

EFFECT OF BOARD ATTRIBUTES ON ENVIRONMENTAL DISCLOSURE OF LISTED MANUFACTURING FIRMS IN NIGERIA

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Abstract

The increasing global concern for the environment and the consequent academic interest in researching best environmental disclosure that enhances the quality of reporting had given tremendous drive for this current research. This study examined the effect of board-specific attributes on the environmental disclosure of listed manufacturing firms in Nigeria. The study used the correlational research design with a positivist research paradigm, and agency theory to underpin the relationship between the independent variables and the dependent variable of interest. The population of the study consisted of the 52 listed manufacturing firms on the Nigerian Exchange Group, the population was later reduced to a sample size of 43 manufacturing using the filtration method. Quantitative data were extracted from the audited annual reports of the 43 manufacturing firms used in the study for twelve-year period covering 2011 to 2022. The data were analyzed using the Fixed Effect regression technique. Findings from the study show a significant positive relationship between board size, board gender, board expertise, board independence, and environmental disclosure of listed manufacturing firms in Nigeria. The implication of this result indicate that increase in these variables will lead to a corresponding increase in the environmental disclosure of listed manufacturing firms in Nigeria. Based on the findings of the study, it is recommended that the management of the sampled firms should increase the minimum number of board size to nine members, board independence to about 11.92% of the directors on the board and the minimum number of women on the board should increase to 15.59% as established by the study. This is because it was established by the findings of the study that increase of the various variables as indicated by the descriptive statistics will promote the environmental disclosure among the listed manufacturing firms in Nigeria. Also, the management of the firms should carry out policies that will promote the inclusion of foreign directors on the board as this was also shown to improve the environmental disclosure of manufacturing firms in Nigeria.

Keywords: Board attributes, environmental disclosure, manufacturing firms, Nigeria.

1.0 Introduction

The environmental challenges caused by the activities of business organizations have become a source of worry to many stakeholders across the globe. Businesses in the process of carrying out their operations cause a lot of environmental damage leading to poor waste management, water and air pollution, biological diversity, desertification, global warming, and drought among others (Uddin, 2021). As a result of this, there has been a debate in our national discourse on the level of pollution caused by environmentally sensitive firms like manufacturing firms. This debate is triggered by the beliefs held by many citizens that the host

communities in which these firms predominantly operate have been short-changed (Emmanuel *et al.*, 2018). Their ecosystem has been destroyed by the activities of these firms. This phenomenon has called on businesses to be more responsible for their activities and consider their decisions to include environmental and sustainable development issues that hurt the environment.

Furthermore, to reduce the effects of environmental issues, countries have designed and implemented several eco-friendly policies, such as the Kyoto Protocol, carbon taxes, the Paris Agreement and schemes of emission trading (Akram & Raza, 2018). In Nigeria, the government has taken steps to promote environmental sustainability practices through policies and regulations such as the National Policy on Environment, the National Environmental Standards and Regulations Enforcement Agency (NESREA), and the Nigerian Climate Change Response Strategy and Action Plan (NCCRSAP) (Tanko, 2024). The government's policies and regulations play a crucial role in promoting environmental sustainability practices in the country (Tanko, 2024).

Despite, the measures put in place by the government to reduce environmental challenges in the country, many manufacturing firms operate without regard for the environment due to limited resources, inadequate knowledge and skills, and lax enforcement of environmental regulations. The level and magnitude of environmental damages differ among countries, companies and sectors and at different period (Kumar, 2021). According to the World Air Quality Report in 2018, Nigeria was ranked as the 10th most polluted country globally (World Air Report [WAQ], 2018), which is not only attributable to the activities of the oil and gas industries in the form of gas flaring, oil spillage and other environmentally related issues but also the activities of other environmentally sensitive firms like manufacturing firms.

According to Iredele and Akinlo (2015) the level of environmental disclosure in Nigeria is still very weak and evolving especially in the non-oil sector like the manufacturing sector. However, environmental disclosure in Nigerian firms' annual reports is still at the voluntary stage. Despite the benefits of environmental sustainability practices by firms, the decision of whether a firm engages in environmental reporting or not can be influenced by a lot of factors as documented in the literature (Salawu *et al.*, 2021; Ramaiah *et al.*, 2022; Suleiman *et al.*, 2023). So, what are the deciding factors for businesses to report their ecological stewardship? Could the firm's corporate board characteristics stimulate their level of disclosure? This study examines those corporate board characteristics that could determine the disclosure of environmental practices among listed manufacturing firms in Nigeria.

Considering the importance of environmental sustainability practice to the firm and the environmental. Research scholars have directed their attention to identifying the factors that influence the level of environmental disclosure of firms both in the developed and the developing societies (Salawu *et al.*, 2021; Ramaiah *et al.*, 2022). While there have been considerable research in the developed countries on the environmental sustainability of firms (Agyemang *et al.*, 2020; Khaireddine *et al.*, 2020; Latif1 *et al.*, 2020), there is a handful of studies on environmental sustainability in developing countries like Nigeria (Salawu *et al.*, 2021; Olowookere, *et al.*, 2023). With most of the studies conducted in Nigeria centered on the effect of environmental performance on the financial performance of firms. However, the factors that influence environmental disclosures in developing countries remain a problem

considering the inconclusive findings of previous studies in this area and the need for this study in the Nigerian perspective.

In Nigeria, the study conducted by Abubakar and Moses (2020); Issa et al. (2021); Olowookere, et al. (2023); and Suleiman et al. (2023), examining the relationship between board characteristics and environmental disclosure among the industrial goods firms and oil and gas firms. The findings of these studies cannot be generalized to the entire manufacturing firms in Nigeria due to the peculiarities of these firms. Hence, this study intends to fill this gap by focusing on the entire manufacturing firms in Nigeria which will enhance a more generalizability of the study. Similarly, there is a limitation in scope of the study and this presents a gap in the period that this study also intends to fill. For instance, the study of Issa et al. (2021), covered the period from 2012-2019, Salawu et al. (2021), covered from 2012-2018, Uche et al. (2019), covered the period from 2008-2017. The period of time covered by these studies are not too current and cannot be relied upon for decision as many environmental issues and guidelines have been offered to promote environmental disclosure of firms.

Therefore, to fill the gaps identified in the literature, this study examines the effect of board specific-attributes on environmental disclosure of listed manufacturing firms in Nigeria. The objective of the study is to address the concern on the environmental disclosure of listed manufacturing firms in Nigeria and to shed more light on the factors that influence the environmental disclosure of firms in Nigeria. Also, the study seeks to strengthen the need for a greener and more responsible business environment in the country.

2.0 Literature Review

This section of the study contains the conceptualization of the concepts of the study, empirical studies and theoretical framework of the study.

Environmental disclosure

Environmental disclosure is defined as the disclosure by an entity of environmentally related data, verified or not, regarding environmental risks, environmental impacts, policies, strategies, targets, costs, liabilities or environmental performance to those who have an interest in such information, as an aid to enriching their relationship with reporting entity (Che-Adam et al., 2019). According to Salawu et al. (2021), environmental disclosure are means of communicating to the stakeholders, the impact of the firm's activities on the environment. The central objective of environmental disclosure is to communicate the firm's environmental performance to the report reader. It is also defined as information disclosed by companies pertaining key environmental matters, policies on environmental issues, quantity of emissions and waste, compliance to environmental regulations, expenditures on environmental activities, contribution to sustainability projects and etc (Ong, et al., 2019). As sustainability and environmental responsibility gain prominence, stakeholders increasingly demand high-quality disclosure to make informed decisions and assess companies' commitment to environmental stewardship. The demand for firms to conduct environmental control assessments and disclose their findings has grown significantly over several decades. The statement strongly appeals to establish an enduring environment that fosters favorable conditions for individuals and corporate entities to effectively carry out their operations (Suleiman, et al., 2023).

Board attributes

Board attributes are characteristics that board should possess in order to protect the rights of shareholders, especially minority shareholders, from deviant management and board members. Board characteristics assist in protecting stakeholder rights against management's unethical conduct (Connelly *et al.*, 2010). The board attributes that will be investigated in this study are explained below.

Board size

Board size refers to the total number of directors on the board of a firm which is inclusive of the Chief Executive Officer and Chairman of the board. This will include outside directors, executive directors, and non-executive directors. The reason for the support is that a larger board of directors can ensure that more non-executive directors can better supervise managers, while a larger board of directors will include more professionals from different fields. High-quality boards from different backgrounds can make better decisions for the board (Olowookere *et al.*, 2023).

Board independence

Board independence refers to the proportion of independent directors serving on a company's board. An independent director has no material relationship with the company, its management, or its major shareholders, which could compromise their ability to act in the best interest of all shareholders (Romlah *et al.*, 2020). Independent directors are essential for effective corporate governance as they bring objectivity, impartiality, and diverse expertise to board decision-making processes. An independent director refers to an individual appointed to a corporation's board but does not engage in the organization's internal management (Suleiman *et al.*, 2023). Furthermore, this director maintains no familial or business affiliations with the corporation.

Board financial expertise

Board financial expertise refers to the presence of directors on a company's board who possess relevant financial knowledge, skills, and experience. Having directors with financial expertise is essential for effective corporate governance, especially in making informed financial decisions, overseeing financial reporting, and assessing the company's financial performance (Suleiman *et al.*, 2023). The significance of board members' educational background and expertise in their oversight responsibilities cannot be overstated. The principles for expertise were delineated in Nigeria through various codes, including the 2011 and 2018 SEC Codes and the 2006 Post Consolidation CBN Code, among others. The US Securities and Exchange Commission (USSEC) also imposes a comparable requirement, stipulating that companies must have a minimum of one individual possessing financial expertise (Suleiman *et al.*, 2023).

Board gender

Board gender diversity is a significant aspect of corporate governance; it is defined as the presence of female directors on the board of directors of corporations. Board gender diversity leads to better decision-making. Overall, there has been strong evidence in the literature that board gender diversity is a critical and favorable aspect of the board of directors and thus reinforces internal corporate governance. The advocacy for gender diversity of the board which started after the Beijing conference recommended that there should be 30% female representation in the management of firms. The composition of the board is very key to determining the disclosure pattern of companies (Olowookere *et al.*, 2023).

Board nationality

According to Financial Reporting Council of Nigeria (FRCN), board nationality is concerned with the number of foreign members in the board of directors of a particular company. It is seen as the number of directors that have different nationality or someone who was born and brought up a different country and has chosen to invest in a different country. Board nationality is the degree of foreign directorship in any board of directors and this has been found to have significant and positive on the environmental disclosures of environmentally sensitive firms (Liao et al., 2014). In African context, due largely to inherent institutional weaknesses, a foreign directorship is seen as institutional mechanisms put in place to enhance the decision-making capacity of the board (Al-Najjar, 2011; Hamid et al., 2015).

Board with large and diverse members are expected to ensure the compliance with environment regulations. Independent directors serve as a mechanism that bridge the gap between management and the shareholder and implement policies that will ensure environmental sustainability. Also, female directors are more concerned with specific aspects of corporate responsibility and could perceive sustainability issues more carefully than male managers which could thus lead to a greater degree of environmental responsibilities (Issa et al., 2021). More so, foreign directors are expected to pay greater attention in environmental issues due to their international exposure.

Empirical Studies

Olowookere et al. (2023), investigated board attributes and environmental disclosure practices among listed pharmaceutical and cement companies in Nigeria. The population of the study consisted of thirteen (13) Nigerian listed companies out of which ten (seven pharmaceutical and three cement Companies) companies were purposely selected based on the availability of data. The study covered a period of ten years (2012 to 2021) and employed Random Fixed Effect Regression for analysis. The results of the study showed that board independence and board gender diversity have a positive and significant relationship with environmental disclosure practices. However, board meetings had a negative and significant impact on environmental disclosure, while board size had a positive but insignificant influence on environmental disclosure.

Suleiman et al. (2023), investigated the attributes of corporate boards and their relationship to environmental disclosure practices among industrial goods companies listed in Nigeria. The study used secondary data from Nigerian Exchange Group (NGX) listed industrial goods companies from 2013 to 2022 in an ex-post facto design. The study tested hypotheses using multiple regression. The result shows a statistically significant and positive link between board size and environmental disclosure. It appears that corporations with larger boards disclose more environmental information.

Ramaiah et al. (2022), examined the influence of board characteristics, namely, Board Size (BS), board Independence, board meetings, CEO duality, firm-size, TobinQ, and ROA on environmental information disclosure. The study used panel data of 60 environmentally most polluted companies listed on the Bombay Stock Exchange from 2017 to 2021. The data was analyzed using the feasible generalized least square (FGLS) regression technique. The regression result indicates that board size has significant influence on environmental disclosure, whereas board independence and size of firms do not influence environmental

information disclosure.

Issa et al. (2021), examined the effect of board mechanism on environmental disclosure quality in Nigeria. Using secondary data extracted from the annual reports of seven listed oil and gas companies on Nigerian Exchange Group (NGX) for the period 2012-2019. Employing the panel-corrected standard error (PCSE) regression analysis. The regression result shows that board independence, board gender diversity and board expertise have a significant positive impact on environmental disclosure quality. However, board size and board nationality has an insignificant relationship with environmental disclosure quality.

Agyemang et al. (2020) examined the effect of board characteristics on environmental disclosure using data of 34 listed mining companies in China for the period covering from 2000 to 2018. Multiple regression analysis results showed that both board independence and board size have a significant positive influence on the disclosure of environmental accounting information. Both foreign nationals and females on board have an insignificant relationship with the disclosure of environmental accounting information.

Khaireddine et al. (2020), investigated how board characteristics impact the governance, environmental and ethics disclosure. Board characteristics such as board size, gender diversity, board independence, CEO/chair duality and board meetings are included. The study was based on a sample of 82 companies listed in the SBF 120 between 2012 and 2017. Several of econometric techniques are used such as generalized least squares to test the panel regressions. The result shows that board independence, board gender diversity and board meetings have a positive and significant influence on governance, environmental and ethics disclosure. Board size is positively and significantly associated only with corporate environmental disclosure.

Latif et al. (2020), examined the factors which motivate companies to disclose environmental information. Based on content analysis, this study finds that the level of ER disclosures is very low with an average ER Disclosure Score of only 26%. Hence more efforts are needed to motivate firms to disclose environmental activities. Using hierarchical Tobit regression with robust standard error, this study finds that board diversity (Muslim directors), firm size, profitability and growth have a significant influence on environmental disclosures. Other board characteristics such as board size and board independence were not significant drivers of environmental disclosures.

Therefore, the following hypotheses were formulated in null form:

H₀₁: Board size has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria;

H₀₂: Board independence has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria;

H₀₃: Board expertise has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria;

H₀₄: Board gender has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria;

H₀₅: Board nationality has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria.

Theoretical Framework

The study underpinned the relationship between board attributes and environmental disclosure using agency theory.

Agency Theory

Agency theory was propounded by Jensen and Meckling in 1976. The interaction between agents and principal is explained by agency theory. Principals are owners or partners, while agents are the company's management (Jensen & Meckling, 1976). The agency arrangement, according to Eisenhardt (1989), is a contract under which the principal employs an agent to conduct a job on his or her behalf and delegates some decision-making power to the agent. In the context of this work, the management represented by the board of directors acts on behalf of the interested parties (shareholders, government, community, investors, etc.). The board of directors would strive to fulfil the needs of the stakeholder while performing its duties.

The tug of war between shareholders or principals and administrators is recognized by agency theory (Kleiman, 2011). The agency dilemma arises as a consequence of the division of ownership and management, which results in an expertise and information disparity between customers or investors and business executives. As a result, agency theory argues that voluntary disclosure may help to reduce conflicts of interest between shareholders and executives. Environmental disclosures are made willingly by managers to notify their clients of the company's environmental policies and operations (Chaklader & Gulati, 2015). According to agency theory, an organization with a large agency cost would aim to lower it by increasing ED and using a monitoring system.

3.0 Methodology

This study used the correlational research design to evaluate the relationship between the environmental disclosure and board attributes. The correlational research design is adopted because of its strength to allow for the examination of variables without manipulation. The population of the study consist of 52 listed manufacturing firms on the Nigerian Exchange Group (NGX) from the period of 2011-2022 and are still on the Exchange as at 1st of December 2022. The study used a filter to arrive at 43 sampled firms for the study. The filter is that a manufacturing firm must not have been delisted from the NGX within the period. This filter was employed to ensure availability of published financial statement of the firms. After applying the filter 9 manufacturing firms were filtered out these firms include: A. G. Leventis Nigeria Plc, Abplast Plc, Africa Paints Nigeria Plc, Afrik Pharmaceutical Plc, Alumaco Plc, Ashaka Cement Plc, Atlas Nigeria Plc, Avon Crown Caps and Container Plc, ABA Textile Mills. Also, secondary data were obtained from the audited annual reports of the firms under investigation within the period of the study. The fixed effect model of regression analysis technique was used to analyze the data used in testing the hypotheses of the study due to the fact that the Hausman test was established to be significant which supported the use of fixed effect regression technique of analysis.

Variable Measurement

The dependent variables, which is environmental disclosures is measured based on Global Environmental Report Initiative. This was done by assigning zero as non-disclosure and one for disclosure. After considering the scoring scale, the summation of the quality score was awarded to the Environmental Disclosure in the checklist. This was done by summing all the scores

obtained from the company disclosures and dividing by the total expected score. Therefore, the environmental disclosure index of a firm was calculated using the equation below:

$$ED = \frac{EDS}{MXDS}$$

Where:

ED = Environmental Disclosure;

EDS = Environmental Disclosure Scores; and

MX DS = Maximum disclosure scores of environmental disclosures for this study is 35 items.

Table1:
Variable Measurement

Acronyms	Variable	Measurement	Source
ED	Environmental Disclosure	Environmental Disclosure is measured as a dichotomous variable of 1 if a firm disclosed an item on the environmental disclosure check list and 0 if not	Salawu et al. (2021); Suleiman et al. (2023)
BSIZE	Board Size	Total number of directors in the board	Agyemang et al. (2020); Latif1 et al. (2020)
BIND	Board Independence	No of independent non-executive directors divided by total number of Directors	Issa et al. (2021); Ramaiah et al. (2022)
BGD	Board Gender	Board gender is measured as the percentage of female directors to total number of board of directors	Khaireddine et al. (2020); Olowookere, et al. (2023)
BEXP	Board Expertise	Board Expertise is calculated as number of directors with professional qualification to total number of directors	Abubakar and Moses (2020)
BNAT	Board Nationality	This will be measured as ratio of foreign directors to total number of directors	Agyemang et al. (2020); Issa et al. (2021).

Source: Authors Compilation, (2024).

Model Specification

The variables that were incorporated into the model of the study include: board size; board independence, board gender, board expertise, and board nationality to assess their respective effect on environmental disclosure of listed manufacturing firms in Nigeria. Hence, the multiple linear regression function was formulated for the model as follows:

$$ED_{it} = \beta_0 + \beta_1 BSIZ_{it} + \beta_2 BIND_{it} + \beta_3 BGD_{it} + \beta_4 BEXP_{it} + \beta_5 BNAT_{it} + \epsilon_{it}$$

Whereas:

ED = Environmental Disclosure

BSIZE = Board Size

BIND = Board Independence

BGD = Board Gender
 BEXP = Board Expertise
 BNAT = Board Nationality
 B0 = Constant
 B1-5 = Coefficient of independent variables
 ϵ = Error Term
 It = Panel Indicator

4.0 Result and Discussion

This section presents the descriptive statistics of the dependent and explanatory variables of the study. It contains the mean sample, maximum, minimum and standard deviation of the various variables.

Table 1:
Descriptive Statistics

Variables	Obs	Mean	Std.Dev	Min	Max
ED	516	0.054	0.127	0.000	0.735
BSIZE	516	8.862	2.468	4.000	17.00
BIND	516	0.119	0.140	0.000	0.500
BGD	516	0.156	0.162	0.000	0.346
BEXP	516	0.126	0.145	0.000	0.600
BNAT	516	0.225	0.210	0.000	0.636

Source: Researchers' Computation using STATA Output, (2024)

Table 1 shows that Environmental Disclosure (ED), the dependent variable of the study, has a mean value of 0.054 indicating that, on average, listed manufacturing firms in Nigeria disclose 5.4% of the information pertaining to their environmental impact in their annual reports. This suggests that the listed manufacturing firms in Nigeria compliance with environmental disclosures. The result similarly reveals that the minimum value of ED is 0.000, indicating that the manufacturing firms in Nigeria do not disclosure environmental information in their annual reports, while the maximum value was 0.735, it indicates that, within the period of the study, the highest level of ED by the listed manufacturing firms in Nigeria was 73.5%. The standard deviation of this figure, 0.127, suggests that there appears to be a very wide variance in the manufacturing firms' level of ED.

Also, Table 1 indicates that board size has a mean value of 8.862, indicating that the firms under examination have an average board size of 9 board members. The standard deviation was 2.468, and the minimum and maximum values were 4.000 and 17.00, respectively; board independence has a mean of 0.119 and a standard deviation, minimum and maximum value of 0.140, 0.000 and 0.500 respectively; Furthermore, the mean in respect to board gender was found to be 0.156, meaning that the manufacturing firms in Nigeria have 15.6% female directors on the board of directors. The standard deviation was found to be 0.162, and the minimum value was found to be 0.000, and a maximum value of 0.346; The result shows that board expertise has a mean of 0.126, revealing that 12.6% of directors on the board of the listed manufacturing firms in Nigeria are members of a professional body; with a standard deviation of 0.145; a minimum value of 0.000, and a maximum value of 0.600.

Finally, the descriptive statistics, show that board nationality has a mean value of 0.225, meaning that 22.5% of directors on the board of the listed manufacturing firms in Nigeria are foreign citizens. The standard deviation, however, is 0.210, indicating that there is a low deviation from the mean of board nationality. The values were 0.000 at the maximum and 0.636 at the minimum.

Correlation Matrix

The correlation matrix reveals the relationship that exists between the dependent variable and each of the independent variables as well as the relationship between the independent variables themselves. The summary of the correlation coefficients of the variables of the study are shown in Table 4.2

Table 2:
Correlation Matrix

Variable	ED	BSIZE	BIND	BGD	BEXP	BNAT
ED	1.000					
BSIZE	0.285	1.000				
BIND	0.017	0.447	1.000			
BGD	0.016	-0.195	-0.081	1.000		
BEXP	0.123	0.158	-0.455	0.025	1.000	
BNAT	0.158	-0.154	0.096	0.078	-0.374	1.000

Source: Researchers' computation using STATA Output, (2024)

Table 2 presents the correlation result between environmental disclosure of listed manufacturing firms and board attributes. With correlation coefficients of 0.285, 0.017, 0.016, 0.123, 0.158, shows a positive relationship between board size, board independence, board gender, board expertise, and board nationality and ED of listed manufacturing firms in Nigeria. Furthermore, the correlation matrix confirms that none of the independent variables for board attributes have a coefficient of correlation greater than 80%. This suggests that the independent variables used in the study may not be multi-collinear (Gujarati, 2004). However, the VIF was also conducted to further confirm the assertion as analyzed using the Multi-collinearity Test.

Multi-collinearity Test

A multi-collinearity test was done to find out if two or more of the independent variables included in the study had high inter-correlation, as this could have an effect on the validity of the study's results and how they should be interpreted.

Table 3
Variance Inflation Factor and Tolerance Value

Variable	VIF	1/VIF
BSIZE	1.12	0.894
BIND	1.12	0.894
BGD	1.14	0.878
BEXP	1.06	0.943
BNAT	1.12	0.894
Mean VIF	1.11	

Source: Researchers' Computation from STATA Output, (2024)

Table 4.3, shows the VIF and tolerance values which were employed as an advance measure to check the presence of multi-collinearity among the explanatory variables of the study. The values of VIF and tolerance level were confirmed to be simultaneously less than 1 and 10 respectively which suggest that there is nonexistence of multi-collinearity among the explanatory variables used in the study (Gujarati, 2004).

Robustness Test

The study determined its best estimates to test the hypotheses earlier formulated in the research by conducting different robustness tests to choose the appropriate technique for the study. It began with the multi-collinearity test to dictate the presence of multi-collinearity between the variables of the study, followed by Hausman specification test to select between Fixed and Random Effect Models which turned out to be significant as shown by the χ^2 of 33.96 and p-value of 0.000 which supported the choice of the fixed effect model. The study further carried out heteroskedasticity test for fixed effect which turn out to be significant with a chi2 of 911.65 and p-value of 0.000 which shows there is no equal variation between two the residuals of the study. To correct this, the study used the fixed effect robust to test the hypotheses formulated in the study.

Presentation and Interpretation of Regression Result

The result obtained from the fixed effect regression is presented in Table 4, as follows:

Table 4:
Fixed Effect Robust Regression Result

ED	Coefficient	Std. Err	z values	P Value
BSIZE	0.278	0.095	2.92	0.006
BIND	0.055	0.023	2.44	0.019
BGD	0.091	0.012	7.40	0.000
BEXP	0.034	0.020	1.70	0.096
BNAT	0.153	0.032	4.70	0.000
Con	0.382	0.160	2.39	0.022
F (5, 42)	23.25			
P Value	0.000			
R-Square	0.152			
No. Obs	516			

Source: Researchers' Computation using STATA Output, (2024)

***p<0.01, **p<0.05

From Table 4, the R-square is 0.152 which means that all of the independent variables selected for this study explain the changes in the dependent variable by 15.2%. This shows that the board attributes such as: board size, board independence, board gender, board expertise and board nationality incorporated into the model of the study explain the changes in the dependent variable of environmental disclosure of the listed manufacturing firms in Nigeria by 15.2% why the remaining 84.80% is explain by other factors not considered in this study. Furthermore, an F-statistics of 23.25 with a corresponding p-value of 0.0000 which is significant at 1%. This confirms the fitness of the model of the study.

$$\text{ED} = 0.3817 + 0.2782\text{BSIZ} + 0.0552\text{BIND} + 0.0908\text{BGD} + 0.0336\text{BEXP} + 0.1525\text{BNAT}$$

The regression result in Table 4 reveals that board size has a coefficient of 0.278, t-value of 2.92 and a p-value of 0.006 which is significant at 1%. This implies that board size has a positive and significant effect on environmental disclosure of listed manufacturing firms in Nigeria. This suggests that, an increase in board size by one director will lead to increase in the environmental disclosure of listed manufacturing firms in Nigeria by 27.8% every other thing being equal. To this end, the research rejects the first null hypothesis which stated that board size has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria. The finding is in line with the studies of Ramaiah et al. (2022) and Suleiman et al. (2023), who found a significant relationship between board size and environmental disclosure and contradicts the finding of Issa et al. (2021) and Olowookere et al. (2023) who found no relationship between board size and environmental disclosure.

Also, Table 4 shows that board independence has a coefficient of 0.055, a t-value of 2.44 and a p-value of 0.019 which is significant at 5%. This means that board independence has a positive and significant effect environmental disclosure by listed manufacturing firms in Nigeria. This implies that, if board independence increases by one independent director it will lead to a corresponding increase in the environmental disclosure of listed manufacturing firms by 5.5% all other things being equal. In view of this, the study reject the second null hypothesis which stated that board independence has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria. The result is in line with the findings of Agyemang et al. (2020); Issa et al. (2021); Olowookere et al. (2023) and contradicts the studies of Latif et al. (2020); Ramaiah et al. (2022) who found no relationship.

The result also reveals that board gender has the coefficient of 0.091, t-value of 7.40 and a p-value of 0.000 which is significant at 1%. This means that board gender has a significant effect on environmental disclosure of listed manufacturing firms in Nigeria. This reveals that if board gender increases by one female director it will lead to increase in environmental disclosure of listed manufacturing firms in Nigeria by 0.91% every other thing being equal. Hence, the study fail to reject the third null hypothesis which assumed that board gender has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria. The result confirms the findings of Khaireddine et al. (2020); and Issa et al. (2021) who found significant relationship between board gender and environmental disclosure, however the finding contradicts the study of Agyemang et al. (2020) who established no significant relationship between board gender and environmental disclosure.

Moreover, the finding shows that board expertise has a coefficient of 0.034 a t-value of 1.70 and a p-value of 0.096 which is not significant. This implies that there is no relationship between board expertise and environmental disclosure of listed manufacturing firms in Nigeria. However, the study failed to reject the fourth null hypothesis which assumed that board expertise has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria. The finding contradicts the finding of Issa et al. (2021).

Finally, the regression result shows that board nationality has a coefficient of 0.153 a t-value of 4.70 and a p-value of 0.000 which is significant at 1%. This means that board nationality has a

positive and significant effect on environmental disclosure of listed manufacturing firms in Nigeria. This further suggests that, if the board nationality increases by one foreign director it will lead to an increase in environmental disclosure of listed manufacturing firms in Nigeria by 15.3% all things being equal. To this end, the study fail reject the fifth null hypothesis which stated that board nationality has no significant effect on environmental disclosure of listed manufacturing firms in Nigeria. The finding of this study is contrary to the studies of Agyemang et al. (2020); and Issa et al. (2021) who reported insignificant relationship between board nationality and environmental disclosure of firms.

5.0 Conclusion and Recommendations

In line with the finding, the study concluded that board size, board independence, board gender, and board nationality had a positive and significant effect on environmental disclosure of listed manufacturing firms in Nigeria. Because large board with diversity of knowledge and experience encourage the compliance with environmental sustainability, management are influence to disclose environmental related information in their annual reports. Furthermore, independence directors serve as a tool in controlling the activities of management, non-executive directors who are not part of the management of the firm influence the decisions of the firm to align with the interest of the principals which may include the disclosure of environmental impact of the firm on the environment. Also, female directors on the board of the firm unlike their male counterparts encourage environmentally friendly policies by the firms. Finally, foreign nationals on the board with more exposure on environmental sustainability practice and best ethics of doing business influence the decisions of management to be more responsible in the operations with regards to the environment and sustainability practices.

Therefore, the study suggested that the listed manufacturing firms in Nigeria increase their board size to at least nine (9) directors to increase their environmental disclosure level. Furthermore, the study suggests that the management increase the number of independent directors on their board of directors to at least 11.92% which will encourage their environmental disclosure level. Also, it is suggested that the management of the firms increase the number of female directors on their board to nothing less than 15.59% as it shows to have positive effect on their environmental disclosure. Lastly, the study suggests that the management of the listed manufacturing firms in Nigeria encourage more foreign directors on their board of directors to improve their environmental disclosure level.

The study has theoretical implication as it fills the gap in literature by examining the effect of board attributes on environmental disclosure of listed manufacturing firms in Nigeria. Also, the study provides information on the effect of board attributes on environmental disclosure which will provide a guide for future researchers in this area. Furthermore, the study has practical implication as the result of the study will assist management and regulators to strengthen the monitoring mechanisms and device measures to ensure that firms adhere to environmental disclosure.

The study was limited to only the listed manufacturing firms in Nigeria, as such the results of the study cannot be generalized to other sectors most especially the financial sector. Also, the study was limited to just four variables: board size, independence, gender, expertise and nationality as the only determinants of environmental disclosure. Finally, future researchers

should replicate this study to the entire listed firms in Nigeria to ensure more generalizability of the findings of the study.

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