & Adegbite, 2020). Moreover, gender-inclusive audit committees are more likely to question assumptions and challenge managerial decisions that could undermine efficiency. However, despite the theoretical appeal, empirical findings from Nigeria show mixed results due to entrenched sociocultural norms that limit women's participation at the top governance levels (Bala & Sule, 2021; Thiruvadi & Huang, 2020).

The importance of strong audit committee characteristics in Nigeria cannot be overstated, particularly in light of corporate failures like the Cadbury Nigeria accounting scandal and the systemic governance lapses in the Nigerian banking sector during the early 2000s. These incidents prompted regulatory responses, including revised corporate governance codes by the Securities and Exchange Commission (SEC) and oversight frameworks by the Financial Reporting Council of Nigeria (FRCN), which emphasized the need for independent, gender-diverse, and active audit committees (Osazuwa, Adegbite, & Farhan, 2020). Yet, despite these regulatory efforts, manufacturing firms in Nigeria still grapple with inefficiencies and cost leakages, pointing to gaps between compliance and performance outcomes.

Prior literature has largely concentrated on broad financial metrics like Return on Assets (ROA) and Return on Equity (ROE) when assessing the impact of audit committee effectiveness, particularly in advanced economies (Jensen & Meckling, 1976; Ibrahim, Thiruvadi, & Huang, 2021). However, such financial ratios may not adequately capture operational nuances such as scale efficiency, which directly reflects a firm's ability to optimize input-output relationships. As Farhan, Osazuwa, and Hassan (2020) noted, operational performance indicators remain under-explored in corporate governance literature, particularly within the Nigerian manufacturing sector.

This study, therefore, seeks to bridge this knowledge gap by empirically analyzing the effect of audit committee diligence and audit committee gender diversity on the scale efficiency of Nigerian manufacturing firms. By focusing on these two core dimensions of audit committee attributes, the study offers insights into how effective governance mechanisms can enhance not only financial performance but also operational productivity. The results aim to inform corporate policymakers, regulators, and board practitioners on the design and deployment of governance practices that support sustainable firm growth and competitiveness in Nigeria's industrial sector.

2. Literature Review and Hypotheses Development

Board Audit Committee Diligence and Scale Efficiency

Board audit committee's diligence, indicated by the frequency and quality of meetings, reflects the committee's committeet to overseeing financial and operational activities. The frequency of audit committee meetings is positively linked with strategic oversight effectiveness, particularly in high-leverage environments (Mohammed & Yusuf, 2024). Scale efficiency, assessing a firm's resource optimization for maximum output, is vital for operational performance. Abubakar & Nnaji, (2021) found that while audit committee diligence improves compliance with financial reporting standards, its correlation with efficiency ratios varies across sectors. Audit committee diligence enhances internal



control efficiency and reduces operational risk in Nigerian manufacturing firms (Adeleke & Usman, 2023). Empirical studies on the relationship between audit committee diligence and scale efficiency present mixed findings.

Some research indicates a positive and significant relationship. For instance, Farhan et al. (2020) found that frequent, well-structured audit committee meetings enhanced operational efficiency by identifying inefficiencies and recommending corrective actions. Similarly, Hassan et al. (2021) observed that diligent audit committees in Nigerian manufacturing firms fostered accountability, ensuring optimal resource utilization.

Conversely, other studies suggest that excessive diligence may lead to negative outcomes, such as increased administrative costs and decision-making delays. Bala and Sule (2021) found that overly frequent meetings in Nigerian firms resulted in operational inefficiencies due to prolonged deliberations. Thiruvadi and Huang (2020) noted that excessive diligence could overwhelm management, creating bottlenecks that negatively impact performance.

Additionally, some studies report non-significant relationships, indicating that audit committee diligence alone may not directly influence scale efficiency. Adewole et al. (2020) found a weak positive relationship but concluded that the lack of statistical significance was due to other factors, such as committee expertise. Hassan et al. (2019) observed a non-significant negative relationship, arguing that in firms with well-established internal controls, audit committee diligence had a minimal direct impact.

In summary, the empirical relationship between audit committee diligence and scale efficiency is mixed. Positive findings highlight the role of diligence in enhancing oversight and performance, while negative and non-significant results suggest that excessive diligence or lack of complementary factors may hinder efficiency. The following hypothesis is developed to evaluate the relationship between audit committee diligence and scale efficiency in Nigerian manufacturing firms:

H1: Audit committee diligence has no positive and significant effect on the scale efficiency of Nigerian manufacturing firms.

Board Audit Committee Gender Diversity and Scale Efficiency

Board audit committee gender diversity, defined as the representation of women within the audit committee, introduces diverse perspectives and enhances decision-making processes. Scale efficiency, which evaluates a firm's ability to optimize resource utilization, is closely linked to the effectiveness of audit committee oversight. Gender-inclusive audit committees promote transparency and accountability, although the direct impact on operational scale efficiency remains inconclusive (Okonkwo & Ibrahim, 2022). Empirical research on the relationship between gender diversity in audit committees and scale efficiency yields mixed results, categorized into positive and significant, negative and significant, and non-significant relationships.

Numerous studies highlight the positive impact of gender diversity on scale efficiency. Hassan et al. (2021) found that gender-diverse audit committees improved scale efficiency in Nigerian manufacturing firms by promoting innovative solutions and ensuring more rigorous scrutiny of financial statements. Khan et al. (2022) observed that gender diversity enhances operational efficiency by introducing diverse viewpoints that strengthen decision-making processes and reduce groupthink. Mohiuddin et al. (2021) reported that female audit committee members contributed to improved financial oversight, reducing

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operational inefficiencies and enhancing resource utilization. Osazuwa et al. (2021) emphasized that gender-diverse audit committees promote transparency and accountability, which indirectly improves scale efficiency by minimizing resource mismanagement.

Conversely, some studies report a negative and significant relationship between gender diversity and scale efficiency. Bala and Sule (2021) found that excessively diverse committees sometimes encountered challenges in reaching consensus, resulting in delays that negatively impacted operational performance. Thiruvadi and Huang (2020) highlighted that in contexts where male-dominated corporate cultures prevail, gender-diverse audit committees may face resistance from management, undermining their ability to enforce cost-control measures effectively. Babatunde et al. (2021) observed that in industries where gender diversity is not actively supported, female committee members may encounter difficulties in influencing critical decisions, limiting their potential to improve scale efficiency.

Other studies indicate no significant relationship between gender diversity and scale efficiency, suggesting that diversity alone may not directly enhance operational performance. Adewole et al. (2020) found a weak positive relationship but concluded that its statistical insignificance resulted from the overriding influence of other factors, such as committee independence and diligence. Hassan et al. (2019) reported a non-significant negative relationship, emphasizing that in firms with established governance frameworks, gender diversity in audit committees may have minimal additional impact on scale efficiency. Osazuwa et al. (2020) also found no significant relationship in highly regulated industries, where operational efficiency is driven more by external oversight than by internal committee composition.

The relationship between audit committee gender diversity and scale efficiency presents mixed findings. Positive results emphasize the benefits of diverse perspectives in enhancing decision-making and operational performance, while negative findings highlight potential challenges related to cultural biases and resistance. Non-significant results suggest that gender diversity alone may not directly influence scale efficiency, emphasizing the importance of supportive governance environments. The following hypothesis is developed to evaluate the relationship between audit committee gender diversity and scale efficiency in Nigerian manufacturing firms:

H2: Audit committee gender diversity has no positive and significant effect on the scale efficiency of Nigerian manufacturing firms.

Theoretical Framework

The relationship between audit committee diligence, audit committee gender diversity, and scale efficiency can be understood through two key theoretical frameworks: agency theory and resource dependence theory. These frameworks provide insights into the role of audit committees in improving operational efficiency and promoting effective resource utilization.

Agency theory, introduced by Jensen and Meckling (1976), highlights the conflicts of interest between managers (agents) and shareholders (principals). Managers may pursue personal objectives that deviate from shareholder interests, necessitating oversight mechanisms such as audit committees to mitigate these conflicts. Audit committee diligence, demonstrated through frequent and well-structured meetings, and gender diversity, which introduces varied perspectives, serve as critical governance attributes that strengthen monitoring and promote scale efficiency by minimizing resource mismanagement and enhancing operational decision-making.



Resource dependence theory, developed by Pfeffer and Salancik (1978), posits that organizations rely on external resources and relationships to maintain stability and enhance performance. In the context of audit committees, diversity in expertise and perspectives, fostered by gender diversity, and a strong commitment to oversight through diligence, equip firms with the knowledge and skills required to address complex operational challenges. Diligent and diverse audit committees improve scale efficiency by optimizing decision-making and ensuring better resource allocation.

Of the two theoretical frameworks often employed in corporate governance research—agency theory and resource dependence theory—agency theory emerges as the most applicable to this study. This preference is grounded in the persistent governance challenges within the Nigerian corporate environment, which include managerial opportunism, information asymmetry, and weak enforcement of regulatory standards (Adegbite & Olaniran, 2019; Osazuwa & Hassan, 2021). This framework effectively explains how audit committee diligence and gender diversity mitigate agency conflicts and enhance scale efficiency by fostering accountability and improving operational oversight. In conclusion, agency theory provides a robust foundation for analyzing the impact of audit committee diligence and gender diversity on scale efficiency in Nigerian manufacturing firms.

3. Methodology

This study investigates the relationship between audit committee diligence, audit committee gender diversity, and scale efficiency in Nigerian manufacturing firms. A quantitative research design is adopted, employing a panel research approach that integrates cross-sectional and time-series data from 49 firms listed on the Nigerian Exchange Group (NGX) between 2012 and 2022. This approach accounts for firm-specific differences and examines the longitudinal effects of audit committee attributes on scale efficiency.

The study follows a positivist research philosophy, emphasizing empirical evidence and statistical analysis to test the formulated hypotheses. Purposive sampling is used to select 49 firms based on the availability of complete and consistent financial data. Secondary data is collected from annual reports and financial statements, ensuring reliability and validity using audited financial disclosures.

Panel regression analysis is employed to evaluate the relationships between the variables, with fixed effects and random effects models tested using the Hausman test to determine the most appropriate model. The independent variables are audit committee diligence and audit committee gender diversity, while scale efficiency, measured using scale efficiency based on turnover and scale efficiency based on assets, serves as the dependent variable. Firm size and leverage are included as control variables to account for external factors that may influence scale efficiency outcomes.

4. Results and Discussion

This section presents the empirical results of the study, analyzing the relationship between audit committee diligence, audit committee gender diversity, and scale efficiency in Nigerian manufacturing firms.

Descriptive Statistics

The descriptive statistics summarize the key variables, providing insights into their central tendencies and variability.

Table 1: Descriptive statistics

| Variable | Mean | Median | Maximum | Minimum | Std. Dev | N | JB (Normality) |
|----------|------|--------|---------|---------|----------|-----|----------------|
| Set | 30 | 29 | 93 | -198 | 21 | 476 | 0.0000*** |
| SEa | 3.1 | 3.6 | 617 | -256 | 36 | 487 | 0.0000*** |
| ACD | 3.8 | 4 | 8 | 0 | 0.8 | 474 | 0.0000*** |
| ACG | 14 | 14 | 125 | 0 | 17 | 475 | 0.0000*** |
| FSA | 16 | 16 | 22 | 11 | 2.2 | 487 | 0.0010** |
| LEV | 91 | 59 | 2354 | 12 | 206 | 487 | 0.0000*** |

Note: SEt – Scale Efficiency (Turnover); SEa: Scale Efficiency (Assets); Audit Committee Diligence; ACG: Audit Committee Gender Diversity; LEV: Leverage; FSA: Firm Size. (FSA and LEV are Control Variables).

Source: Researcher Computation (2024).

The descriptive statistics reveal that Nigerian manufacturing firms exhibit significant variability in cost efficiency. Scale efficiency based on turnover (SEt) has a mean of 30 and a standard deviation of 21, with extreme values ranging from -198 to 93, indicating both severe inefficiencies and optimal performance. Scale efficiency based on assets (SEa) shows a mean of 3.1 and a higher standard deviation of 36, with values spanning from -256 to 617, reflecting even greater variability in asset utilization. Both SEt and SEa display significant non-normality, as evidenced by the Jarque-Bera test (p = 0.0000). Audit committee diligence (ACD) averages 3.8 meetings annually, suggesting regular oversight activities. Audit committee gender diversity (ACG) has a mean of 14%, indicating low female representation, though some firms report values up to 125%, suggesting higher female participation in certain cases. Firm size (FSA) averages 16 with a standard deviation of 2.2, implying minimal variability among firms. Leverage (LEV) exhibits a high mean of 91 and a substantial standard deviation of 206, reflecting diverse financial risk exposures. Except for firm size, all variables are significantly non-normally distributed, necessitating appropriate statistical adjustments in further analyses.

Correlation Analysis

The correlation analysis assesses the strength and direction of relationships between the study variables.

Table 2: Correlation Analysis

| Variable | Set | SEa | ACD | ACG | FS | LEV |
|----------|---------|---------|---------|---------|---------|--------|
| SEt | 1.0000 | | | | | |
| SEa | 0.4118 | 1.0000 | | | | |
| ACD | 0.2381 | 0.1489 | 1.0000 | | | |
| ACG | 0.1068 | 0.1452 | -0.0343 | 1.0000 | | |
| FS | 0.1859 | 0.2323 | 0.1573 | 0.1465 | 1.0000 | |
| LEV | -0.0594 | -0.7382 | -0.0393 | -0.0501 | -0.1058 | 1.0000 |

Source: Researcher Computation (2024).

The descriptive statistics reveal that scale efficiency based on turnover (SEt) and assets (SEa) exhibit considerable variability among Nigerian manufacturing firms, with SEt averaging 30 (SD = 21) and SEa averaging 3.1 (SD = 36); both measures show significant non-normality (Jarque-Bera p = 0.0000), indicating diverse efficiency levels across firms. Audit committee diligence (ACD) averages 3.8 meetings annually, suggesting regular oversight activities, while audit committee gender diversity (ACG) has a



mean of 14%, reflecting relatively low female representation, though some firms report higher participation. Firm size (FSA) shows minimal variability (mean = 16, SD = 2.2), whereas leverage (LEV) displays substantial variation (mean = 91, SD = 206), indicating differing financial risk exposures. Correlation analysis indicates a moderate positive relationship between SEt and SEa (r = 0.4118), suggesting that firms efficient in turnover also tend to be efficient in asset utilization. ACD correlates positively with both SEt (r = 0.2381) and SEa (r = 0.1489), implying that diligent audit committees may enhance scale efficiency. In contrast, ACG shows weaker correlations with SEt (r = 0.1068) and SEa (r = 0.1452), suggesting limited direct impact on efficiency. Firm size correlates positively with SEt (r = 0.1859) and SEa (r = 0.2323), indicating that larger firms may achieve better efficiency. Leverage exhibits a weak negative correlation with SEt (r = -0.0594) and a strong negative correlation with SEa (r = -0.7382), highlighting that higher leverage may adversely affect efficiency, particularly in asset utilization.

Regression Analysis

The regression analysis assesses how audit committee effectiveness influences corporate financial performance by examining the significance and direction of these relationships.

Table 3: Regression Results

| Variable | Expected Sign | Model 1: SEt | Model 2: SEa | |
|-----------------------------------|----------------------|-------------------|--------------------|--|
| Constant | - | 14.12 (0.648) | -12.03 (0.070) | |
| ACD | + | 0.95 (0.397) | 2.23 (0.024)* | |
| ACG | + | -0.07 (0.225) | -0.03 (0.580) | |
| FS | + | 1.62 (0.404) | 0.32 (0.852) | |
| LEV | | -0.02 (0.003)** | -0.11 (0.000)*** | |
| F-value (p-value) | | 3.00 (0.007)*** | 43.25 (0.000)*** | |
| Breusch-Pagan LM Test (p-value) | | 357.37 (0.000)*** | 2414.22 (0.000)*** | |
| Portmanteau Test (p-value) | | 45.00 (0.4720) | 46.74 (0.483) | |
| Ramsey RESET (p-value) | | 14.44 (0.000)*** | 73.21 (0.000)*** | |
| Hausman Test (p-value) | | 275.42 (0.000)*** | 118.99 (0.000)*** | |
| Multicollinearity test | | 1.19 | 1.20 | |
| Heteroskedasticity Test (p-value) | | N/A | 0.0000*** | |
| R-square | | 0.0419 | 0.358 | |
| Observations | | 466 | 472 | |

p-values in parentheses indicate significance at the 5% level, ** at 1%, and *** at 0.1%.

Source: Researcher Computation (2024).

The regression analysis explores the influence of audit committee diligence (ACD) and audit committee gender diversity (ACG) on scale efficiency, evaluated through turnover-based (SEt) and asset-based (SEa) metrics. In Model 1, focusing on SEt, ACD exhibits a positive but statistically insignificant effect (0.95, p = 0.397), indicating a limited impact on turnover efficiency. ACG demonstrates a negative, insignificant effect (-0.07, p = 0.225), suggesting minimal influence on turnover efficiency. Firm size (FS) shows a positive association (1.62, p = 0.404) that is not statistically significant. Leverage (LEV), however, presents a significant negative effect (-0.02, p = 0.003), implying that higher leverage reduces turnover efficiency.

In Model 2, which assesses SEa, ACD has a significant positive effect (2.23, p = 0.024), indicating that diligence enhances asset-based efficiency. ACG remains negative and insignificant (-0.03, p = 0.580), showing little impact on asset efficiency. FS is positive but not significant (0.32, p = 0.852). LEV exhibits a strong negative, significant effect (-0.11, p = 0.000), suggesting that high leverage impairs asset efficiency. Model 2 explains more variance in efficiency ($R^2 = 0.358$) compared to Model 1 ($R^2 = 0.0419$), highlighting the stronger explanatory power of asset-based efficiency measures.

To address heteroskedasticity and non-normality concerns, the study employed robust regression estimation techniques, which adjust standard errors to remain valid even in the presence of heteroskedastic disturbances. This method ensures that the coefficient estimates are reliable, and inference remains statistically sound despite violations of classical OLS assumptions

Discussion of Findings

The regression analysis indicates that audit committee diligence (ACD) positively influences asset-based scale efficiency (SEa) significantly (2.23, p = 0.024), but its effect on turnover-based efficiency (SEt) is positive yet statistically insignificant (0.95, p = 0.397). This suggests that diligent audit committees enhance asset efficiency through improved oversight, aligning with Farhan et al. (2020) and Hassan et al. (2021), who found that frequent and structured audit committee meetings in Nigerian manufacturing firms facilitated better resource utilization and operational efficiency. However, excessive diligence may lead to diminishing returns and increased operational costs, as noted by Bala and Sule (2021) and Babatunde et al. (2021), indicating that the quality and focus of committee engagements are crucial for enhancing scale efficiency.

Regarding audit committee gender diversity (ACG), the regression results show a negative and statistically insignificant effect on both SEt (-0.07, p = 0.225) and SEa (-0.03, p = 0.580). This implies that gender diversity alone may not significantly influence scale efficiency in Nigerian manufacturing firms. While Adewole et al. (2020) reported that gender diversity introduced varied perspectives without measurable improvements in operational efficiency, other studies like Hassan et al. (2021) and Khan et al. (2022) found that gender-diverse audit committees enhanced scale efficiency by fostering critical evaluation and accountability. The inconsistency between these findings and the current study highlights the context-dependent nature of the relationship, suggesting that in Nigeria, cultural and societal norms may limit the effectiveness of gender diversity initiatives. Therefore, a supportive governance environment and stronger regulatory frameworks are necessary to maximize the benefits of gender diversity in audit committees

5. Conclusion and Recommendations

The study examined the relationship between audit committee diligence, gender diversity, and scale efficiency in Nigerian manufacturing firms. Findings indicate that audit committee diligence positively and significantly affects asset-based scale efficiency, suggesting that frequent, well-structured meetings enhance resource utilization and oversight. However, its impact on turnover-based efficiency is positive but not statistically significant, implying limited influence on short-term financial performance. Conversely, audit committee gender diversity shows a negative, statistically insignificant relationship with both turnover-based and asset-based scale efficiency, indicating that while diversity may introduce varied perspectives, it does not directly improve operational efficiency in this context. These results highlight that audit committee effectiveness in promoting scale efficiency depends not only on diligence and diversity but also on factors like governance culture and regulatory enforcement.



To enhance scale efficiency, audit committees should focus on high-quality deliberations and strategic oversight during meetings. Firms should ensure that female audit committee members possess the necessary expertise, possibly through capacity-building programs, to contribute effectively. Regulatory bodies like the Securities and Exchange Commission (SEC) and the Financial Reporting Council of Nigeria (FRCN) should strengthen governance frameworks to align audit committee practices with operational efficiency goals. Additionally, fostering a culture of inclusivity and collaboration within audit committees can help value diverse perspectives and minimize operational barriers. Regular reviews of audit committee effectiveness are recommended to assess the alignment between diligence, diversity, and operational outcomes, enabling firms to refine governance practices for sustainable efficiency.

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