Board Attributes and Environmental Disclosure Practices among Quoted Manufacturing Companies in Nigeria

Johnson Kolawole OLOWOOKERE[*], Jayeola OLABISI[**], Gabriel Monday OIJIANGBE[***], Titilope Esther OLOREDE[****]

Abstract *This study 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. The study concluded that board attributes contributed to environmental disclosure practices of Nigerian listed pharmaceutical and cement companies in Nigeria. Therefore, the study suggested that every company should ensure the inclusion of appropriate board attributes to encourage voluntary environmental disclosure practices among Nigerian listed pharmaceutical and cement companies.*

Keywords*: Board independence; board size; board meeting; board gender diversity; environmental disclosures*

JEL Classification Code*: M; M48*

---

[*] **Johnson Kolawole OLOWOOKERE, PhD.,** Osun State University, Osogbo, Nigeria, Johnson.olowookere@uniosun.edu.ng, ORCID iD: https:// orcid.org/0000-0003-3062-3156

[**] **Jayeola OLABISI,** Associate Professor of Management Accounting, Federal University of Agriculture, Abeokuta, Nigeria; olabisij@funaab.edu.ng ORCID iD: https://orcid.org/0000-0002-5390-0307

[***] **Gabriel Monday OIJIANGBE, M.Sc.,** African Regional Institute for Geospatial Information Science and Technology, Nigeria, oijiangbegabriel@gmail.com , ORCID iD: https:// orcid.org/0000-0003-1066-1470

[****] **Titilope Esther OLOREDE, M.Sc., Accounting**, Osun State University, Nigeria, Titilope.olorede@uniosun.edu.ng, ORCID iD: https:// orcid.org/0000-0002-1857-5975

1. INTRODUCTION

Environmental disclosure practice is the process by which an organization's environmental reporting extends beyond traditional annual reports of environmental impact on business. The environmental disclosure reveals the impact of a company's activities on the host community and does not only concern the company-specific costs and specific benefits but incorporates external costs and other gains that affect different stakeholders within the community. The disclosure of environmental activities is an important global governance practice, especially in more advanced countries such as Canada, Germany, France, Australia, the United Kingdom, and the United States. In these countries, many corporate governance principles are relevant governance mechanisms, especially in America. The concept of a triple footprint emphasizes the need for disclosing full information about business activities and environmental impact on stakeholders. Hence, an environmental report provides useful information for stakeholders to measure business successes both in absolute and real terms. Wood and Sangster (2002) opined that large companies have a greater demand for environmental disclosures such as environmental protection, the need to maintain a green ecosystem, reduce carbon emissions and maintain environmental sustainability.

Companies have developed frameworks and mechanisms that ensure that businesses measure their success in line with shareholder theory and wealth maximization. Although a company's financial performance is regularly reported in the annual report, the environmental impact of business activities is either not disclosed or poorly disclosed by many corporate organizations. This problem is exacerbated by inadequate enforcement of existing legislation (Olabisi, Kajola, Oladejo, Ojeaga, & Abass, 2018). Nigeria generally has a weak corporate environmental disclosure culture due to unstable institutions, weak legal frameworks, non-enforcement of environmental laws, and inadequate environmental disclosure standards (Fave, Bawa & Dabari 2017).

Board characteristics such as board size, board independence, board gender diversity, and board meetings are mechanisms that determine environmental disclosure and provide a platform for clarifying environmental goals that are not previously included in annual reports as a result of non-mandatory disclosure requirements. This problem of non-disclosure or inadequate disclosure of environmental information had resulted in health challenges being suffered by communities, pollution of the environment, low agricultural yields, climate change, depletion of the ozone layer, and in some instances, elimination of the ecosystem.

Discussions about the non-disclosure or under-reporting of environmental matters in financial statements and the role of the board structure through governance in achieving environmental disclosure practices have dominated discussions among scientists, business analysts, and decision-makers, especially in recent times (Odoemelam & Okafor, 2018). Therefore, the study investigated board attributes and environmental disclosure practices among Nigerian listed pharmaceutical and cement manufacturing companies. The specific objectives are to:

i) assess the impact of board size on environmental disclosure practices of Nigerian listed pharmaceutical and cement manufacturing companies;
ii) examine the relationship that exists between board independence and environmental disclosure practices of Nigerian listed pharmaceutical and cement companies;
iii) evaluate the influence of board gender diversity on environmental disclosure practices of Nigerian listed pharmaceutical and cement companies; and
iv) investigate the relationship that exists between board meetings and environmental disclosure practices of Nigerian listed pharmaceutical and cement companies.

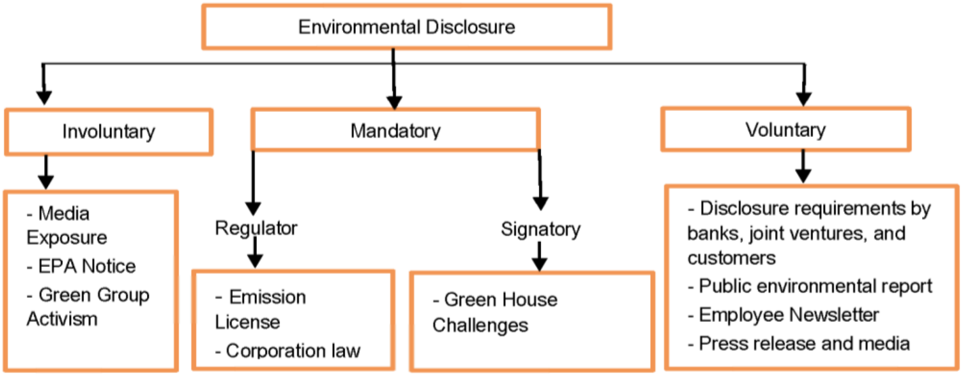
The remaining sections of the study are structured into four parts. The second section reviewed relevant literature and the third part dealt with the methodology adopted to achieve the objective of the study. Section four presented the results obtained using various analytical tools together with the interpretation and the last section concluded the study.

2. LITERATURE REVIEW

2.1.1. Conceptual Review

The concept of environmental disclosure is considered a branch of social accounting and reporting. Companies that operate in any business jurisdiction are to add value to the environment through business activities and receive value from the environment even without paying for such value (Wood & Sangster, 2002). Business activities have an external impact on the environment in the form of health challenges, soil and water pollution resulting in poor agricultural productivity, climate change resulting in unpredictable outcomes like flooding and drought, distortions in the ecosystem, and improper waste management, among others. The economic impact of these external consequences is borne by the host community. The three types of environmental disclosures discussed by Deloitte Touché International (1993) are; Mandatory environmental disclosure, Voluntary environmental disclosure, and; Involuntary environmental disclosure.

Figure 1: Types of Environmental Disclosure



Source: Deloitte Tohmatsu International (1993)

2.1.2. Environmental Disclosure Index

The United Nations Global Compact (UNGC), the International Standard Organization (ISO), and the Global Reporting Initiative (GRI) among others have contributed and made an addition to the literature on environmental reporting by formulating guidelines as a framework that helps to achieve disclosure measurement. Epstein (2014) opined that the first global framework on environmental reporting was formulated by the GRI as a guideline that comprehensively depicts how the report should be produced.

2.1.3. Board Size

Board size refers to the total number of directors on the board of each sample firm which is inclusive of the CEO and Chairman for each accounting year. 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.

2.1.4. Board Independence

The composition of members that form the board represents the number of executive directors about the number of non-executive (independent) directors of companies. Ienciu, (2012) concluded that to ensure a high degree of transparency in the environmental reports, the directors must use more numbers of independent directors to instill independence of mind in solving the conflict of interest issues. The theories adopted in this study strongly recommended a properly constituted board of directors of companies to ensure that the activities of the executive directors are controlled and that they act in the best interest of stakeholders.

2.1.5. Board Gender Diversity

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.

2.1.6. Board Meeting

A board meeting is a meeting of a company's board of directors, held usually at certain times of the year to discuss company-wide policies or issues. The board of directors determines the overall business strategy of the company, and the directors are either elected by shareholders or by members of the organization. A board meeting is held to review the strategic plan that has been developed by the board of directors. The goal is for the directors to agree on which direction to move in and how it will be implemented. Simply put, a board meeting is a meeting to set policy and strategy. The board of directors meeting is a formal meeting of an organization's board members. This meeting is usually held at regular intervals to discuss major problems and policy issues within the organization. All individuals that make up an organization's board of directors are usually in attendance.

2.2. Theoretical Review

Studies across the world have provided evidence of the impact of board structure on environmental reporting practices (Akbas, 2016). The underlying theory for board attributes and environmental disclosure is the Stakeholder theory. Stakeholder theory was postulated by Freeman, (1984) to connote anybody that is affected directly or indirectly by the activities of a business entity with the host community. Several studies have described stakeholders. A stakeholder is viewed as someone affected by the operations of an organization. The theory is widely used in literature to provide a strong basis for the disclosure of information in annual reports. This theory explains a company's responsibility to stakeholders (shareholders, creditors, employees, supervisors, local governments, etc.). It is also considered a theory that explains corporate environmental accounting (Liao et al., 2015). Therefore, the going concern of the company requires the support and consent of stakeholders for the company to successfully operate its business activities profitably.

Over the past four decades, the definition of “stakeholder” has changed significantly. Cowan (2007) defined a stakeholder to be the principal or sole owner of a business entity. The definition supported that of Friedman (1962) that argued that the main objective of companies was to maximize the wealth of their shareholders. The position was expanded by Freeman (1984) when he defined stakeholders to include different categories of interest groups and regulators. Cowan, (2007) adopted both definitions of shareholder for the development of compulsory environmental disclosure regulations for companies. The interdependence of companies with stakeholders is very significant. If customers or suppliers are not satisfied with the actions of a company and they withdraw their support for the services of the company, the company will be adversely affected as a going concern. Based on this argument, the company is described as an interconnected system or group of interests with aims and set objectives.

2.3. Empirical Review

Several studies have reported the influence of board attributes and the disclosure of environmental information across the world, including Nigeria. The board attributes considered in this study were board size, board independence, board meetings, and board gender diversity.

Dixon-Fowler, Ellstrand, and Johnson (2017) examined the association between environmental reporting and corporate financial performance in the United States. The study used a meta-analytic review of the business environment to investigate how firm size could influence the financial benefits derived from environmental reporting. The study found that a positive connection exists between the board's independence and environmental disclosure practices consistent with agency theory. The study concluded that board independence and board gender diversity had a positive and significant relationship with environmental disclosure practices.

Cooray, Gunaratne, and Senaratne (2020) examined the effects of board attributes on the quality of integrated reporting in Sri Lanka. This study was conducted using panel multivariate linear regression to analyze the content of 132 public company annual reports over three years. The study revealed limited support for a corporate governance system to provide stakeholders with quality information about the process of creating value through integrated reporting, while the size of the board and the existence of an independent risk committee the board had a significant association with integrated reporting. In addition, it was argued that there was a greater emphasis on the corporate governance compliance requirements of Sri Lankan companies compared to voluntary reporting models such as integrated reporting.

Ofoegbu, Odoemelam, and Okafor (2018) examined the relationship between board characteristics and the quality of environmental disclosure practices. The study used evidence from the integrated reporting method in South Africa and the traditional reporting method in Nigeria, using descriptive, multivariate, and regression models. The study found that board independence and board size had a positive and significant influence on environmental disclosure practices, while the percentage of disclosure in South Africa was 45% which was significant. About 51% of companies that are polluting the environment in Nigeria do not disclose their environmental information.

Akbas, (2016) investigated the influence of board attributes on the disclosure of environmental information among listed firms in Turkey. A total of 62 firms were selected from the non-financial sector in 2011. The study measured the extent of the disclosure using board size, board independence, board gender diversity, and board meeting as board attributes and extracted data using content analysis. The study revealed that environmental reporting and board size have a significant positive association. However, board independence, board gender diversity, and board meetings were found to have no association with environmental reporting practices. The results indicated that firms with large boards would report more information than firms with smaller board sizes. It concluded that board independence and board gender diversity of small companies could be the reason for the result.

Isa and Muhammad (2015) investigated board characteristics and their impact on the disclosure of corporate information using Content analysis from 2005 to 2014. The study adopted content analysis, multiple regressions, and other descriptive statistics. The results showed that board size and board gender diversity had a significant and positive influence on the disclosure of corporate information. A significant negative association was established between managerial ownership and corporate disclosure of environmental information.

Ajibolade and Uwuigbe (2013) investigated corporate governance characteristics and the effects on corporate disclosure of social and environmental information in Nigeria. Consistent with the previous study, content analysis and multiple regression models were used to achieve the objectives of the study. The result showed the existence of a significant inverse association between the duality of CEO and environmental disclosure, while non-executive directors, the board size, and board independence, board meetings had a positive and significant relationship with environmental disclosure. The study further revealed that the larger the number of non-executive directors on the board of companies, the better the disclosure. Also, regular board meetings promote more disclosure of environmental information to stakeholders.

3. METHODOLOGY

The study adopted *an ex-post facto* research design because the data was already in existence. The population consisted of thirteen (13) listed pharmaceutical and cement companies. The purposive sampling technique was adopted to select seven pharmaceutical and three cement companies out of the thirteen listed on the Nigerian Exchange Group as of 2021. The sectors considered were environmentally sensitive but rarely investigated by previous studies. Secondary data were generated from annual reports of the selected companies, while Content analysis was specifically used to convert qualitative data obtained from the annual reports of the selected companies into quantitative. The data were collected from the audited annual reports over ten years (2012 to 2021).

Panel data was adopted for the study where the same variables were observed repeatedly over some time. The research methods used for the study were both descriptive and inferential statistics. In particular, correlation and panel regression methods were employed to determine the existence of a relationship between the variables investigated. The selected companies have consistently published annual accounts throughout the study.

3.1. Methods of Data Analysis

The data obtained for the study were analyzed using a panel regression method. The Random effect regression technique was employed to achieve the objectives of the study. The choice of technique was informed by the outcome of the various diagnostic tests conducted. In particular, the study conducted diagnostic tests for the presence of multicollinearity using Levin Lin and Chu to test the unit root of the series and Variance Inflation Factors with the aid of EViews version 10.

The variable measurements used in this study are shown in Table 1.

Table 1. Measurement and description of variables

Variables	Types of Variables	Measurement	Reference
Environmental Disclosure (EDP)	Dependent	A score of 1 is assigned if a firm discloses an item and 0 scores if not.	(Uwuigbe, 2012; Saha & Akter 2012; Malarvizhi & Matta, 2016 & Okewale, 2017)
Board Size (BS)	Independent	Total number of Directors on the board of the companies.	(Ammari, Kadria & Ellouze 2014; Inua & Emeni 2019)
Board independent (BI)	Independent	The proportion of Executive Directors on the board with non- Executive Directors.	(Ammari, Kadria & Ellouze 2014; Inua & Emeni 2019)
Board gender diversity (BGD)	Independent	The proportion of females to males on the board	(Ammari, Kadria & Ellouze 2014; Inua & Emeni 2019)
Board meeting (BM)	Independent	The number of times the board of directors meets in a year	(Ammari, Kadria & Ellouze 2014; Inua & Emeni 2019)

Source: Authors' Compilation (2022)

3.2. Model Specification:

This study is characterized by four basic objectives which guide the study. Hence, the study has four baseline models for the objectives numbering from1 to 4.

$$EDP = f(BS, BI, BGD, BM) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots. \quad (3.1)$$

Where:

EDP = Environmental Disclosure Practices

BS = Board Size

BI = Board Independence
BGD = Board Gender Diversity
BM = Board Meeting
f = the functional notation relating environmental disclosure with board attributes and control variables.
The specification in (3.1) is then expressed in linear panel regression form as

$$EDP_{it} = \delta_0 + \delta_1 BS_{it} + \delta_2 BI_{it} + \delta_3 BGD_{it} + \delta_4 BM_{it} + \varepsilon_{it} \dots \dots .. \quad (3.2)$$

Where:
δ_0= intercept term
δ_1 to δ_6 = the slope coefficients for model 1
ε_{it}= error term

Table 2. A priori expectation

Variable	Parameter	Expectation
Board Size (BS)	δ_1	$\delta_1 > 0$
Board Independence (BI)	δ_2	$\delta_2 > 0$
Board Gender Diversity (BGD)	δ_3	$\delta_3 > 0$
Board Meeting (BM)	δ_4	$\delta_4 > 0$

Source: Authors' Computation, 2022

Justification for using Board Size, Board Independence, Board Gender Diversity and Board Meeting to proxy Board attributes

Board size is frequently used to perform monitoring and advisory roles of corporate boards. The literature is inconclusive about optimal board size. From a resource dependence perspective, large boards incur more cost, while small board size might not be effective to monitor the powerful managers. As regards board meetings, an often asked question is if frequency of board meetings can contribute to a better control of the company and thus improve financial performance?

Several inconsistent findings have been reported as to the relationship that exists between number of board meetings and firm's financial performance (García-Ramos & García-Olalla, 2011); Jackling & Johl (2009) found no association between number of board meetings and firm's financial performance based on Indian listed firms. Various studies linked the increased number of meetings with poor financial performance of firms and reported that progress in financial performance has been observed after such an increased number of meetings (Vafeas, 1999). Furthermore, literature has mixed findings about the relationship between board gender diversity and firm's financial performance. Boards are traditionally male dominant and the presence of female directors in the boards enhances the board independence and plays a positive role towards the perception of shareholders and their confidence about the company's success increased (Carter et al., 2003). The protection of shareholders' interest is often seen to be with executive and non-executive directors of the company. Independent directors are usually taken for outside directors and non –executive directors. Non-executive directors may not be able to perform without independence and provide unbiased judgments.

Research Hypotheses

H_{01}: there is no significant impact of board size on environmental disclosure practices of Nigerian listed pharmaceutical and cement manufacturing companies

H_{02}: there is no significant relationship between board independence and environmental disclosure practices of Nigerian listed pharmaceutical and cement companies

H_{03}: there is no significant influence of board gender diversity on environmental disclosure practices of Nigerian listed pharmaceutical and cement companies

H_{03}: There is no significant relationship between board meetings and environmental disclosure practices of Nigerian listed pharmaceutical and cement companies

4. RESULTS AND DISCUSSION

4.1. Descriptive Analysis

In this section, the results obtained from descriptive statistics and analyses of the variables used are presented. The results in Table 3 contained the mean as well as the maximum and minimum values of all the variables used for this study.

Table 3. Summary Statistics of Variables

Variable	Obs.	Mean	Std.Dev.	Min	Max
EDP	100	42.405	27.695	0	93.3
BS	100	10.864	3.445	5	19
BI	100	66.532	18.551	0	94.444
BGD	100	10.58	11.071	0	37.5
BM	100	5.062	1.511	3	10

Source: Authors' Computation, 2022

The results revealed that the average environmental disclosure for the period covered is 0.42405 with a standard deviation of 27.695, a minimum of 0, and a maximum of 93.3. By implication, the practice of environmental disclosure of the sampled listed cement and pharmaceutical firms in Nigeria is below average. The results further revealed that average board independence is 66.532 percent with standard deviation, minimum, and maximum of 18.551, 0, and 94.444 percent respectively. Hence, 66.532 percent of the board is independent of the management. Also, the average gender diversity of the board is found to be 10.58 with a minimum of 0 percent and a maximum of 37.5 percent, and a standard deviation of 11.07 percent. This implies that female representation on the boards of Nigerian corporate firms is still low at about 11 percent. The average board meeting is found to be 5.062 with a standard deviation of 1.511. This implies that the board of directors meets about five times a year on average with a minimum meeting time of 3 and a maximum of 10. In addition, the results show that the average board size of the sampled firms is 10.864

4.2. Correlation Matrix

The correlation matrix shows the relationship between every two pairs of variables in a model. This is a preliminary check for the possibility of multicollinearity among the variables.

Table 4. Matrix of Correlations

Variables	EDP	BS	BI	BGD	BM
EDP	1.000				
BS	0.110	1.000			
BI	0.310	-0.074	1.000		
BGD	0.302	0.022	0.042	**1.000**	
BM	-0.035	0.604	-0.133	**0.032**	**1.000**

Source: Authors' computation, 2022

The results of the correlation analysis are presented in Table 4. The estimated correlation coefficient of 0.110 shows a weak direct relationship between the size of the board and environmental disclosure practices. The results also show a weak positive relationship between environmental disclosure practices and board independence giving the estimated correlation coefficient of 0.310, implying that corporate environmental disclosure is expected to increase with higher board independence. The estimated correlation coefficient of 0.302 revealed the presence of a weak positive relationship between board gender diversity and environmental disclosure practices indicating that a more gender-diversity board has the potential to disclose more corporate environmental information. In addition, the coefficient of -0.035 indicated that a weak inverse relationship exists between a board meeting and corporate environmental disclosure. Also, in the table, the relationship between each independent variable and the dependent variable is expected to be strong while between each pair of independent variables is expected to be low. Gujarati and Porter (2009) affirmed that a correlation coefficient between independent variables above +_ 0.8 is considered excessive and indicates the existence of multicollinearity. However, the results in the table revealed that all the correlation coefficients between the four pairs of the independent variables were less than 0.8, thus suggesting the four independent variables were well fitted into one regression model.

4.3. The size of Variance Inflation Factor

A further test was carried out using the Variance Inflation Factor (VIF). A multicollinearity test was conducted to test whether there is a strong or perfect correlation between the independent variables. The study employed Variance Inflation Factor (VIF) to test for the existence of multicollinearity in the model of the study.

Table 5. Estimated Variance Inflation Factor for Model

Variables	VIF	1/VIF
BS	2.417	.414
BI	1.117	.895
BGD	1.079	.926
BM	2.021	.495
Mean VIF	1.787	.

Source: Authors' Computation, 2022

The results obtained were presented in Table 5. The highest VIF obtained is 2.889, recorded by the firm size while the mean VIF is 1.787. The implication is that none of the variables in the model has a VIF that is up to the threshold of 5 which suggests that the model was free of a multicollinearity problem.

4.4. Unit Root Test

The unit root test was carried out to ensure that the current values do not comprise the last period's values and are free from dependent disturbance. This was done before analyzing the relationship between variables of interest in this study because of the challenges that non-stationarity series present in regression analysis. Hamilton (1994) specifically stated that insufficient accounting for unit roots can lead to results that may appear to be significant and meaningful but in reality meaningless. Therefore to avoid spurious results, the stationarity test of the variables was done as presented in Table 5, using Levin, Lin & Chu Unit root test.

Table 5. Levin, Lin & Chu Unit root test

Variables	LEVEL			Order of Integration
	Model 1	Model 2	Model 3	
EDP	-5.85429 (0.0000)	-6.03949 (0.0000)	-8.53985 (0.0000)	I(0)
BS	-0.29410 (0.0000)	-1.77217 (0.0382)	-3.35501 (0.0004)	I(0)
BI	1.03384 (0.8494)	-4.91257 (0.0000)	-2.53246 (0.0057)	I(0)

Variables	LEVEL			Order of Integration
	Model 1	Model 2	Model 3	
BGD	1.31618 (0.9059)	-3.37349 (0.0004)	-3.31455 (0.0005)	I(0)
BM	3.07390 (0.9989)	-3.90575 (0.0000)	-2.78704 (0.0027)	I(0)

Source: Authors' computation, 2022.

Table 5 presents Levin Lin & Chu unit root test results and from the result, all the variables are stationary at level. The test options were carried out in the following order, Model 1 (None), Model II (intercept and trend), and Model III (intercept). The results showed that all the variables were integrated at these levels, i.e stationary at level 1(0) at a 5% level of significance. With these results, we rejected the null hypothesis and accepted the stationarity of the series. Once the unit root test revealed a combination of stationarity of variables at 1(0) across the dependent and independent variables, econometric theory suggests we fit a regression model for the variables.

4.6. Regression Analysis

Since the unit root test revealed that all variables are stationary at a level as shown in Table 6, the study proceeded to estimate the pooled OLS as against the fixed and random effect model and therefore decided on the best model to use. The Redundancy test was used to determine the most appropriate between the Pooled OLS and Fixed effect.

Table 6. Pooled OLS

Variable	POOLED OLS		
	Coefficient	t-stat	Prob
C	-1.2812	-1.9769	0.0510
BS	-0.0373	-1.8775	0.0635
BI	0.4441	4.6141	0.0002
BGD	-0.3744	-7.6011	0.0013
BM	0.0786	-1.9769	0.0510
R-squared	0.4787		
Adjusted R-squared	0.4399		
F-statistic	2.0278		
Prob(F-stat)	0.0167		
Durbin Waston Stat	2.4751		
Redundancy test			
Effects Test	Statistic	Chi-Square/ (Prob)	
Cross-section F	9.4979	9,86 (0.0000)	
Cross-section Chi-square	69.0128	6,98 (0.0000)	

Source: Authors' Computation, 2022

The null hypothesis for the redundancy fixed effect is that the pooled OLS is the appropriate estimator to give the best consistent result which can only be accepted when the probability is greater than 5%. The result of the test gave a probability of 0.0000 (P<0.5) as presented in Table 6. Hence, the null hypothesis was rejected, and concluded that the fixed effect panel is the best estimator.

4.5. Fixed effect and Random Effect

To determine the most appropriate panel to interpret for the study between Fixed and Random effect panels, the Hausman test was carried out and the results are presented in Table 7. The result of the Hausman test showed a probability value of 0.9695 which is greater than the 5% level of significance. The implication of this result is to accept the null hypothesis. Thus, the Random effect is the best estimator to give the most consistent and efficient result.

Table 7. Panel Regression Results

	FIXED EFFECT			**RANDOM EFFECT**		
Variables	**Coefficient**	**t-stat**	**Prob**	**Coefficient**	**t-stat**	**Prob.**
C	-0.5184	-0.5463	0.5863	-0.7856	-0.9223	0.3587
BS	0.0351	1.5097	0.1348	1.6941	1.5764	0.1581
BI	0.0346	2.3789	0.0115	0.0419	2.3806	0.0125
BGD	0.6312	2.2351	0.1211	0.6291	2.3616	0.0012
BM	-3.5715	-2.1238	0.0166	-3.645	-2.0122	0.0145
R-squared	0.5379			0.5967		
Adjusted R-squared	0.4681			0.4589		
F-statistic	7.7018			6.5497		
Prob.(F-stat)	0.0000			0.0042		
Durbin Waston Stat	2.4326			2.1720		
Hausman test results						
Test summary			Chi-Statistic	Chi-Sq. d.f/ (Prob)		
Cross-section random			0.6569	4/(0.7691)		

Source: Authors' Computation, 2022

The results obtained from the Random effect regression panel concerning the impact of board attributes on environmental disclosure practices by the listed cement and pharmaceutical companies in Nigeria are presented in Table 7. From the results, the estimated coefficient of 0.0419 showed that board independence has positive effects on environmental disclosure practices as the corresponding p-value of 0.0125 was less than a 5% level of significance. Hence, the results showed that board independence had a positive and significant influence on environmental disclosure practices among listed cement and pharmaceutical companies in

Nigeria. From the results, the more independent a board is, the higher the environmental disclosure practices of such a company. Also, the estimated coefficient of 0.629 with a corresponding p-value of 0.0012 indicated that board gender diversity has a positive and significant influence on environmental disclosure practices. By implication, the higher the ratio of females on the board of Nigerian cement and pharmaceutical firms, the more the tendency for environmental disclosure practices while firms with a lesser number of female representations on the board hardly practice environmental disclosure.

The estimated coefficient of -3.645 with a corresponding p-value of 0.145 revealed that board meetings had a negative and significant impact on corporate environmental disclosure practices. By implication, the study could not establish a significant influence of board meetings on environmental disclosure practices among the listed cement and pharmaceutical companies in Nigeria. Hence, board meetings do not influence the extent of disclosure of corporate environmental information. In addition, the results showed that board size has a positive and insignificant influence on environmental disclosure given its coefficient and associated coefficient of 1.694 and 0.158 respectively.

Furthermore, in the model summary, the coefficient of determination (R-Squared) was 0.5967 and the adjusted R square was 0.4589 indicating that 46% change in environmental disclosure practices among selected manufacturing companies was brought about by specific board attributes (board size, board independence, board meeting, and board gender diversity). These factors could not explain all the variation in environmental disclosure practices of the selected companies quoted as there were other factors represented by 54% not covered in the study. The result of F-statistics of 6.5497 indicates that the model is fit because the probability value is significant at a 5% level of significance (p-value <0.05). The Durbin Watson of (2.1720) showed that there was no problem of first-order autocorrelation in the data set.

5. Discussion of findings

This study investigated the impact of board attributes on the environmental disclosure practices among Nigerian listed pharmaceutical and cement companies. This was achieved by using the Environmental Disclosure Index (EDI) obtained through content analysis of the annual reports to measure the firm's environmental disclosure practices while Random Effect panel regressions were used to test the hypotheses of the study. The results obtained show that the average environmental disclosure index for the sampled cement and pharmaceutical companies was about 46% implying that the environmental disclosure practices among Nigerian cement and pharmaceutical companies were below average and thus, needed attention to improve practice.

The results of the random effect regression employed in the study revealed that board gender diversity and board independence exerted a positive and significant influence on the environmental disclosure practices among the listed cement and pharmaceutical firms in Nigeria. The results imply that increased female representation on the board would increase environmental disclosure practices. The finding is linked with the fact that women leaders are more attentive and sensitive to stakeholders' demands, especially concerning environmental matters, and show more effective leadership in corporate environmental disclosure practices. In addition, the listed cement and pharmaceutical manufacturers would have better environmental disclosure practices with an increased proportion of outside directors on the board. These findings were consistent with the studies of Ajibola and Uwuigbe (2013) who reported that board size, board independence, and board meeting had a positive and significant relationship with environmental disclosure practices. The findings also conformed to the finding of Isa and Muhammad, (2015) whose study found a positive and significant relationship between board size, board gender diversity, and environmental disclosure practices.

However, the results revealed that board size and board meetings have no significant impact on the environmental disclosure practices among the listed cement and pharmaceutical companies in Nigeria. Hence, variation in each of these two attributes of the board of directors would not affect the environmental disclosure practices. The results here failed to agree with the reports of previous studies such as that of Cooray, et al. (2020); Isa and Muhammed (2015) who reported that environmental disclosure practices increased with increased board size and board meetings. These findings concurred with the results of Akbas (2016) who found that board independence and board meetings had no association with environmental disclosure practices.

5.1. Conclusion and Recommendations

From the study, it was discovered that the problems of inadequate environmental information were still noticed among the investigated companies. This was traced to a weak legal environment, unstable institutions, and a lack of uniform environmental disclosure standards in the country that made the companies exhibit an unconcerned approach to full environmental disclosure practices. The study concluded that a firm's environmental disclosure was below average and that regulatory bodies should make environmental disclosure mandatory, increase female participation on the board, and increase the proportion of outside directors.

The concerned companies should ensure higher female representation on the board as the study found that gender diversity increased environmental disclosure practices. The study found that board independence is directly associated with environmental disclosure, hence the number of outside directors on the board should be increased by the companies to make the board more independent to improve environmental disclosure practices.

References

Ajibolade, S. O., & Uwuigbe, U., (2013). Effects of corporate governance on corporate social and environmental disclosure among listed firms in Nigeria, *European Journal of Business and Social Sciences,* 2 (5), 76-92

.Akbas, H. E. (2016). The relationship between board characteristics and environmental disclosure: evidence from Turkish listed companies. *Southeast European Journal of Economics and Business*, *11*(2), 7–19.

Carter, D. A., Simkins, B. J., & Simpson, W. G. (2003). Corporate governance, board diversity and firm value, Financial Review, 38 (1), 33-35

Cooray, A. D., Gunarathne N., & Senaratne, S., (2020). Does corporate governance affect the quality of integrated reporting? Sustainability 2020, 12, 4262; DOI: 10.3390/su12104262. www.mdpi.com/journal/sustainability

Cowan, S., Gadenne, D. (2005). Australian corporate environmental reporting: A comparative analysis of disclosure practices across voluntary and mandatory disclosure systems. *Journal of Accounting & Organizational Change,* 1(2), 165-179.

Deloitte Touche Tohmatsu International (1993). International institute for sustainable development (IISD) & sustainability, coming clean, Corporate environmental reporting, opening up for sustainable development, London

Dixon-Fowler, H. R., Ellstrand, A. E., & Johnson, J. L. (2017). The role of board environmental committees in corporate environmental performance, *Journal of Business Ethics*, *140*(3), 423–438

Fave, K., Bawa, A. B., Babara, I. J., (2017). Impact of mandatory information disclosure on compliance with CAMA 2004, *Saudi Journal of Business and Management Studies* United Arab Emirate, ISSN 2415-6663 (print)

Freeman, A. B. (1984). Toward an epistemology for radical accounting: Beyond objectivism and relativism. *Critical Perspectives on Accounting*, 6(1), 485-496.

Friedman, M. (1962). Capitalism and freedom. Chicago: University of Chicago Press.

García-Ramos, R., & García-Olalla, M. (2011). Board characteristics and firm performance in public founder- and nonfounder-led family businesses, Journal of Family Business Strategy, 2 (4), 220-231

Gujarati, D. N., & Porter, D. C. (2009). Basic econometrics. New York: McGraw-Hill/Irwin.

Hamilton, J.D. (1994) Time Series Analysis. Princeton University Press, Princeton

Ienciu, I. A., Popa, I. E., & Ienciu, N. M. (2012). Environmental reporting and good practice of corporate governance: Petroleum Industry Case Study. *Procedia Economics and Finance*, *3*, 961–967.

Isa, M. A., & Muhammad, S., (2015). The impact of board characteristics on corporate social responsibility disclosure: Evidence from Nigerian food product firms. *International Journal of Management Science and Business Administration,* 1(12), 34-45

Jackling, B., & Johl, S. (2009). Board structure and firm performance: evidence from India's top companies", Corporate Governance, An International Review, 17 (4), 492-509

Liao, L., Luo, L., & Tang, Q. (2015). Gender diversity, board independence, environmental committee, and greenhouse gas disclosure. *The British Accounting Review*, *47*(4), 409–424.

Odoemelan, N., & Okafor, R. G. (2018). The influence of corporate governance on environmental disclosure of listed non-financial firms in Nigeria, *Indonesian Journal of Sustainability Accounting and Management*, 2(1) 25-49.

Ofoegbu, G. N., Odoemelam, N., & Okafor, R. G., (2018). Corporate board characteristics and environmental disclosure quality: Evidence from South Africa (integrated Reporting) and Nigeria (Traditional Reporting). *Cogent Business & Management* (2018), 5: 1551510. https//doi.org/10.1080/23311975.2018.1551510

Olabisi, J., Kajola, S. O., Oladejo, D. A., Ojeaga, P. I., & Abass, T. F. (2018). Board Characteristics and Performance of Quoted Consumer Goods Firms: Evidence from Nigeria, Journal of Economics and Business Research, 14(2), 7-26, ISSN: 2068 - 3537, E – ISSN (online) 2069 – 9476, ISSN – L = 2068 – 3537

Vafeas, N. (1999). Board meeting frequency and firm performance. Journal of Financial Economics, 53 (1), 113-142. Wallison

Wood, F., & Sangster, A., (2002). *Business Accounting*: 9th Ed, Pearson Education, London, UK