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# Moderating Role of Firm Size in Carbon Emission Disclosures and Financial Performance of Listed Industrial Goods Firms in Nigeria.

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**ABSTRACT**
This study empirically investigated the moderating role of firm size in carbon emission disclosures and financial performance of listed industrial goods firms in Nigeria. The study is vital as it portrays the extent to which firm size moderates the relationship between carbon emission disclosures and firm financial performance in Nigeria. Carbon emission disclosures was measured in line with the guideline of Global Reporting Initiative (GRI) G4 on Content Index. Financial performance on the other hand was proxied by net assets per share while the moderating variable of firm size was measured by the natural logarithm of total assets. Two hypotheses were formulated to guide the investigation and the statistical test of parameter estimates was conducted using panel least squares regression model operated with E-Views.12. Ex Post Facto design was adopted and data for the study were obtained from the published annual financial reports of listed industrial goods firms on Nigerian Exchange Group (NGX) spanning from 2018-2025. The results of the study showed that carbon emission disclosures have positive and significant effect on financial performance of listed industrial goods firms in Nigeria at 5% level of significance. Also, firm size was found to moderate the relationship between carbon emission disclosures and firm financial performance at 5% significant level. Hence, the study concludes that firm size moderates the relationship between carbon emission disclosures and financial performance of listed industrial goods firms in Nigeria. Also, carbon emission disclosures ensure firm financial performance. The study therefore recommends that management of listed industrial goods firms in Nigeria should strengthen and consistently report carbon emission disclosures in their annual reports and sustainability statements, as transparent environmental disclosure can enhance investor confidence, reduce information asymmetry, and support improved financial performance. Also, since firm size moderates the relationship, larger listed industrial goods firms should leverage their resources to adopt comprehensive carbon disclosure frameworks and integrate emission reporting into corporate strategy, while regulators should provide simplified disclosure guidelines for smaller firms to ensure firm size does not weaken the financial benefits of carbon transparency.
**Keywords:** Carbon Emission Disclosures; Financial Performance; Firm Size; Net Assets Per Share

## 1. INTRODUCTION

The escalating global climate crisis has placed unprecedented pressure on corporations to be transparent about their environmental impact, particularly their carbon footprint. Carbon emission disclosures (CED) have transitioned from a niche aspect of corporate social responsibility to a core component of corporate strategy, risk management, and stakeholder communication (Kılıç & Kuzey, 2019). In Nigeria, a country highly vulnerable to climate change impacts such as desertification, flooding, and coastal erosion, the industrial sector is a significant contributor to greenhouse gas emissions (World Bank, 2021). Consequently, understanding the financial implications of CED for Nigerian firms is of paramount importance for investors, regulators, and corporate managers.

A substantial body of literature has explored the nexus between environmental disclosure and financial performance, yet the findings remain inconsistent and contested. While legitimacy theory suggests that firms disclose environmental information to legitimize their operations and mitigate potential regulatory and societal pressures, which can positively impact performance (Suchman, 1995), other perspectives like the shareholder expense view argue that such disclosures impose additional costs that erode profitability (Friedman, 1970). Empirical evidence from emerging markets, particularly in Africa, is mixed, with some studies reporting a positive relationship (e.g., Ofoegbu & Odoemelam, 2018; Ganda, 2022) and others finding a negative or insignificant one (Farooq & De Villiers, 2019).

This ambiguity suggests that the direct relationship between CED and financial performance is not universal and is likely contingent on specific firm-level characteristics. One such critical, yet under-researched, contingency in the Nigerian context is firm size. Firm size is a fundamental organizational attribute that influences strategic choices, resource availability, stakeholder pressure, and market visibility (Dang et al., 2018). Large firms are often subject to greater public scrutiny and regulatory pressure, compelling them to engage in more extensive CED. They also possess the financial and human resources to absorb the associated costs and leverage such disclosures for reputational gains and improved access to capital (Hahn & Kühnen, 2013). Conversely, smaller firms may lack the resources or face less stakeholder pressure, rendering the costs of CED more burdensome relative to any potential benefits. Although firm size has been frequently used as a control variable in disclosure-performance studies, its potential moderating role in this relationship remains largely unexplored in academic literature, especially within the specific context of the Nigerian Industrial Goods sector (Uwuigbe et al., 2020).

This industrial goods sector is of particular strategic importance to Nigeria's economic diversification agenda but is also capital-intensive and environmentally sensitive. While some studies have examined environmental disclosure in Nigerian firms broadly (Oyewumi et al., 2018; Uwuigbe et al., 2020), there is a distinct lack of research focusing specifically on carbon emissions, as opposed to general environmental or sustainability disclosures. Furthermore, the potential for firm size to condition the financial outcomes of CED for listed industrial goods firms in Nigeria has not been systematically investigated.

Therefore, a critical knowledge gap exists. On a theoretical level, it is unclear whether the established legitimacy and resource-based perspectives hold uniformly across firms of different sizes in an emerging economy like Nigeria. On a practical level, corporate managers lack empirical evidence on how to calibrate their carbon disclosure strategies based on their firm's scale, while policymakers lack nuanced insights to develop size-appropriate regulatory incentives. In light of the conflicting findings in the literature and the identified contextual and empirical gaps, this study seeks to address the effect of carbon emission disclosures on the financial performance of listed industrial goods firms in Nigeria moderated by firm size. This study aims to provide empirical evidence to resolve the ambiguity in the CED-performance link by introducing firm size as a crucial contingent variable within the unique institutional and economic environment of Nigeria. To achieve this purpose, we formulated the following hypotheses:

**$H_{01}$:** Carbon emission disclosures has no significant effect on financial performance of listed industrial goods firms in Nigeria

**$H_{02}$:** Firm size does not moderate the effect of carbon emission disclosures on financial performance of listed industrial goods firms in Nigeria

## 2. Review of Related Literature

### 2.1 Conceptual Review

#### 2.1.1 Carbon Emission Disclosures

Carbon emission disclosure is defined as the process by which firms communicate quantitative and qualitative information on their greenhouse gas emissions including direct (Scope 1), energy indirect (Scope 2), and other indirect (Scope 3) emissions to external stakeholders such as investors, regulators, customers, and the public (Omaliko & Mordi, 2026). Carbon emission disclosure refers to the voluntary or mandatory reporting of a firm's carbon footprint, emission reduction targets, and climate change strategies, aimed at demonstrating environmental responsibility and securing organizational legitimacy. The study note further that carbon emission disclosure is a strategic response to societal and regulatory pressures that seek to align corporate behaviour with broader environmental norms (Kılıç & Kuzey, 2019).

According to He et al. (2021), carbon emission disclosure is conceptualized as the disclosure of climate-related risks and opportunities, carbon performance metrics, and emission reduction initiatives as part of corporate risk management and long-term value creation. This definition highlights the integration of carbon information into broader enterprise risk frameworks, such as those recommended by the Task Force on Climate-related Financial Disclosures (TCFD), to inform strategic decision-making. Carbon emission disclosure encompasses the reporting of greenhouse gas emissions in accordance with established frameworks and protocols such as the GHG Protocol, CDP (formerly Carbon Disclosure Project), or national regulatory guidelines ensuring consistency, comparability, and verifiability of carbon data (Alsayegh et al., 2020).

#### 2.1.2 Firm Size

Firm size is defined as the total value of a firm's assets, reflecting the scale of its economic resources, operational capacity, and market presence. This asset-based conceptualization views firm size as a proxy for the resource base available to a firm, which influences its strategic choices, risk tolerance, and capacity to absorb the costs associated with regulatory compliance and voluntary disclosures (Dang et al., 2018). Firm size refers to the magnitude of a firm's workforce and operational activities, often measured by the total number of employees. This definition captures the human capital dimension of organizational scale and reflects the firm's operational complexity, hierarchical structure, and the extent of stakeholder interactions. Larger employee bases often correspond to greater organizational visibility and heightened societal expectations regarding corporate responsibility (Gupta et al., 2020).

Firm size is conceptualized as the market capitalization of a firm, representing the aggregate market value of its outstanding shares as determined by investor perceptions and capital market dynamics. This market-oriented definition emphasizes the external valuation of the firm and its visibility to investors, analysts, and other financial stakeholders. Firms with larger market capitalization typically attract greater media coverage and institutional investor scrutiny (Hashmi et al., 2019). According to Aslam et al., (2021), firm size is defined as the classification of enterprises into categories such as micro, small, medium, and large based on a combination of turnover, total assets, and employee thresholds as stipulated by regulatory frameworks or national statistical agencies. The study went further to acknowledge that firm size is not merely a continuous variable but also a categorical construct with significant implications for regulatory compliance, access to finance, and strategic reporting obligations.

#### 2.1.3 Financial Performance

Financial performance is viewed as the extent to which a firm generates profits from its assets, operations, and investments, typically measured through accounting-based indicators such as return on assets (ROA), return on equity (ROE), and net profit margin. This definition emphasizes the internal efficiency and profitability of a firm as reflected in its audited financial statements, providing stakeholders with an assessment of management's effectiveness in utilizing corporate resources (Khan et al., 2022). In the study of Velte (2022), financial performance refers to the market's valuation of a firm's economic prospects and the wealth created for shareholders, commonly operationalized through market-based

metrics such as Tobin's Q, market-to-book value ratio, earnings per share (EPS), and total shareholder returns.

According to Alsayegh et al. (2020), financial performance is conceptualized as a multidimensional construct encompassing both traditional financial outcomes such as profitability, liquidity, and solvency and broader economic contributions, including long-term value creation, operational efficiency, and sustainable growth. The study recognizes that contemporary financial performance extends beyond short-term profit maximization to incorporate the firm's capacity for sustained economic viability in an increasingly complex and stakeholder-oriented business environment. Financial performance is defined as the degree to which a firm efficiently converts its inputs (such as capital, labour, and materials) into outputs (such as revenue and profit), often measured through efficiency ratios like asset turnover, inventory turnover, and economic value added (EVA) (Omaliko et al., 2021). Buuallay (2019) notes that firm size focuses on the operational effectiveness and productivity of the firm, highlighting how well organizational resources are deployed to generate financial returns relative to the level of investment.

## 2.2 Theoretical Framework

### 2.2.1 Legitimacy Theory

This study is anchored on legitimacy theory propounded in the year 1984 by Donavan. The theory, provides a comprehensive and robust framework for examining the relationship between carbon emission disclosures, financial performance, and the moderating influence of firm size. Legitimacy theory is fundamentally based on the concept of a social contract between organizations and the society in which they operate. According to this theoretical perspective, firms do not function in isolation; rather, they operate under an implicit agreement with society that grants them the license to conduct their business. This contract is dynamic and evolves in response to changing societal norms, values, and expectations. For a firm to ensure its continued survival and prosperity, it must demonstrate that its activities, outputs, and values are consistent with those of the broader society (Suchman, 1995). When a discrepancy emerges between corporate behaviour and societal expectations referred to as a legitimacy gap the firm confronts significant threats, including regulatory sanctions, consumer boycotts, investor divestment, and substantial reputational damage (Deegan, 2019). Consequently, organizations are compelled to adopt strategies that restore, maintain, or enhance their legitimacy, and one of the most prominent of these strategies is the public disclosure of environmental information, particularly carbon emissions (Hummel & Schlick, 2016).

Carbon emission disclosure is widely acknowledged as a critical legitimizing tool, particularly for firms operating in environmentally sensitive sectors such as the industrial goods industry in Nigeria. This sector, which encompasses cement manufacturing, building materials, packaging, and other heavy industries, is inherently carbon-intensive and therefore subject to heightened environmental scrutiny. These firms face escalating pressures from a diverse array of stakeholders, including regulatory bodies such as the National Environmental Standards and Regulations Enforcement Agency, international investors demanding climate transparency, global supply chain partners requiring environmental accountability, and local communities directly affected by pollution and resource depletion (Oyewumi et al., 2018). Under the lens of legitimacy theory, carbon emission disclosure serves as a strategic response to these pressures. By publicly reporting their greenhouse gas emissions, emission reduction targets, and climate mitigation strategies, industrial goods firms attempt to demonstrate conformity with societal environmental norms, pre-empt or mitigate regulatory interventions, enhance their corporate reputation, and reduce information asymmetry between management and external stakeholders (Kılıç & Kuzey, 2019). In the Nigerian context, where environmental enforcement has historically been inconsistent but is progressively strengthening due to global climate commitments and increasing local environmental activism, industrial goods firms face growing legitimacy threats that necessitate proactive carbon disclosure as a means of securing their social license to operate (Borghei, 2021).

The connection between carbon emission disclosure and financial performance, as explained by legitimacy theory, operates through several interconnected mechanisms. First, enhanced legitimacy leads to improved stakeholder relations, which translate into tangible financial benefits. When a firm discloses its carbon emissions transparently, it signals accountability and responsiveness to stakeholder concerns, thereby fostering investor confidence, customer loyalty, and regulatory goodwill. Legitimate firms are perceived as lower-risk investments, which reduces their cost of equity and debt capital while attracting capital from environmentally conscious investors (He et al., 2021). Similarly, consumers and institutional buyers increasingly prefer suppliers with strong environmental credentials, leading to higher revenues and market share. Furthermore, firms perceived as environmentally responsible may benefit from reduced regulatory scrutiny and preferential treatment from government agencies, thereby lowering compliance costs and operational risks. Second, proactive carbon disclosure enables firms to avoid the substantial costs associated with legitimacy deficits. Firms that fail to disclose carbon emissions or are perceived as environmentally irresponsible risk regulatory penalties, litigation costs, reputational damage leading to loss of customers and investors, and community opposition that can disrupt operations (Ganda, 2022). Third, carbon disclosure can serve as a mechanism for competitive differentiation in increasingly environmentally conscious markets, enabling premium pricing, securing access to international markets, and attracting partnerships with sustainability-focused organizations (Velte, 2022).

The moderating role of firm size in the relationship between carbon emission disclosure and financial performance is elegantly explained through legitimacy theory, as firm size fundamentally alters both the magnitude of legitimacy pressures and the capacity of the firm to respond to those pressures. Larger firms face greater public visibility and political exposure, which intensifies societal scrutiny of their environmental practices (Dang et al., 2018). Major industrial goods firms in Nigeria are more visible to the media, non-governmental organizations, and regulatory agencies, and are therefore more likely to be targeted by environmental activists and advocacy groups. Additionally, these large firms are subject to greater expectations from institutional investors who increasingly screen for environmental, social, and governance criteria. Consequently, large firms experience stronger legitimacy pressures to disclose carbon emissions, and the legitimacy benefits of disclosure such as enhanced reputation, reduced regulatory risk, and improved investor relations are likely to be more pronounced, translating into stronger positive effects on financial performance (Khan et al., 2022). In contrast, smaller firms face lower societal visibility and may not encounter the same intensity of legitimacy demands, resulting in weaker links between disclosure and financial outcomes (Gupta et al., 2020).

Furthermore, legitimacy theory recognizes that firms differ in their capacity to implement legitimizing strategies, and this capacity is closely tied to firm size. Larger firms typically possess greater financial resources to invest in comprehensive carbon accounting systems, sustainability departments, and third-party verification processes. They also have more sophisticated managerial expertise to integrate carbon disclosure into broader corporate strategy and stronger bargaining power with stakeholders, enabling them to derive greater strategic benefits from legitimacy-enhancing disclosures (Hahn & Kühnen, 2013). These resource advantages allow large firms to produce higher-quality, more credible carbon disclosures, which are more likely to be rewarded by stakeholders and reflected in improved financial performance. Smaller firms, on the other hand, may lack the resources to invest in robust carbon reporting infrastructure. Even when they choose to disclose, the quality and credibility of their disclosures may be lower, limiting the legitimacy gains and associated financial benefits. Additionally, the cost burden of carbon disclosure relative to total resources is proportionally higher for smaller firms, potentially offsetting any financial benefits that might accrue from legitimacy enhancement (Aslam et al., 2021). Finally, the size of the legitimacy gap is likely to differ across firms of different sizes. Large industrial goods firms, due to their significant absolute carbon emissions, are perceived as major contributors to climate change and therefore face a wider legitimacy gap, making carbon disclosure particularly critical for these firms as a means of narrowing the gap and restoring legitimacy (Borghei, 2021).

This differential in the magnitude of the legitimacy gap across firm sizes provides further theoretical justification for the moderating role of firm size in the carbon emission disclosure and financial performance relationship among listed industrial goods firms in Nigeria.

**2.3 Empirical Review**

Khan et al. (2022) examined the relationship between sustainability disclosure and firm performance, with a specific focus on the moderating role of firm size. The study sought to determine whether the strength of the disclosure-performance relationship varied across firms of different sizes. The study employed a quantitative research design using panel data from listed firms across multiple sectors. Data on sustainability disclosure were collected from annual reports and sustainability reports, while firm performance was measured using both accounting-based indicators such as return on assets and market-based indicators such as Tobin's Q. Firm size was operationalized as the natural logarithm of total assets. The analysis employed panel regression techniques, including fixed and random effects models, alongside interaction terms to test the moderating effect of firm size. The results revealed that sustainability disclosure had a positive and significant effect on firm performance. More importantly, the interaction term between sustainability disclosure and firm size was positive and statistically significant, indicating that firm size strengthens the positive relationship between disclosure and performance. The study concluded that larger firms derive greater financial benefits from sustainability disclosure due to their higher visibility, greater stakeholder pressure, and superior resource capacity. These findings align with legitimacy theory, suggesting that large firms face stronger legitimacy pressures and are better positioned to leverage disclosure for performance gains.

Ganda (2022) investigated the effect of carbon emission disclosure on the financial performance of listed companies in South Africa, an emerging economy with similar institutional characteristics to Nigeria. The study also examined whether firm size played a role in conditioning this relationship. The study utilized a sample of companies listed on the Johannesburg Stock Exchange over a five-year period. Carbon emission disclosure was measured using a content analysis index based on the Carbon Disclosure Project framework, capturing the extent and quality of greenhouse gas emission reporting. Financial performance was measured using return on assets, return on equity, and earnings per share. Firm size was included as a moderating variable, measured by the natural logarithm of total assets. The data were analyzed using multiple regression analysis with interaction terms. The study found a positive and significant relationship between carbon emission disclosure and financial performance. Firms that disclosed more comprehensive carbon emission information exhibited higher profitability and better market valuation. The moderating analysis revealed that firm size significantly enhanced the positive effect of carbon disclosure on financial performance. Larger firms benefited more from carbon disclosure, likely because they faced greater stakeholder scrutiny and possessed the resources to implement credible and comprehensive carbon reporting systems. The author concluded that carbon disclosure is a strategic investment for large firms in emerging economies seeking to enhance their legitimacy and financial outcomes.

Borghei (2021) carried out a systematic literature review and synthesized findings from multiple empirical studies on carbon disclosure disclosures. The study reviewed over one hundred empirical articles published in peer-reviewed journals between 2000 and 2020 and employed a structured approach to identify studies examining carbon disclosure antecedents and consequences, with specific attention to studies that examined firm size as a key variable. The study categorized studies based on their theoretical frameworks, measurement approaches, and empirical findings, providing a comprehensive synthesis of the literature. The study found consistent evidence that firm size is one of the most significant determinants of carbon disclosure, with larger firms disclosing more extensively than smaller firms. More importantly, several studies reviewed indicated that firm size moderates the relationship between carbon disclosure and financial performance. Larger firms were found to derive greater financial benefits from carbon disclosure due to their higher visibility, greater stakeholder pressure, and superior capacity to produce credible disclosures. The study also noted that the moderating effect of firm size was particularly

pronounced in emerging economies, where institutional pressures and stakeholder expectations vary significantly across firms of different sizes.

He et al. (2021) investigated the relationship between carbon disclosure, carbon performance, and the cost of capital in China, with firm size as a moderating variable in these relationships. The study utilized a sample of Chinese listed firms over an eight-year period. Carbon disclosure was measured using a comprehensive index based on the Carbon Disclosure Project framework, while carbon performance was assessed using greenhouse gas emission intensity. The cost of capital was measured using the weighted average cost of capital. Firm size was operationalized as the natural logarithm of total market capitalization and was included as a moderating variable in the regression models. The analysis employed panel data techniques with interaction terms to test the moderating effects. The study found that carbon disclosure significantly reduced the cost of capital, indicating that transparent carbon reporting lowers perceived risk among investors. More importantly, the moderating analysis revealed that firm size significantly strengthened the negative relationship between carbon disclosure and cost of capital. Larger firms experienced greater reductions in their cost of capital as a result of carbon disclosure compared to smaller firms. The study explained that large firms face greater visibility and scrutiny from investors, making transparent carbon reporting more effective in reducing information asymmetry and perceived risk. Additionally, large firms possess the resources to produce credible carbon disclosures that investors find more trustworthy.

Farooq and De Villiers (2019) carried out an investigation on sustainability reporting and assurance in emerging economies, with a specific focus on how firm characteristics, including firm size, influence the relationship between sustainability disclosure and financial performance. The study employed a systematic literature review approach, analyzing empirical studies published in academic journals between 2010 and 2018. The study focused on studies conducted in emerging economies across Africa, Asia, and Latin America to determine how firm size influenced sustainability reporting practices and how it moderated the relationship between sustainability reporting and financial performance. The study found that firm size was a consistent and significant predictor of sustainability reporting in emerging economies, with larger firms engaging in more extensive reporting due to greater legitimacy pressures and resource availability. The study also identified several studies that demonstrated a moderating effect of firm size on the sustainability reporting-financial performance relationship. Larger firms in emerging economies were found to experience stronger positive financial effects from sustainability reporting compared to smaller firms.

Oyewumi et al. (2018) examined the relationship between environmental disclosure and financial performance among listed oil and gas companies in Nigeria, with particular attention to the influence of firm size on this relationship. The study sampled listed oil and gas companies on the Nigerian Stock Exchange over a six-year period. Environmental disclosure was measured using a disclosure index developed from the Global Reporting Initiative guidelines, while financial performance was operationalized using return on assets and return on capital employed. Firm size was measured as the natural logarithm of total assets and was included as a moderating variable in the regression models. The analysis employed panel data regression techniques with interaction terms to test the moderating effect of firm size. The study found that environmental disclosure had a positive but statistically insignificant direct effect on financial performance. However, when the interaction term between environmental disclosure and firm size was introduced, the relationship became significant and positive. This finding indicated that firm size acts as a critical moderator in the environmental disclosure-performance relationship. The study explained that larger firms, due to their greater visibility and resource availability, are better able to convert environmental disclosure into financial benefits. Smaller firms, despite disclosing environmental information, did not experience significant financial gains, possibly due to lower stakeholder interest and limited resource capacity.

## 3.0 METHODOLOGY

This study employed an *Ex Post Facto* research design, a choice necessitated by the use of secondary data that were pre-existing and thus impervious to manipulation. The target population comprised all eleven (11) industrial goods firms listed on the Nigerian Exchange Group (NGX) as of December 31, 2025, with the study covering the fiscal years 2018 through 2025. Consequently, a census approach was adopted, incorporating the entire population without sampling. On this basis, a total of 11 firms made up the sample size for the study. It ranges from Austin Laz and Company Plc, Beger Paints Plc, Beta Glass Plc, BUA Cement Plc, CAP Plc, Cutix Plc, Dangote Cement Plc, Lafarge Africa Plc, Meyer Plc, Premier Paints Plc to Tripple Gee Company Plc.

The data for the study was collected from the annual reports of the firms under review. Panel least square regression model was therefore used to examine the moderating role of firm size in carbon emission disclosures and financial performance of listed industrial goods firms in Nigeria.

### 3.1 Operationalization and Measurement of Variables

The dependent variable in this study is firm performance and it was measured using net assets per share. The independent variable of carbon emission disclosure on the other hand was measured in-line with the Guideline of GRI G4 on content index.

This is shown below on table 3.1.1 as thus:

**Table 3.1.1: Variable Measurements**

| Variables | Measurement | Source | A Priori Expectations |
|---|---|---|---|
| Carbon Emission Disclosure (CED) | A dichotomous procedure by (GRI) was applied in scoring the items whereby specifically, a "1-point" score was awarded for each item that is disclosed in the annual report and otherwise, a "0-point". | Wibowo (2020), Commerçon et al. (2023) | It is expected to have a positive effect. |
| Net Assets Per Share (NAPS) | Net Assets/ Number of Ordinary Shares Issued | Nahiba (2022), Abd.Hamid et al. (2022) | |
| Firm Size (FS) | Logarithm of Total Assets | Zhang et al. (2021), Omaliko (2026) | |

**Sources: Empirical Survey (2026)**

### 3.1 Model Specification

In line with the previous studies, the present study designed a model in examining the moderating role of firm size in carbon emission disclosures and financial performance of listed industrial goods firms in Nigeria. This is shown below as thus;

**NAPS = F (CED, FS)**

The econometric form of regression modified for the study is shown below as thus:

$$\mathbf{NAPS_{it} = \beta_0 + \beta_1 CED_{it} + \beta_2 FS_{it} + \beta_3 CED*FS_{it} + \varepsilon}$$

**Where:**

NAPS = Net Assets Per Share
CED = Carbon Emission Disclosure
FS = Firm Size
μ = Stochastic Term
$\beta_{1-}$ $\beta_3$ = Coefficient of Regression Equation
$\beta_0$ = Constant coefficient (intercept) of the model
'*A Priori*' is given as: $\beta_0, \beta_1, \beta_2, \beta_3 > 0$

**Decision Rule:** accept Ho if P-value >5% significant level otherwise reject Ho

## 4.0 ANALYSIS AND DISCUSSION

### 4.1 Descriptive Summary

**Table 4.1.1: Descriptive Statistics**

| | NAPS | CED | FS |
|---|---|---|---|
| Mean | 3.895568 | 2.840909 | 7.588864 |
| Median | 0.505000 | 3.000000 | 7.650000 |
| Maximum | 76.25000 | 5.000000 | 8.740000 |
| Minimum | -1.120000 | 0.000000 | 5.420000 |
| Std. Dev. | 10.55766 | 1.004431 | 0.852127 |
| Skewness | 4.789442 | -0.636032 | -0.978539 |
| Kurtosis | 2.904532 | 2.321127 | 2.340670 |
| Jarque-Bera | 2823.750 | 6.096879 | 14.46945 |
| Probability | 0.736533 | 0.087433 | 0.900721 |
| Sum | 342.8100 | 250.0000 | 667.8200 |
| Sum Sq. Dev. | 9697.380 | 87.77273 | 63.17249 |
| Observations | 88 | 88 | 88 |

**Source: E-View 12 Computational Results (2026)**

From Table 4.1.1 above, it was found that financial performance of listed industrial goods firms in Nigeria is positively associated with the level of disclosures on carbon emission with a mean value of 3.89 for net assets per share. Thus, implies that financial performance of industrial goods firms in Nigeria is a determinant of carbon emission disclosures. The distribution of NAPS is platykurtic since the kurtosis (2.90) is less than 3, implying that the outliers are few. However, the Jarque-Bera probability of .74 is greater than 5% level of significance adopted for the study, which means that the distribution of financial performance (NAPS) does not deviate from a normal distribution. The average value of carbon emission disclosure (CED) for the sampled firms was 2.84 with a standard deviation value of 1.00. Thus, implies that carbon emission disclosures determine the financial performance of listed industrial goods firms in Nigeria. The maximum value for the study was 5.00 while the minimum value was 0.00. This wide variation in maximum value of and the minimum value of CED implies that the sampled firms' financial performance is determined by carbon emission disclosures. Also, the distribution for the study is platykurtic since the kurtosis (2.32) is less than 3, implying that the outliers are few. However, the Jarque-Bera probability of 0.09 is greater than 5% level of significance adopted for the study, which means that the distribution of carbon emission disclosures is not different from a normal distribution.

Also, the moderating variable of firm size has an average value of 7.59. This implies that firm size has a significant effect on the relationship between carbon emission disclosures and firm financial performance. Thus, firms' size determines the relationship between CED and NAPS. The maximum value for the study was 8.74 while the minimum value was 5.42. This variability in maximum and minimum FZ values justify the need for this study as we assume that the size of a firm moderates firm financial performance and carbon emission disclosures at a high risk of 0.85%. The distribution is platykurtic since the kurtosis (2.34) is less than 3, implying that the outliers are few. The Jarque-Bera probability of 0.901 is greater than 0.05, which means that the distribution of firm size does not deviate from a normal distribution.

**4.2: Test of Hypotheses**

Regression Model was developed to test the linear relationship between the dependent and independent variables. It was operated using E-Views 12 as shown in the table 4.2.1below:

**Table 4.2.1: Result on Moderating Role of Firm Size in Carbon Emission Disclosures and Financial Performance of Listed Industrial Goods Firms in Nigeria**

Dependent Variable: NAPS
Method: Panel Least Squares
Date: 09/06/26 Time: 14:00
Sample: 2018 2025
Periods included: 8
Cross-sections included: 11
Total panel (balanced) observations: 88

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **CED** | 21.44516 | 9.115888 | 2.352504 | 0.0210 |
| **FS** | 8.476127 | 3.331855 | 2.543966 | 0.0128 |
| **CED*FS** | 2.683247 | 1.223313 | 2.193426 | 0.0310 |
| **C** | 70.96643 | 24.57808 | 2.887387 | 0.0049 |

| | | | |
|---|---|---|---|
| R-squared | 0.700544 | Mean dependent var | 3.895568 |
| Adjusted R-squared | 0.668421 | S.D. dependent var | 10.55766 |
| S.E. of regression | 10.19008 | Akaike info criterion | 7.525095 |
| Sum squared resid | 8722.363 | Schwarz criterion | 7.637701 |
| Log likelihood | -327.1042 | Hannan-Quinn criter. | 7.570461 |
| F-statistic | 3.129940 | Durbin-Watson stat | 2.613085 |
| Prob(F-statistic) | 0.029917 | | |

**Source: Author's Computation (2026)**

**4.3: DISCUSSION OF FINDINGS.**

The coefficient of determination $R^2$ shows 0.70 indicates that the overall model explained 70 percent of the total variations in the dependent variable (NAPS). Thus, shows that carbon emissions disclosures can only explain 70 percent of change in net assets per share of listed industrial goods firms in Nigeria leaving 30 percent unexplained. This is to say that there are other factors that could enable financial performance of listed industrial goods firms in Nigeria other than carbon emission disclosures.

The results of the regression are therefore slated below as follows:

**$H_{01}$: Carbon emission disclosures has no significant effect on financial performance of listed industrial goods firms in Nigeria.**

This hypothesis was tested and the result of this regression as exposited on table 4.2.1 indicates that the relationship between CED and NAPS is positive and significant. This is justified with the P-value (significance) of 0.0210 which is less than the 5% level of significance adopted. Likewise; the result of positive coefficient of 21.4 indicates that disclosures on carbon emission ensures firm financial performance in Nigeria. We consequently accepted the alternate hypotheses which connotes that carbon emission disclosure has significant effect on financial performance of listed industrial goods firms in Nigeria. The result of the study is in agreement with the a priori expectations of Khan et al. (2022) and Ganda (2022) who found that carbon emission disclosures influence firm financial performance.

**$H_{02}$: Firm size does not moderate the effect of carbon emission disclosures on financial performance of listed industrial goods firms in Nigeria**

This hypothesis was tested and the result of this regression as exposited on table 4.2.1 indicates that the relationship between CED and NAPS moderated by FS is positive and significant. This is justified with

the P-value (significance) of 0.0310 which is less than the 5% level of significance adopted. Likewise, the result of positive coefficient of 2.68 indicates that an increase in carbon emission disclosures increases financial performance of listed industrial goods firms in Nigeria. We consequently accepted the alternate hypotheses which denotes that firm size moderates the effect of carbon emission disclosures on financial performance of listed industrial goods firms in Nigeria. The result is in tandem with the results of the study of Borghei (2021) and He et al. (2021) who reported that carbon emission disclosures has significant effect on firm financial performance moderated by firm size.

Also, firm size when tested as a control variable indicates a positive and significant relationship with firm financial performance. With a p-value of 0.0128, the test is considered statistically significant at 5% level. Thus, implies that the size of a firm determines its financial performance.

## 5. CONCLUSION

The study found a positive and significant relationship between carbon emission disclosures and financial performance of listed industrial goods firms in Nigeria. Also, firm size was found to moderate the relationship between carbon emission disclosures and firm financial performance. Hence, the study concludes that carbon emission disclosures influence financial performance of listed industrial goods firms in Nigeria while firm size on the other hand moderates the relationship between the variables.

### 5.1 RECOMMENDATION

In lieu of the findings of the study, the following recommendations were made;

1. Management of listed industrial goods firms in Nigeria should strengthen and consistently report carbon emission disclosures in their annual reports and sustainability statements, as transparent environmental disclosure can enhance investor confidence, reduce information asymmetry, and support improved financial performance.
2. Since firm size moderates the relationship, larger listed industrial goods firms should leverage their resources to adopt comprehensive carbon disclosure frameworks and integrate emission reporting into corporate strategy, while regulators should provide simplified disclosure guidelines for smaller firms to ensure firm size does not weaken the financial benefits of carbon transparency.

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