

Firm Characteristics and Environmental Reporting in Nigerian Listed Manufacturing Firms: The Moderating Role of Foreign Institutional Ownership

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ABSTRACT

Environmental reporting remains strikingly underdeveloped where disclosure remains voluntary among listed manufacturing firms in Nigeria despite mounting global pressure for sustainability accountability. This study addressed this issue by carrying out study on the moderating role of foreign institutional ownership on the relationship between firm characteristics and environmental reporting in Nigerian listed manufacturing firms from 2013 to 2023. A sample of 44 manufacturing firms was considered in the study while employing Least Square Dummy variable (LSDV) technique. The findings revealed that both firm size and firm age had significant positive effect on environmental reporting. However, foreign institutional ownership showed no significant relationship with environmental reporting. Meanwhile, interestingly, foreign institutional ownership significantly moderated the relationship between firm size and environmental reporting but on the contrary have no significant moderating effect on the relationship between firm age and environmental reporting. The study concludes that internal firm characteristics are strong predictor of environmental disclosure, while the influence of foreign ownership is only meaningful when interacted with firm size. The study recommended that regulators should enforce differentiated disclosure guidelines based on firm size, while foreign investors should take a more proactive governance role to shape sustainability outcomes.

Keywords: Environmental Reporting, Firm Characteristics, Firm Size, Foreign Institutional Ownership

INTRODUCTION

The detrimental effect of firm's production activities around the world necessitated the birth and adoption of sustainability reporting to enable firms make environmental disclosure that determine the extent of firm commitment to environmental sustainability and communicating their environmental responsibilities through corporate non-financial reports [1,2]. The introduction of environmental eco-friendly practices and policies into a firm's operation and strategies is a right move in a right direction. It is seen as a crucial phase in an organization's long-term value creation. Environmental sustainability practices and policies means principles, actions that are strategic, and directives that look out to reduce environmental damages, encourage sustainability and guarantee responsible utilization of resources. Corporate governance, stakeholder interests and financial performance have these initiatives connected to them. It is a visible attempt made by firms to alleviate production effect on the environment through reduction of carbon emissions, selection of renewable energy sources, recycling initiatives, waste management, eco-friendly production methods, sustainable supply chain management and

compliance with environmental regulations and standards [3].

Corporate environmental responsibility are activities relevant and usually conveyed through environmental reporting channels. Environmental sustainability strategies stand as a leading principles to integrate eco-friendly activities into firm operations. These policies are corporate environmental governance frameworks, sustainability disclosure policies carbon footprint reduction strategies, policies on sustainable procurement and resource efficiency and regulatory compliance measures [4]. The initiatives are guided by corporate policies that ensure regulatory compliance, sustainability disclosures, and responsible resource use [4]. which not only align organizations with global sustainability goals but also enhance investor confidence, particularly foreign institutional investors who exert significant influence on corporate sustainability strategies. Their insistence on transparency and sustainability disclosures encourage firms to adopt rigorous environmental reporting practices [5].

The integration of environmental sustainability activities into organizational assessments help to

communicate organizational strategies in overcoming global challenges ranging from biodiversity, climate change, ecosystem and carrying capacity [3]. Environmental eco-friendly activities undeniably have financial implications across economic, environmental, and social fields. Undoubtedly, the cost expended on environmental activities will enhance financial performance and market value of an organization because exceptional sustainable development plans are more likely to attract investors and achieve higher market valuations. Besides, organizations exhibiting superior sustainability achievement typically encounter reduced capital challenges due to stakeholder engagement, which facilitates more effective contractual arrangements [6]. Meanwhile, the earth was serenely organized with the environment free from unhealthy substances until the interaction of men through its numerous activities impacted adversely on the natural environment leading to degradation of the ecosystem and pollution where all manners of toxic and harmful substances were deposited into the natural habitat of humans, animals and plants [7].

In the past, companies do not engage in sustainability reporting until the environmental regulatory authority suggested a voluntary sustainability reporting [7]. Environmental sustainability disclosure has become a contemporary issue over time, particularly in industrialized nations globally. However, non-financial reporting's evolution in developing nations are still developing to contribute meaningfully to extensive structure for reporting on sustainability [8]. Businesses can be held responsible for their environmental damage and advancements in sustainable development by using the fully transparent integrated reports. [9]. As environmental issues gain more attention, stakeholders including investors and consumers demand more openness from firms which could influence their decisions on the performances of the business environmental reporting.

In Nigeria, there is no legal framework yet that mandated environmental disclosure and its inclusion in the financial report while oil & gas and manufacturing industries continued to degrade the environment. The infiltration of toxic harmful emissions and other substances into the environment have led to destruction of the natural environment, land, air and water pollution, drought, flood and changes in temperature and rainfall which have affected livelihood of people leading to loss of job, decline in income generation, poverty, untold hardship, economic adversity and serious health challenges worldwide [10]. In the light of this, the environment needs to be restored to its natural state or at best, sustained. However, managing stakeholders' expectations and interacting with local populace is a serious challenge in organizations

which could be as a result of the firm characteristics and possible influence of ownership [11].

Firm characteristics can be connected to environmental reporting and foreign institutional ownership. Foreign institutional investors are becoming more interested in how businesses match the United Nation's (UN) sustainable development goals (SDGs) into corporate social responsibility plans [12]. Institutional owners seek to have direct or indirect impact on how a firm is managed, decisions made and effective corporate governance is promoted and also depicts how strategic decisions of firms are determined to improve disclosure quality [13]. It is imperatively clear that there has been no consensus on the accepted correlation linking firm characteristics, foreign institutional ownership and environmental disclosure in Nigeria, particularly in manufacturing firms. Some authors believed that the existence of foreign institutional owners have impact on the investees' disclosure and environmental performance. Also, that the controlling stakes of foreign institutional owners can affect a firm's disclosure standards leading to encouragement in sustainability environmental practices [9,14]. Larger firms with long years of operation seems to have the controlling stakes of foreign institutional investors [15]. (7) found a significant improvement in environmental reporting over time due to enforcement of the Green Banking Rules of 2011, which lends support for environmental disclosure. On the contrary, it is also argued that institutional investors do not gear up firms to be innovative in environmental practices neither does firm attributes have the same influence on environmental reporting [9]. Given the inconclusive results of previous studies, and dearth of studies on the moderating influence of foreign ownership on the relation between firm characteristics and environmental reporting, we deemed it fit to explore the moderating role of foreign institutional ownership on nexus between firm characteristics and environmental reporting of listed manufacturing firms in Nigeria as an emerging economy.

The paper aimed to provide empirical findings on effect of firm attributes on environmental reporting, foreign institutional ownership and environmental reporting, and moderating effect of foreign institutional ownership on the link between dependent and independent variables, clearly distinct from what obtained from previous investigations. The relevance of the current study to the conference theme lies on the need for corporate organizations to shift focus from traditional accounting reward system to a more dynamic and globally acclaimed sustainable initiatives which is central to alignment of firm's objectives to global sustainability expectations. Environmental reporting as a communication tool reminds managers of the need to preserve the

environment against infractions while pursuing organization goals and objectives. Therefore, through conferences and other channels, capacity building can be enhanced among relevant stakeholders on the need for inclusive sustainable development particularly in business. The concept of sustainability should be integrated into business strategy for eventual long-term value creation and survival. In addition, the study provides information about the need for transparency, accountability, sustainable consumption, and resource utilization by management of corporate organizations to enhance degree of confidence of investors particularly foreign institutional ownership given their attributes.

LITERATURE REVIEW

Environmental Reporting

Environmental reporting refers to financial or non-financial disclosures made by companies about their operational influence on the environment [16]. Environmental disclosures are now crucial to the development process in order to protect the environment. Nigeria's slow industrial expansion has likely deterred economic progress while also causing a number of environmental issues that have led to a perception of the threat to natural well-being, including global warming and pollution of the air, water, soil, etc. (Akhter et al., 2022). As a result of the drastic changes in the climate, the corporate sector is facing intense pressure from a different stakeholder to act properly towards society [17]. The importance of disclosing environmental initiatives by responsible corporate citizens has become apparent to the society. Thus, in today's competitive and globalized business environment, environmental reporting is receiving a lot more attention than it did in the past [17]. Natural disasters including drought, floods, cyclones, and earthquakes have become more frequent as a result of climate change, and scientists have determined that rising carbon emissions and ecosystem degradation are the main causes of temperature and precipitation variations. Around the world, this predicament has impacted people's health, livelihoods, cultures and societies. It also poses a threat to sustainable development, global economic growth, and poverty alleviation [7].

Firm Characteristics

Firm characteristics are the result of a company's managerial and demographic factors, which are specific to a given company [18]. They are distinct attributes that can be vividly identified with a firm that affects how strategic decisions are made. It also points to the system of governance employed in the firms' management, show forth the firms' operating style, its intellectual capacity and performance. It was described by (19) as an essential part of a company's internal environment. It depicts the structure of ownership a firm has. According to (18), firm age, leverage, firm size, liquidity, sales growth, asset

growth and turnover, etc. are the characteristics of a firm that helps investors makes an informed decision. It ensures the continual progress and prosperity of the firm.

A company's financial success, strategic choices, and market placement are all influenced by its firm characteristics. Firm size, age, leverage, profitability, and ownership structure are important factors that influence how businesses operate and compete [20]. Larger companies can invest in sustainability projects and other long-term projects since they have more access to financial resources, economies of scale, and established brand reputations [12]. The age of a company influences its strategic flexibility while older companies may have advantages such as industry experience and client loyalty, they may also face organizational stagnation and resistance to change [20]. Leverage is another crucial element that influences a business's risk exposure and financial stability; heavily leveraged companies have less investment flexibility and more financial restraints [21]. The ownership structure of a company greatly affects corporate transparency, governance procedures, and decision-making when assessing its attributes [22]. According to research by (22), in order to draw in long-term investment, companies with larger institutional ownership including foreign investors tend to have stronger governance procedures and increased financial reporting transparency.

Foreign Institutional Ownership (FIO)

Foreign institutional owners have equity holdings in a company, such as those from hedge funds, mutual funds, sovereign wealth funds and pension funds. They are financial organisations that oversee large asset pools for their clients [23]. These investors are frequently attracted to companies with robust governance frameworks, financial transparency, and room for expansion. Better corporate governance procedures and higher levels of financial disclosure are generally seen in companies with larger percentages of foreign institutional ownership because these investors expect accountability and transparency. Moreover, foreign institutional investors opt for firms located in nations with robust investor protection legislation and stable regulatory frameworks, which lowers the risks involved in cross-border investments. Political risks, market conditions, and exchange rate swings can all have an impact on foreign institutional ownership, which means that investment patterns fluctuate over time [24]. Companies with substantial FIO are more likely to implement global best practices in governance, financial reporting, environmental reporting and risk management because foreign investors prefer firms with strong oversight procedures, [25]. FIO generally has a beneficial effect on firms since it fosters greater corporate transparency, better governance, and

improved financial performance, making it an essential part of the world's capital markets [25]. (13) pointed out that companies with a large percentage of foreign institutional investors may be more closely regulated, especially in sectors that national governments consider strategically significant.

THEORETICAL REVIEW

Legitimacy Theory

Legitimacy theory as developed by (26), organizations tried to align their operations with social norms and values in order to preserve their legitimacy, which is crucial for obtaining funding and guaranteeing their long-term survival. The theory states that companies should behave responsibly to satisfy the expectations of the public and investors and should be accountable to the society [27]. The theory explained that businesses should reveal environmental information to show that they are adhering to social norms and satisfy the many requirements of society and behave as a legitimate and respectable corporate citizen in order to achieve great social acceptability and credibility [28]. Research has proved that companies that are more exposed to global markets typically report on environmental issues in greater detail in an effort to be seen as legitimate by stakeholders abroad [11]. Corporate citizens are extremely hesitant to reveal any negative information to secure their reputation and use annual report to highlight positive environmental actions as a means of communicating with large social groups. Legitimacy theory critiques contend that businesses might not be genuinely committed but may participate in greenwashing, which is the disclosure of information without making significant changes [29]. This offers insight that disclosure could be either way.

EMPIRICAL REVIEW

Firm Attributes and Environmental Reporting

The impact of firm characteristics on environmental reporting has been a subject of debate in academic over time. There had been divergent of opinions by previous researchers. For example, (30) conducted an investigation into the correlation between firms' attributes and environmental disclosure using Bangladesh as a case study. The study adopted the Ordinary Least Squares (OLS) regression technique and revealed that larger firms are more likely to engage in environmental reporting on account of competitive advantage or scale of operation. Also, employing a longitudinal research design, (31) evaluate the extent and quality of environmental reporting practices among Bangladesh firms from 2015 to 2019 while relying on legitimacy theory as framework. The results indicated a significant improvement in environmental reporting due to the enforcement of the Green Banking Rules of 2011. Similarly, (32) interrogate the relationship between corporate attributes and environmental disclosures of

listed breweries in Nigeria for a ten-year period from 2012 to 2021. The findings revealed that firm size had a significant positive impact on environmental disclosure practices. Furthermore, (33) assessed the relationship between the firm attributes and voluntary information disclosure among consumer good companies listed on Nigeria Exchange Group between 2012-2021. The results revealed that larger companies and those with high debt profile were more inclined to voluntarily disclose information, probably in order to reduce information asymmetry, improve transparency, and secure stakeholder confidence.

A study by (34) assessed whether financial leverage influences firms' decisions to disclose environmental information within the Nigerian context and aimed. Adopting binary logistic regression, the study found no significant relationship between leverage and environmental disclosures. Contrarily, (35) investigated how corporate structure, market attributes, performance, and governance influence environmental reporting practices in a highly regulated and environmentally sensitive industry in Nigeria. The pooled Ordinary Least Squares (OLS) regression technique was adopted for the analysis. The findings indicated that firm size and auditor type have a negative and significant impact on environmental disclosure, suggesting that larger firms and those audited by high rated firms (Big4) were reluctant towards transparency of operations and lack motivation for environmental disclosure. Furthermore, board size was significant and negatively associated with environmental disclosure, indicating that larger boards may hinder environmental transparency, possibly due to conflict of interests.

Ownership Structure and Environmental Performance

A growing body of literature have examined the relation between ownership structure and environmental disclosure with mixed findings. For instance, (14) studied the impact of ownership structure on environmental performance in the G20 energy sector between 2018 to 2022. The findings were mixed. First, it was observed that foreign ownership had a strong positive association with environmental performance, suggesting that foreign investors encouraged or demand greater accountability in sustainability practices. Furthermore, firms located in developed G20 countries exert stronger influence on the overall sample outcomes compared to those in developing G20 nations. Conversely, institutional ownership showed a significant negative relationship with environmental performance, implying that institutional investors prioritized financial returns over environmental concerns, thereby jettisoning non-financial goals. Likewise, (36) conducted a comparative study on institutional ownership and greenhouse gas emissions

between United Kingdom (UK) and United States of America (US) while considering the moderating influence of litigation risk and board gender diversity. The findings revealed a reduction in GHG emissions by the presence of institutional owners, indicating possible effective monitoring which enforced compliance with law and regulations. Surprisingly, we observed no difference in reduction level between UK and USA firms. With a large dataset comprising 27,847 company across 72 countries, (10) explored whether ownership structure affect environmental disclosure and moderating role of a country's development over the period 2002 to 2017. The results showed that environmental disclosures were greater for companies with high concentration of state ownership than those with institutional ownership with low records of environmental disclosure. In addition, the study showed that companies operating in industrialised nations with greater state ownership provide environmental information at a progressively higher rate than their counterparts operating in underdeveloped nations.

Another study by (11) investigated the impact of ownership structure particularly foreign versus domestic institutional ownership on firms' environmental reporting behavior covering 34 countries over the period 2006 to 2018. Adopting a Difference-in-Differences (DiD) approach, the results revealed that firms with higher levels of foreign institutional ownership consistently demonstrated better quality climate change disclosures, whereas domestic institutional ownership had no significant influence. Further analysis showed that the favourable correlation between foreign institutional investment and quality of disclosure was especially strong in stakeholder-oriented countries, in jurisdictions with emissions trading schemes, and among firms characterized by higher levels of information asymmetry. Moreover, the effect was more pronounced when the foreign investors originated from environmentally conscious countries. The study also identified an indirect effect, showing that high-quality climate disclosures partially mediate the relationship between foreign institutional ownership and increased firm valuation. (37) carried out an empirical analysis to determine the correlation between foreign ownership and economic performance and corporate environmental reporting practices in India. Dealing with a sample of 404 companies listed on the National Stock Exchange (NSE) 500 index between 2010 and 2022, the analysis indicates that foreign ownership has considerable influence on economic performance

which served as incentives for companies towards environmental disclosure. In a similar study, (38) investigated the influence of ownership structure on environmental information disclosure using China as a case study. The study sample included companies listed on the Shanghai Shenzhen 300 (SHSZ300) Index over the period 2009 - 2019. The study found that managerial ownership was positively associated with EID, suggesting that transparency is undeniable in firms with managerial shareholding. Conversely, both institutional ownership and state ownership were found to be negatively associated with environmental disclosure. This implies that institutional and state-owned investors do not place priority on environmental disclosure probably due to divergent interests. The study underscored the relationship between ownership structure and EID. However, the impacts of managerial and state ownership varied with firm size, highlighting that firm characteristic may be crucial as a moderator to governance–disclosure relations. (39) considered firm attributes, corporate governance, and adoption of sustainability reporting with focus on 99 countries from Gulf Cooperation Council (GCC). They revealed that firm size, profitability, engagement with Big Four audit firms, and government ownership significantly influenced both SDG-related reporting and economic performance, indicating that larger profitable firms audited by big4 audit firms and having among its stakeholders experienced better economic performance and improved disclosure.

METHODOLOGY

The study employed an ex-post facto research design using panel data to empirically study the role of foreign institution ownership on the connection between firm characteristics and environmental reporting of listed manufacturing firms in Nigeria for the period 2013-2023. The choice of manufacturing firms was informed based on attributes commonly observed among Nigeria manufacturing firms which is disregard for law and regulations. The data was secondary data obtained from the annual reports of oil and gas and manufacturing firms. The population of the study comprised 59 manufacturing firms listed on the trading floor of Nigeria Exchange Group (NGX) and active as at 31st December, 2023 operating in various sectors of the economy. The sample size was limited to 44 manufacturing firms including construction/real estate (4), consumer goods (16), health services (6), industrial goods (11) and Oil & Gas (7). The study employed panel regression analysis as an estimation technique.

Model Specification

This study adapted the work conducted by (7) and (41) as specified below:

Model One: Firm Characteristics and Environmental Reporting (Non-moderated)

$$\text{ENVRPT} = \beta_0 + \beta_1 \text{FSZ}_{it} + \beta_2 \text{AGF}_{it} + \beta_3 \text{LEVR}_{it} + \beta_4 \text{MB}_{it} + \beta_5 \text{SGROWTH}_{it} + \epsilon_{it} \dots \dots \dots 1$$

Model Two: Foreign Institutional Investors and Environmental Reporting (Non-moderated)

$$\text{ENVRPT} = \beta_0 + \beta_1 \text{FIO}_{it} + \beta_2 \text{LEVR} + \beta_3 \text{MB}_{it} + \beta_4 \text{SGROWTH}_{it} + \epsilon_{it} \dots \dots \dots 2$$

Model Three: Foreign Institutional Investors, Firm characteristics and Environmental Reporting (Non-moderated)

$$\text{ENVRPT} = \beta_0 + \beta_1 \text{FSZ}_{it} + \beta_2 \text{AGF}_{it} + \beta_3 \text{FIO}_{it} + \beta_4 \text{LEVR}_{it} + \beta_5 \text{MB}_{it} + \beta_6 \text{SGROWTH}_{it} + \epsilon_{it} \dots \dots \dots 3$$

Foreign Institutional Investors, Firm characteristics and Environmental Reporting (Moderated)

$$\text{ENVRPT} = \beta_0 + \beta_1 \text{FSZ}_{it} + \beta_2 \text{AGF}_{it} + \beta_3 \text{FIO}_{it} + \beta_4 (\text{FIO} \times \text{FSZ})_{it} + \beta_5 (\text{FIO} \times \text{AGF})_{it} + \beta_6 \text{LEVR}_{it} + \beta_7 \text{MB}_{it} + \beta_8 \text{SGROWTH}_{it} + \epsilon_{it} \dots \dots \dots 4$$

Where:

ENVRPT	=	Environmental Reporting
FSZ	=	Firm Size
AGF	=	Age of the firm
FIO	=	Foreign Institutional Ownership
LEVR	=	Leverage ratio
MB	=	Market-to-book ratio
SGROWTH	=	Sales Growth
β_0	=	Constant term/intercept
$\beta_1, \beta_2, \beta_3, \dots$	=	Beta coefficients of independent variables
ϵ	=	Error term

TABLE 1 Measurements and Operationalization of Variables

VARIABLES	DESCRIPTION	MEASUREMENT	SOURCE
Dependent Variables			
ENVRPT	Environmental reporting: any financial or non-financial disclosure made by firms	Average of total index score (TOD) obtained for all environmental indicators in a dimension / number of sustainability dimension	[40]
Independent Variables			
FSZ	Firm Size	Natural logarithms of total assets	[7, 41, 37]
AGF	Firm Age	Number of years the business has been in operation	[7,41,37]
Moderating Variable			
FIO	Foreign Institutional Ownership	Percentage of foreign investors' ownership to total number of outstanding shares	[11, 37]
Control Variables			
LEVR	Leverage	Proportion of debt to equity in the capital structure of a firm. (Total debt/Total equity) X 100	[7, 41, 37]
MB	Market-to-Book Ratio	A financial metric that compares a company's current market value to its book value. (Market value per share / Book value per share)	[11]
SGROWTH	Sales growth	A metric that measures the increase in a firm's revenue over a specific period (Current sales period – Previous sales period) / Previous sales period	[11]

Source: Authors Compilation (2025)

RESULTS AND DISCUSSION OF FINDINGS

Descriptive Statistics Analysis

This section presents key statistical insights for the variables. Each variable is summarized using core statistical measures, including the mean, standard

deviation, minimum, and maximum values. As shown in Table 4.1, the descriptive statistics offered insight into the distribution and characteristics of the dataset within the context of this study.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
envrpt	484	0.148	0.253	0.000	1.000
fsz	484	7.317	1.028	5.030	9.520
agf	484	32.012	12.427	2.000	58.000
fio	484	0.462	0.499	0.000	1.000
levr	484	64.554	30.441	-20.780	247.850
mb	484	0.981	54.499	-1176.190	91.690
sgrowth	484	21.664	86.718	-231.960	1354.260

Source: Authors (2025)

The descriptive statistics provide an overview of the key variables used in the study. Environmental

reporting (ENVRPT) has a mean value of 0.148, indicating that, on average, firms disclosed approximately 15% of the environmental issues

considered in the study. The standard deviation of 0.253 suggests considerable variation among firms, with some disclosing no environmental items (minimum value of 0.000) and maximum of 1. These variations reflect differing levels of commitment to environmental transparency among listed manufacturing firms in Nigeria. Firm size (FSZ), measured by the natural logarithm of total assets, has a mean of 7.317 and a standard deviation of 1.028. The range, from 5.030 to 9.520, shows that there is a noticeable spread in firm sizes across the sample, which may affect their capacity and willingness to engage in environmental reporting. Larger firms are generally expected to have more resources and greater external visibility, which could motivate higher levels of disclosure. Firm age (AGF), calculated as the number of years since incorporation, has a mean of 32.012 years with a standard deviation of 12.427. The minimum age is 2 years, while the maximum is 58 years, indicating a wide distribution in the maturity levels of the firms. Older firms may have more structured reporting frameworks and stronger stakeholder pressures to engage in environmental disclosures. Foreign institutional ownership (FIO) has a mean of 0.462, implying that approximately 46% of the firms in the sample have some level of foreign institutional ownership. The standard deviation of 0.499, along with the minimum and maximum values of 0 and 1 respectively, indicates a binary distribution, where firms either have or do not have foreign institutional investors. The presence of foreign investors may play a role in influencing firms' disclosure practices due to global expectations on sustainability standards.

Leverage (LEVR), defined as the ratio of total debt to total assets, shows a mean value of 64.554%, suggesting that, on average, debt comprises a substantial portion of firm capital structures. The relatively high standard deviation of 30.441 and the wide range from -20.780 to 247.850 indicate significant variation in firms' debt levels. Negative leverage values may reflect firms with excess cash or accounting anomalies, while extremely high leverage could signal financial distress or aggressive debt financing, both of which may impact reporting practices. Market-to-book value (MB) has a mean of 0.981, but an exceptionally large standard deviation of 54.499. The values range from a minimum of -1176.190 to a maximum of 91.690, suggesting the presence of outliers and extreme variability in how the market values these firms relative to their book values. These outliers may affect the interpretability of MB and should be carefully considered in regression diagnostics. Sales growth (SGROWTH), measured as the annual percentage change in sales revenue, has a mean of 21.664%, indicating positive growth on average across the firms. However, the standard deviation of 86.718 and a wide range from -231.960 to 1354.260 show that while some firms

experienced significant growth, others faced sharp declines. This volatility in growth rates may influence firms' strategic focus, including their willingness or capacity to invest in environmental initiatives and disclosures. Overall, the descriptive statistics revealed a diverse sample of firms in terms of size, age, ownership structure, and financial characteristics, all of which may have implications for their environmental reporting behaviour.

Regression Analyses

To examine the relationships between environmental reporting (ENVRPT) and the independent variables of firm size (FSZ) and firm age (AGF), as well as to assess the moderating effect of foreign institutional ownership (FIO), the study employed panel regression analysis. This method is considered appropriate in light of the detection of heteroscedasticity, which can compromise the reliability of standard ordinary least squares (OLS) estimates. Consequently, the study presents and interprets the robust regression results alongside the pooled OLS regression outputs in the subsequent sections to enhance the validity and consistency of the findings.

Table 3: Firm Attributes and Environmental Reporting

Variables	(1) OLS	(2) FE	(3) RE	(4) LSDV
FSZ	0.089*** (0.000)	0.127*** (0.000)	0.117*** (0.000)	0.127*** (0.000)
AGF	0.005*** (0.000)	0.027*** (0.000)	0.013*** (0.000)	0.027*** (0.000)
LEVR	-0.000 (0.705)	-0.000 (0.711)	0.000 (0.391)	-0.000 (0.711)
MB	-0.000 (0.566)	-0.000 (0.491)	-0.000 (0.546)	-0.000 (0.491)
SGROWTH	-0.000 (0.691)	-0.000 (0.925)	0.000 (0.486)	-0.000 (0.925)
Intercept	-0.664*** (0.000)	-1.641*** (0.000)	-1.143*** (0.000)	- (0.000)
Observations	479.000	479.000	479.000	479.000
R ²	0.206	0.311		0.657
Adj R ²	0.197	0.234		0.619
F-stat	24.490	38.852		17.190
Year Dummy	No	No	No	Yes
Hettest	76.26{0.000}			
FE/RE		13.19{0.000}	406.03{0.000}	
VIF	1.02			
Hausman		64.16{0.000}		

Notes: *p*-values are in parentheses. ****p*<.01, ***p*<.05

Source: Authors (2025)

Table 3 presents the results obtained from the estimation of the models in this study, focusing first on the pooled Ordinary Least Squares (OLS) regression. The results indicate that the dependent variable environmental reporting has an R-Square (R²)

value of 0.206. This implies that the independent variables—firm size (FSZ) and firm age (AGF)—along with the control variables of leverage (LEVR), market-to-book value (MB), and sales growth (SGROWTH), collectively explain approximately 20.6% of the systematic variations in environmental reporting. The adjusted R-Square (Adj R²) value of 0.197 further accounts for the number of predictors in the model, suggesting that the model retains reasonable explanatory power after adjustments. The unexplained variations in environmental reporting are captured by the error term. The F-statistic of 24.490 with a p-value of 0.000 indicates that the overall model is statistically significant at the 1% level, confirming that the independent variables jointly influence environmental reporting.

Least Square Dummy Variable (LSDV) Regression

Based on the outcome of the Hausman test, the study adopts the Least Squares Dummy Variable (LSDV) regression model to account for unobserved variations over time. The LSDV model yields a high R-squared value of 0.657, suggesting that approximately 65.7% of the systematic variation in the dependent variable is explained by the independent variables when time effects are considered. Furthermore, the adjusted R-squared value of 0.619 reinforces the reliability and explanatory power of the LSDV model in capturing variations in environmental reporting, thereby justifying its application for interpretation and policy formulation.

Table 4: Foreign Institutional Ownership and Environmental Reporting

Variables	(1) OLS	(2) FE	(3) RE	(4) LSDV
FIO	0.069*** (0.003)	0.001 (0.990)	0.061 (0.218)	0.001 (0.990)
LEVR	-0.000 (0.288)	0.001** (0.030)	0.001 (0.100)	0.001** (0.030)
MB	0.000 (0.655)	-0.000 (0.727)	-0.000 (0.867)	-0.000 (0.727)
SGROWTH	0.000 (0.387)	0.000** (0.015)	0.000** (0.017)	0.000** (0.015)
Intercept	0.141*** (0.000)	0.089 (0.134)	0.075 (0.079)	0.195** (0.001)
Observations	479.000	479.000	479.000	479.000
R ²	0.026	0.026		0.515
Adj R ²	0.018	-0.081		0.463
F-stat	3.137	2.841		9.753
Year Dummy	No	No	No	Yes
Hettest	17.88{0.000}			
FE/RE		10.13{0.000}	453.71{0.000}	
VIF	1.01			
Hausman		9.64{0.047}		

Notes: p-values are in parentheses. *** p<.01, ** p<.05

Source: Authors (2025)

Table 4 presents the results obtained from the estimation of the models in this study, focusing first on the pooled Ordinary Least Squares (OLS) regression. The results indicate that the dependent variable of environmental reporting has an R-Square (R²) value of 0.026. This implies that the independent variable—foreign institutional ownership (FIO)—along with the control variables of leverage (LEVR), market-to-book value (MB), and sales growth (SGROWTH), collectively explain approximately 2.6% of the systematic variations in environmental reporting. The adjusted R-Square (Adj R²) value of 0.018 further accounts for the number of predictors in the model, suggesting that the model retains minimal explanatory power after adjustments. The unexplained variations in environmental reporting are captured by the error term. The F-statistic of 3.137 with a p-value of 0.000 indicates that the overall model is statistically significant at the 1% level, confirming that the independent variables jointly influence environmental reporting. Multicollinearity was assessed using the Variance Inflation Factor (VIF), with the mean VIF reported as 1.01. This value is well below the commonly accepted threshold of 10, aligning with the recommendations of Gujarati (2004). This suggests that multicollinearity is not a concern in this model, indicating that none of the independent variables are excessively correlated with one another. Consequently, all variables are retained for further analysis. The assumption of homoscedasticity in the pooled OLS model was tested using the Breusch-Pagan test. The test result shows a heteroscedasticity test statistic (Hetest) of 17.88 with a p-value of 0.000, indicating that the assumption of homoscedasticity is violated at the 1% significance level. This violation suggests that the variance of the error terms is not constant across observations, which could affect the reliability of standard errors and confidence intervals in the OLS estimates. The Hausman specification test yields a chi-square statistic of 9.64 with a p-value of 0.047, indicating statistical significance at the 5% level. This outcome implies that the fixed effects (FE) model is more suitable than the random effects (RE) model for the present analysis. The result validates the application of the fixed effects model, as it effectively accounts for unobserved heterogeneity that is correlated with the explanatory variables. Further, the findings from the panel fixed effects regression, as detailed in Table 4, report an F-statistic of 2.841 with a p-value of 0.000, confirming the statistical significance of the model at the 1% level and its appropriateness for drawing valid inferences. Furthermore, the fixed effects regression reveals an R-squared value of 0.026, indicating that the independent variables account for approximately 2.6% of the systematic variation in the dependent variable, namely environmental reporting, over the period under investigation. Notably, the result also

confirms the presence of fixed effects, as evidenced by a statistic of 31.35 with a p-value of 0.0000.

This suggests that unobserved heterogeneity exists across cross-sectional units over time, which poses a methodological concern that must be addressed in the analysis. Therefore, the study adopts the Least Square Dummy Variable (LSDV) regression approach to account for unobserved variations over time. Based on the results of the Hausman specification test, the LSDV model is employed to effectively control for time-specific unobserved heterogeneity. The model yields a relatively high R-squared value of 0.515, suggesting that the independent variables explain approximately 51.5% of the systematic variation in the dependent variable, environmental reporting, when time effects are considered. Additionally, the adjusted R-squared value of 0.463 reinforces the robustness and explanatory strength of the LSDV model, thereby supporting its appropriateness for drawing policy implications and informed interpretation.

Table 5: Firm Attributes and Environmental Reporting: The role of Foreign Ownership

Variables	(1) OLS	(2) FE	(3) RE	(4) LSDV
FSZ	0.069*** (0.000)	0.011 (0.850)	0.109*** (0.000)	0.011 (0.850)
AGF	0.003** (0.013)	0.030*** (0.000)	0.010*** (0.000)	0.030** (0.000)
FIO	-0.819*** (0.000)	-0.910** (0.031)	-0.701** (0.017)	- (0.031)
FIO × FSZ	0.046** (0.028)	0.184** (0.011)	0.022 (0.566)	0.184** (0.011)
FIO × AGF	0.012*** (0.000)	-0.003 (0.589)	0.012*** (0.001)	-0.003 (0.589)
LEVR	-0.000 (0.722)	-0.000 (0.746)	0.000 (0.421)	-0.000 (0.746)
MB	-0.000 (0.768)	-0.000 (0.398)	-0.000 (0.594)	-0.000 (0.398)
SGROWTH	0.000	-0.000	0.000	-0.000
Intercept	(0.914) -0.436***	(0.909) -1.049***	(0.770) -0.966***	(0.909) -
Observations	479.000	479.000	479.000	479.000
R ²	0.273	0.325		0.664
Adj R ²	0.260	0.245		0.624
F-stat	22.029	25.739		16.579
Year	No	No	No	Yes
Dummy				
Hettest	82.29{0.000}			
FE/RE		54.34{0.000}	358.36{0.000}	
VIF	2.39			
Hausman		9.64{0.047}		

Notes: p-values are in parentheses. *** p<.01, ** p<.05

Source: Authors (2025)

Table 5 presents the results obtained from the estimation of the models in this study, focusing first on the pooled Ordinary Least Squares (OLS)

regression. The results indicate that the dependent variable of environmental reporting has an R-Square (R²) value of 0.273. This implies that the independent variables—firm size (FSZ), firm age (AGF), and foreign institutional ownership (FIO), including the interaction terms (FIO × FSZ and FIO × AGF)—along with the control variables of leverage (LEVR), market-to-book value (MB), and sales growth (SGROWTH), collectively explain approximately 27.3% of the systematic variations in environmental reporting. The adjusted R-Square (Adj R²) value of 0.260 further accounts for the number of predictors in the model, suggesting that the model retains reasonable explanatory power after adjustments. The unexplained variations in environmental reporting are captured by the error term. The F-statistic of 22.029 with a p-value of 0.000 indicates that the overall model is statistically significant at the 1% level, confirming that the independent variables jointly influence environmental reporting.

Multicollinearity was assessed using the Variance Inflation Factor (VIF), with the mean VIF reported as 2.39. This value is well below the commonly accepted threshold of 10, aligning with the recommendations of Gujarati (2004). This suggests that multicollinearity is not a concern in this model, indicating that none of the independent variables are excessively correlated with one another. Consequently, all variables are retained for further analysis. The assumption of homoscedasticity in the pooled OLS model was tested using the Breusch-Pagan test. The test result shows a heteroscedasticity test statistic (Htest) of 82.29 with a p-value of 0.000, indicating that the assumption of homoscedasticity is violated at the 1% significance level. This violation suggests that the variance of the error terms is not constant across observations, which could affect the reliability of standard errors and confidence intervals in the OLS estimates.

The Hausman specification test reports a chi-square statistic of 9.64 with a corresponding p-value of 0.047, indicating statistical significance at the 5% level. This outcome implies that the fixed effects (FE) model is more appropriate than the random effects (RE) model for this study. The result confirms that the FE model is better suited due to the existence of unobserved heterogeneity that is correlated with the explanatory variables. Furthermore, the panel fixed effect regression results, as detailed in Table 4.6, reveal an F-statistic of 25.739 with a probability value of 0.000. This indicates that the fixed effects model is statistically significant at the 1% level and appropriate for reliable statistical inference. Moreover, the fixed effects regression yields an R-squared value of 0.325, suggesting that approximately 32.5% of the systematic variation in the dependent variable—environmental reporting—is

explained by the independent variables over the study period.

However, the results also indicate the existence of fixed effects, as evidenced by the statistic {31.35 (0.0000)}. This implies that the fixed effects present a challenge, stemming from unobserved heterogeneity across cross-sectional units that persists over time. Consequently, the study adopts the Least Square Dummy Variable (LSDV) regression model to address the unobserved time-specific variations. In line with the outcome of the Hausman test, the LSDV approach is employed to effectively capture the unobserved heterogeneity across time. The model produces a high R-squared value of 0.664, indicating that approximately 66.4% of the systematic variation in the dependent variable—environmental reporting—is accounted for by the independent variables when temporal effects are considered. Furthermore, the adjusted R-squared value of 0.624 affirms the robustness of the LSDV model in explaining variations in environmental disclosure, thereby reinforcing the suitability of this model for policy interpretation and practical recommendations.

DISCUSSION OF FINDINGS

Firm Attributes and Environmental Reporting

The observation that firm attributes particularly firm size and firm age exert a substantial positive influence on environmental reporting among listed Nigeria manufacturing firms provides several critical insights within the framework of this research. It indicates that firms with larger size and longer operational history are more inclined to adopt and implement environmental disclosure practices. This is not only a reflection of their capacity to bear the cost of disclosure but also a response to the greater scrutiny they face from stakeholders, regulators, and the public. Larger firms tend to have more established corporate governance structures, better access to resources, and stronger reputational concerns, which obligates them to demonstrate greater transparency regarding their influence on the environment.

For management, this finding implies that environmental reporting is not merely a compliance activity but a strategic communication tool that reflects the firm's scale, maturity, and accountability. Larger firms must continue investing in environmental sustainability initiatives and ensure these are adequately reported, not only to comply with regulatory demands but also to strengthen investor confidence and build long-term brand value. This result aligns with the findings reported by (30, 31), who found that firm characteristics, especially size, are significantly related to market value, implying that market participants perceive disclosures from larger firms as more credible and value-relevant. Similarly, (35) reported that firm age

positively influences financial outcomes due to accumulated experience, which likely extends to better structured reporting systems. (32) also emphasized that firm-specific factors like size and age contribute significantly to the quality of social and sustainability disclosures, suggesting a similar pattern with environmental reporting. Contrarily, some studies have highlighted challenges, (34) noted that the institutional environment in Nigeria often leads to weak enforcement of corporate governance, which could dampen the effect of firm attributes on disclosure practices. In such contexts, even large or old firms may sometimes underreport unless compelled by external pressures or internal governance reforms. This discrepancy may reflect the duality in corporate practices where firm capacity exists, but commitment to transparency varies based on strategic priorities or leadership values.

Foreign Institutional Ownership and Environmental Reporting

The result indicating that foreign institutional ownership does not exert a significant influence on the environmental reporting practices of listed Nigeria manufacturing firms is quite revealing, especially given the widely held assumption that foreign investors typically encourage higher standards of corporate governance and disclosure. This outcome suggests that the presence or absence of foreign institutional investors does not, on its own, drive improvements in environmental transparency among these firms. It is possible that foreign investors in the Nigerian manufacturing sector are more focused on short- to medium-term financial returns and less concerned with non-financial disclosures such as environmental reporting. Alternatively, their influence may be diluted by structural and institutional constraints within the Nigerian regulatory environment. For management, this result suggests that foreign institutional shareholding may not exert sufficient pressure to influence sustainability reporting practices. This calls for internal leadership to take initiative in embedding sustainability into corporate strategy rather than relying on external ownership influence. Management teams may need to adopt a proactive stance, using environmental reporting as a competitive tool to position their firms favourably in both local and international markets. Without such initiative, firms risk missing out on the reputational and financial benefits associated with sustainability disclosures.

This result also contradicts what was established in the study of (10, 14), who emphasized that ownership characteristics significantly influence social sustainability disclosures. The divergence may point to contextual or sectoral differences in the expectations placed on foreign investors. (36) similarly found that institutional ownership had a

measurable impact on environmental performance, but the current study suggests that such influence does not automatically extend to non-financial reporting domains. Therefore, while ownership structure remains an important variable, its effect on sustainability-related disclosures appears to be mediated by a broader set of institutional, regulatory, and firm-level factors.

Firm Attributes and Environmental Reporting: The Role of Foreign Ownership

The finding showed that foreign institutional ownership significantly moderates the relationship between firm size and environmental reporting, but not between firm age and environmental reporting, presents a nuanced understanding of how ownership structure interacts with firm-specific characteristics to shape disclosure practices. The significant moderation effect on firm size implies that the presence of foreign institutional investors reinforces the tendency of larger firms to engage more actively in environmental reporting. This may be due to the fact that larger firms with foreign ownership face dual pressures first from their scale, which naturally attracts more public attention, and second from institutional investors who are more attuned to global disclosure norms and sustainability expectations. In line with (19, 11), this result supports the stakeholder management perspective, where firms that cater to broader stakeholder demands, including those of foreign investors, are more likely to demonstrate transparency in areas such as environmental responsibility.

For management, this suggests a need to leverage the presence of foreign investors as a strategic advantage. The combined effect of firm size and foreign institutional ownership should be harnessed to strengthen sustainability policies, increase environmental investments, and build a consistent disclosure culture. It also indicates that leadership in larger firms must align corporate reporting frameworks with global ESG benchmarks to meet the expectations of institutional stakeholders. Regulators, on the other hand, may see this finding as justification to design policies that target larger firms with more rigorous reporting requirements, especially those with significant foreign shareholding. Such targeted enforcement could drive broader improvements in disclosure across the sector.

The overall pattern is consistent with some earlier empirical work, such as that by (37), which noted that firm size has a more pronounced effect on market value when complemented by strong governance mechanisms. However, it diverges from studies such as those by (8), who found that ownership structures generally have a more direct and consistent effect on social sustainability disclosures. The current finding tempers that perspective by suggesting that the

influence of foreign institutional ownership is contingent on firm characteristics and does not operate uniformly across all dimensions of sustainability disclosure.

CONCLUSION

This research was set out to examine the influence of firm-specific characteristics on environmental reporting, with an emphasis on assessing whether foreign institutional ownership plays a moderating role in the association within Nigeria's manufacturing companies. The principal findings of this research indicate that larger and more established firms are significantly more inclined to engage in environmental disclosure, highlighting the critical role of organisational capacity, visibility, and operational maturity in shaping reporting behaviours. In contrast, the study observes that foreign institutional ownership does not exert a statistically significant direct effect on environmental reporting, suggesting that foreign investor participation alone does not serve as an independent driver of sustainability disclosures within Nigeria's manufacturing industry. Notably, foreign ownership is found to significantly strengthen the association between firm size and environmental reporting, while no such moderating effect is observed in relation to firm age. The overarching conclusion is that intrinsic firm attributes, specifically size and age, are key determinants of environmental reporting, and the influence of foreign institutional investors becomes meaningful only when combined with complementary internal firm characteristics, such as operational scale.

RECOMMENDATIONS

Drawing upon the findings of this study, the following recommendations are proposed:

Given that firm size positively influences environmental reporting, corporate managers and directors of larger firms should continue to leverage their resources and visibility to adopt standardized environmental disclosure practices. Regulators such as the Financial Reporting Council of Nigeria (FRCN) and the Nigerian Exchange Group (NGX) should mandate detailed sustainability disclosure templates for larger manufacturing firms. Investors and financial analysts should also integrate firm size as a critical factor in sustainability-based valuation and portfolio decisions. Similarly, since firm age is positively related to environmental reporting, older firms are encouraged to build on their legacy by formalizing and institutionalizing their environmental disclosure processes. Corporate governance bodies should ensure that reporting practices evolve to meet contemporary sustainability standards. Policy makers should design incentive schemes or awards for long-standing firms that adopt and publish comprehensive environmental sustainability reports. Additionally, given the finding that foreign institutional ownership

has no statistically significant impact on environmental reporting, it is recommended that foreign investors take a more active role in corporate governance processes by requesting greater environmental transparency during stakeholder engagements and general meetings. Corporate managers should not rely on foreign ownership to drive sustainability but should instead embed environmental accountability within corporate strategy. Regulatory authorities may also need to strengthen the disclosure expectations for firms with significant foreign participation. Also, as foreign ownership significantly has no statistically significant impact on size and environmental reporting, corporate boards of large firms with foreign investors should seize this strategic advantage by developing integrated sustainability frameworks that meet both local and global ESG expectations. Institutional investors should use their influence to demand ESG-aligned policies from boards and ensure compliance through continuous engagement and periodic evaluations. Analysts and accounting professionals should factor in this interaction when analysing disclosure quality and advising on corporate reporting strategies. The study also reveals that foreign institutional ownership does not have a statistically significant moderating effect on the relationship between firm age and environmental reporting. This suggests that maturity or experience alone does not amplify the influence of foreign investors. As such, managers of older firms should modernize their sustainability approaches through digital and integrated reporting systems, rather than relying on foreign ownership for disclosure improvements. Regulators and accounting standard setters should develop sector-specific sustainability disclosure guidelines tailored for mature firms, to help align legacy reporting systems with global best practices.

LIMITATION OF THE STUDY

The current study is limited to manufacturing firms operating in Nigeria business landscape and do appreciate that it might be difficult to generalize the results across other sectors or countries. The concept of sustainability is all encompassing comprising economic, social, economic and governance factors. The current study is restricted to environmental sustainability while ignoring other aspects of sustainability, an act that may cast doubt on the reliability of the results, and in turn, may necessitate further research to reflect a comprehensive understanding of, and holistic perception of sustainability. Finally, the study was moderated with the help of foreign institution ownership, future studies may consider other forms of ownership structure to see their contributions to sustainability initiatives.

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