

CLIMATE CHANGE RESPONSIBILITY AND PERFORMANCE OF SELECTED MULTINATIONAL FIRMS IN NIGERIA

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Abstract

This study investigated the effect of climate change responsibility on the performance of selected multi-national companies quoted on the floor of a Nigerian exchange group. To address this objective, the study specifically reviewed the following sub-objectives: Investigating the effect of energy disclosure on performance of quoted manufacturing companies in Nigeria and the effect of water disclosure on performance of quoted manufacturing companies in Nigeria. The study adopted an ex-post facto research design. The population of the study included all manufacturing firms quoted on the Nigerian exchange group (NXG) as at 31st December 2022. The study relied on secondary sources of data obtained from the Nigerian exchange group (NXG) as compiled by machameratios.com. This study conducted descriptive statistics to provide an understanding of the data in terms of the measures of dispersion and central tendencies. Correlation analysis was also conducted to express the relationship between the independent and dependent variables employed in this study and to validate the hypotheses of the study. The OLS regression was employed as captured in the model specification sections. The study found energy disclosure and water disclosure to have significant effects on returns on assets and equity, respectively. Consequent to the findings, the study recommended, among others, that manufacturing companies should consider investing in green innovation and eco-friendly technologies.

1.0 INTRODUCTION

1.1 Background of the study

The increase in global climate change awareness and the campaign for sustainable economic development is redirecting firms' attention toward environmental sensitivity (Okafor, 2018). Sustainable development, as is generally known, focuses on the creation of wealth and prosperity, whilst considering the true importance of social and environmental aspects, allowing business and public organizations to meet the triple bottom line in

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sustainable management, which has today extended to green practices in order to foster sustainable environment (Okafor, 2018).

Climate change responsibility thus refers to upholding sustainable practices while taking into account the probable impact of climate change on the environment and the associated costs emanating from production externalities (Makori & Jagongo, 2013).

Climate change responsibility, which evolved from “sustainability accounting”, has been receiving increasing attention in academia and business literature since the early 90’s (Bhat, 2014). Presently, firms are paying more attention to social and environmental issues and dedicate portions of their annual reports and accounts to reporting and disclosing such costs (Okafor, 2018). Stakeholders are mounting pressures on corporate boards on corporate social responsibility issues (Rahim, 2012; Kakabadse, 2007), and there are also increasing regulations and sanctions (Aggarwal, 2013).

Firms are being pressured to respond to clean energy and social and environmental matters and report on them (Oluwagbemiga, 2014). Such disclosure is believed to make a firm more responsible and responsive (Mendelsohn, & Nordhaus, 2011). Thus, it enhances the performance and reputation of a firm (Servaes & Tamayo, 2013) and reduces idiosyncratic risk (Lee & Faff, 2009; Bassen, Meyer, & Schlange, 2006).

As a response, the Nigerian exchange group (NGX) has demonstrated efforts to integrate sustainability into existing business models, which culminated in the production of the Sustainability Disclosure Guidelines (SDG), covering environmental, social, and governance (ESG) issues. Thus, sustainability reporting has remained a strategic tool used by organizations to engage with wider stakeholders. Therefore, the present study seeks to investigate the effect of climate change responsibility on the performance of selected manufacturing firms in Nigeria.

1.2 Statement of the Problem

Climate change awareness as well as responsibility is now a burning issue in Nigeria, as companies are facing tremendous pressure to take responsibility for their activities in the natural environment (Fodio & Oba, 2012). These include gas flaring, environmental degradation, indiscriminate land and hill clearing, and toxic waste dumping (Uwuigbe & Egbiide, 2012). Stakeholders are becoming knowledgeable, driven by the wider availability of information and governance codes, granting greater visibility of corporate business practices (COSO, 2013). The literature on climate change and performance documented mixed findings both globally and locally (Onyali, Okafor, & Egolum, 2014). However, the general consensus seems to be that the disclosure level is still ad hoc, with little or no quantifiable data. According to Jeroh and Okoro (2016), this is further compounded by the absence of adequate climate change models or techniques of practical applicability in Nigeria.

The second stream of studies was devoted to studying the link between sustainability practices and corporate performance as it relates to climate change. They include studies by Asuquo, Dada, and Onyeogaziri (2018) on sustainability reporting, Egbunike and Okoro (2018) on green accounting practices, and Nnamani, Onyekwelu, and Ugwu (2017) on sustainability accounting and reporting. These studies extensively focused on only consumer or industrial goods firms. Other studies, such as Onyekwelu and Ekwe (2014) on the banking sector and Ijeoma (2015), used primary data, while Udeh and Ezejiofor (2018) focused on telecommunication firms.

However, despite the abundance of studies, few studies have specifically examined this issue among multinational manufacturing firms in Nigeria. For instance, Ekwe, Odogu, and Mebrim (2017), on two companies, and Ajayi and Ovharhe (2016), undertook an exploratory study on Nze, Okoh, and Ojeogwu (2016), restricted to two firms in the oil and gas sector. An extensive study was conducted by Ifurueze, Lydon, and Bingilar (2013) on a sample of twelve oil companies based on field survey methodology in the Niger Delta region. Although the survey methodology can pass the reliability and validity tests, it cannot be applied to various samples.

On the other hand, secondary data research can cover extensively areas that are out of physical reach given the availability of verified data floated online, in fact books, annual reports, and academic journals. Considering these concerns surrounding financial performance, this study investigates how climate change responsibility affects the financial performance of quoted multinational manufacturing firms in Nigeria.

1.3 Objective of the study

The broad objective of this study is to investigate the effect of climate change responsibility on the financial performance of quoted manufacturing firms in Nigeria. The specific objectives of the study are as follows:

- ✓ Investigate the effect of energy disclosure on the return on assets of quoted multinational manufacturing companies in Nigeria.
- ✓ Examine the effect of water disclosure on the return on assets of quoted multinational manufacturing companies in Nigeria.
- ✓ Evaluate the effect of energy disclosure on the return on equity of quoted multinational manufacturing companies in Nigeria.
- ✓ Examine the effect of water disclosure on the return on equity of quoted multinational manufacturing companies in Nigeria.

2.0 REVIEW OF THE RELATED LITERATURE

2.1 Concept of Climate Change Responsibility

Climate change is an undeniable reality that demands collective responsibility from every corner of the globe. As our planet faces unprecedented challenges, the imperative to address and mitigate the impacts of climate change becomes increasingly urgent (IPCC, 2021). Responsibility for climate change transcends borders, industries, and individual actions. It is a shared obligation that requires a collaborative effort to ensure the sustainability of our planet for future generations.

At the heart of climate change responsibility is the acknowledgment that human activities, particularly the burning of fossil fuels, deforestation, and industrial processes, are major contributors to rising temperatures and environmental degradation (NASA, 2020). Governments, corporations, and individuals play pivotal roles in fostering a sustainable future.

Governments bear the responsibility of developing and implementing policies that promote clean energy, regulate emissions, and encourage sustainable practices (UNFCCC, 2015). International cooperation is essential to address the global nature of climate change, as nations must work together to set and achieve ambitious targets (Paris Agreement, 2015).

Corporations, as significant contributors to greenhouse gas emissions, play a crucial role in adopting environmentally friendly practices (World Bank, 2016). Investing in renewable energy sources, reducing carbon footprints, and implementing circular economy models are vital steps toward corporate responsibility for climate change.

Individuals, too, must recognize their role in the grand scheme of climate change responsibility (Lutzenhiser, 2017). Simple lifestyle changes, such as reducing energy consumption, using public transportation, and adopting sustainable consumption habits, can collectively have a substantial impact.

Education is another key aspect of climate change responsibility (PBL Netherlands Environmental Assessment Agency, 2019). Increasing awareness and understanding of the consequences of climate change can empower individuals and communities to take informed actions. Education fosters a sense of responsibility and encourages the adoption of sustainable practices at every level of society. Climate change responsibility is therefore not a burden to be shouldered by a select few; it is a shared commitment that requires a global alliance. By holding governments, corporations, and individuals accountable for their actions and encouraging sustainable practices, we can pave the way for a resilient and sustainable future.

2.1.1 Financial performance

The concept of performance is based on the idea that an organization is the voluntary association of productive assets, including human, physical, and capital resources, for achieving a shared purpose (Barney, 2002). Financial ratios are often employed to gauge a firm's financial performance (Lin, Liu, & Chu, 2005). According to Osisima (1996) "ratios relate one set of values to another, with the resulting quotient serving as a measure, a standard or a norm by which performance is judged." Financial ratios provide a description of a firm's financial performance compared with previous periods (Kwaghfan, 2015). Glautier and Underdown (2001) observed that two aspects of a company's financial performance are of interest to investors. First, a company's financial performance may be assessed by reference to its ability to generate profit. Second, a company's financial performance may be assessed

in terms of the value of its shares to investors. This study will focus on the following profitability ratios as identified by Osisioma (2009).

1. Return on equity, which is a test of profitability based on the investments of the business owners. It measures the return that accrues to shareholders after interest payments and taxes are deducted. It is given by the following formula:

$$\frac{\text{Net profit (after interest, taxes and preference dividend)}}{\text{Shareholders' Equity}}$$

2. Return on assets (ROA) represents the amount of earnings (before interest and tax) a company can achieve for each naira of assets it controls and is a good indicator of a firm's profitability. According to Hagel, Brown, and Davison (2010), ROA explicitly considers the assets used to support business activities. It determines whether the company can generate an adequate return on these assets rather than simply showing a robust return on sales.

2.2 Theoretical Framework

The study is anchored on 'stakeholder theory' that emphasized on the role of the firm in meeting the interests of several stakeholders.

2.2.1 Stakeholder Theory

The stakeholder theory was propounded by Freeman (1984). The theory draws from the strategic management literature, systems theory, and corporate social responsibility to challenge the long-standing assumption "that the sole objective of firms is to maximize shareholders' wealth" (Laplume, Sonpar, & Litz, 2008). Stakeholders refer to individuals or groups who are affected by, or whose actions can directly, or sometimes indirectly, affect the firm's operation (Orlitzky, Louche, Gond, & Chapple, 2017; Kassinis & Vafeas, 2006). Stakeholders include employees, consumers, suppliers and related organizations, the local community, and the public.

Stakeholder theory suggests that the company has a binding fiduciary duty to different stakeholder, which ultimately determines the value of the company based on how well the company fulfills its contracts with its stakeholders (Ong & Djajadikerta, 2017). A firm's objective is to optimize stakeholders' well-being to create the strategic advantage (Laplume, Sonpar, & Litz, 2008).

Summarily, the relevance of the theories on which the study is anchored is premised on the fact that they emphasize the relationship which one or more persons (the principals) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent" and the role of the firm in meeting the interests of several stakeholders,.

2.3 Empirical Review

Wang, H., Khan, Anwar, Shahzad, Adu, and Murad, (2021) in Pakistan investigated the impact of stakeholders' views on the practices of green innovation (GI), the consequent effect on environmental and organizational performance (OP), and the moderating influence of innovation orientation. They employed a quantitative method with a sample size of 515 responses. Convenient random sampling was used. Data were collected from manufacturing and services firms through a field survey using a closed-ended questionnaire based in the Punjab province of Pakistan. The analysis was performed using the structural equation model of the partial least squares analysis method. Their findings revealed a positive and significant link between stakeholders' views on GI practices. A significant association has been found between GI practices and environmental factors and OP. The moderating effect was negative but statistically significant. This research makes numerous contributions and provides decision-making insinuations.

Udeh and Ezejiofor (2018) investigated the effect of sustainability cost accounting on Nigeria's financial performance. The sample comprised telecommunication firms in Nigeria. They used regression to test the developed hypotheses. The study found that sustainability cost accounting has a significant effect on the return on assets and return on equity of Nigerian telecommunication firms.

Asuquo, Dada, and Onyeogaziri (2018) investigated the effect of sustainability reporting on corporate performance in Nigeria. The sample comprised three brewery firms listed on the Nigerian Stock Exchange from 2012 to 2016. Data were obtained from the annual reports and accounts of selected non-consumer goods firms. The results showed that economic performance disclosure, environmental performance disclosure, and social performance disclosure have no significant effect on return on assets.

Egbunike and Okoro (2018) investigated the effect of green accounting practices on profitability in Nigeria. The sample comprised ten non-consumer goods firms listed on the Nigerian Stock Exchange from 2012 to 2016. The data were sourced from the annual reports and accounts of selected non-consumer goods firms. They used canonical correlations to analyze the data. The study finds no significant relationship between green accounting and profitability.

Lokesh, Jitesh, and Gopal (2017) investigated the impact of organizational size on adoption of green supply chain management (GSCM) practices for the Indian industry. It also evaluates the impact of GSCM practices on organizational performance. This study empirically tested the GSCM model to investigate this orientation of the Indian industry toward GSCM practices using a pre-tested structured questionnaire. Statistical inferences were drawn using the data provided by 161 Indian firms. The study revealed that Indian organizations have shown satisfactory implementation of the majority of environmental practices, except ISO:14001 certification and Tier-II supplier evaluation. The study also revealed that out of 21 practices, medium-sized organizations adopted GSCM practices at a similar level compared with large organizations, with three exceptions: existing environmental management systems, support from mid-level and top management, and supplier evaluation for environmental practice. It was found that GSCM adoption can lead to equal improvements in operational performance for both large-size and medium-sized organizations.

2.4 Gaps in the Literature

Despite corporate stakeholders becoming knowledgeable, driven by the wider availability of information and climate change responsibility and disclosures, the literature on green management practices and performance has documented mixed findings both globally and locally (Onyali, Okafor, & Egolum, 2014; COSO, 2013). Moreover, most of the available studies lacked adequate climate change responsibility techniques of practical applicability in Nigeria (Jeroh & Okoro, 2016).

Furthermore, prior studies by Asuquo, Dada, and Onyeogaziri (2018) on sustainability reporting and Egbunike and Okoro (2018) on sustainability practices; extensively focused on firms only from consumer or industrial goods. Other studies, such as Onyekwelu and Ekwe (2014) on the banking sector and Ijeoma (2015), used primary data, while Udeh and Ezejiofor (2018) focused on telecommunication firms. Very few studies have specifically examined this among multinational firms in Nigeria (Ekwe, Odogu, & Mebrim, 2017; Ajayi & Ovharhe, 2016; Nze, Okoh & Ojeogwu, 2016). There is a need to evaluate the extent of green management practices among multinational firms that are perceived to be at the forefront of climate change mitigation.

Regarding the method of data collection gap, an extensive study was conducted by Ifurueze, Lydon, and Binglar (2013) on a sample of twelve oil companies (multi-nationals) based on field survey methodology in the Niger Delta region. Although the survey methodology can pass the reliability and validity tests, it cannot be applied to various samples.

There is therefore a need to replicate similar studies using secondary data collection and to cover extensively areas that are out of physical reach given the availability of verified data floated online, in fact-books, annual reports, and academic journals.

Therefore, the current study intends to fill the above gaps while investigating how climate change responsibility affects the financial performance of quoted multinational manufacturing firms in Nigeria.

3.0 METHODOLOGY

3.1 Research Design

The research design is based on the methodological connection between the philosophies and subsequent selection of data collection methods (Denzin & Lincoln, 2011). The research work will adopt an *ex-post facto* research design. *Ex-post facto* means after the event, meaning that the events under investigation had already occurred and data already existed. The choice of *ex-post facto* research design is based on the fact that the study relies on historical accounting data obtained from annual reports and accounts.

3.2 Population of the study

The population of the study comprises quoted manufacturing firms on the Nigerian exchange group (NGX) as of the end of 2022 financial year. The number of firms included in the various sectors that constitute the population of the study is shown in Table 1.

Table 3.1: Number of firms by sector

S/No	Sector	Number of firms
1	Agriculture	5
2	Conglomerates	5
3	Construction/Real Estate	9
4	Consumer Goods	20
5	Financial Services	52
6	Health Care	10
7	ICT	9
8	Industrial Goods	13
9	Natural Resources	4
10	Oil and Gas	12
11	Services	25
	Total	164

Source: NGX, (2022)

3.3 Sample Size of the Study

This study was limited to multinational manufacturing firms in Nigeria. Multinational companies are companies that have operations in more than one nation. twenty (20) quoted multinational manufacturing companies were selected using a purposive sampling technique; the decision was premised on the classification of the firms as manufacturing (based on the nature and description of activities) as shown on the Nigerian exchange group (NGX) website. The sample selection criteria are shown in the table below. The full list of companies is shown in Appendix I.

Table 3.1: Sample Selection

Sector/criteria	Number of firms
No. of firms	164
Less: Construction/Real Estate	9
Less: Financial services	52
Less: Natural resources	4
Less: Oil and Gas	12
Less: Services	25
Less: Consumer goods non-multinational	10
Less: Industrial goods non-multinational	09
Less: Health care non-multinational	07
Less: Agriculture non-multinational	04
Less: Conglomerate non-multinational	03
Less: ICT non-multinational	09
Total sample size	20

Source: NXG (2022)

The exclusion of the sectors was consistent with prior studies; firms from the financial sector are mainly excluded because of different regulatory environments, and it is also challenging to estimate discretionary accruals for these firms (Abid, Shaique, & Anwar-ul-Haq, 2018; Tsipouridou & Spathis, 2012). In addition, during the data analysis, any company whose required data are incomplete or unavailable will be eliminated from the sample. The final sample percentage with respect to the population is approximately 12.20% of all quoted manufacturing companies on the Nigerian exchange group.

3.4 Sources of Data

Data collection is a crucial stage of a dissertation that entails gathering all the necessary and required information from essential sources to be used for the analysis (Kumar, 2011). The data for this study were obtained from secondary sources. Secondary data is information or data that has previously been collected and recorded for other purposes (Blumberg, Cooper, & Schindler, 2008). One major advantage of secondary data is that analysis time can be saved (Blumberg, Cooper, & Schindler, 2008). The data will be extracted from the annual reports and

accounts of the selected companies. Specifically, the Statement of Financial Position and Statement of Profit or Loss and Comprehensive Income will provide data for computing the selected ratios and the Statement of Cash Flows.

3.5 Methods of Data Analysis

The study will conduct descriptive statistics to provide an understanding of the data in terms of the mean, standard deviation, maximum, and minimum values. Correlation analysis will also be conducted to express the relationship between the independent and dependent variables employed in this study. However, to achieve the objective of the study, panel fixed and random effect regression will be employed as captured in the model specification sections. *Panel data are data that are collected by observing particular variables over a period of time at a regular frequency. It has same number of years and same number of companies.*) Specifically, the econometric techniques adopted in this study are the panel fixed and random effect regression techniques. The rationale for its usage is based on the following justifications: the data that will be collected may have time and cross-sectional attributes as well as across the sampled firms (cross-section); panel data regression provides better results since it uses large observations and reduces the problem of degree of freedom; it avoids the problem of multicollinearity and helps to capture the individual cross-sectional (firm-specific) effects that the various pools may exhibit concerning the dependent variable in the model.

3.5.1 Model Specification

Based on the theoretical literature and earlier empirical studies, the present study adapted the model of Gholami, Sands, and Rahman (2022) to express the econometric form of the model as follows:

$$ROA_{it} = \beta_0 + \beta_1 END_{it} + \beta_2 WD_{it} + \beta_3 FSize_{it} + \beta_4 LEV_{it} + \mu_{it} \dots \dots \dots [1]$$

$$ROE_{it} = \beta_0 + \beta_1 END_{it} + \beta_2 WD_{it} + \beta_3 FSize_{it} + \beta_4 LEV_{it} + \mu_{it} \dots \dots \dots [2]$$

Thus, the apriori expectation based on the literature reviewed and related theories is stated as follows; $\beta_1 X_{1it} < 0$, $\beta_2 X_{2it} < 0$, $\beta_3 X_{3it} > 0$, $\beta_4 X_{4it} < 0$. The basis for this expectation flows from the outcome of the literature review and empirical findings. The operationalization of the above proxies is captured in Table 3.2.

Where:

ROA	=	Return on assets
ROE	=	Return on equity
END	=	Energy disclosure
WD	=	Water disclosure
FSize	=	Firm size
LEV	=	leverage
β_0	=	Constant
$\beta_1 - \beta_4$	=	Slope Coefficient
μ	=	Stochastic disturbance
i	=	i th company
t	=	period

4.0 DATA PRESENTATION AND ANALYSIS

4.1 Data Presentation

This study investigated the effect of greenhouse management practices on the performance of multinational manufacturing firms quoted in Nigeria between 2011 and 2012.

4.1.1 Descriptive Statistics

Table 4.1 displays the descriptive statistics for the study and describes the variables used. It also displays the number of observations of each variable and a description of their mean, standard deviation, maximum, and minimum values.

Table 4.1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	240	.0679471	.1061002	-.157263	.539594
roe	240	.1082393	.7565884	-9.893803	1.408151
end	240	.3	.4592153	0	1
wd	240	.3083333	.4627701	0	1
lev	240	.8071759	3.4501	0	48.67
fsize	240	7.577186	.7830448	6.008314	9.348257

Source: SATA 14.2/Author (2023)

Table 4.1 provides a quick summary of the central tendency (mean), spread (standard deviation), and range (minimum and maximum) of this study, reflecting 240 observations from multinational companies over a 12-year period. This means that there were no cases of missing values as all values were duly captured. In the case of the dependent variable, the table shows that the firms under study have an average financial performance score of 6.79% in the case of ROA and 10.82% in the case of ROE.

The mean value of energy disclosure (END) is 0.3, suggesting that, on average, it takes up 30% of the observed values in the dataset. The standard deviation of 0.4592 indicates a significant variation in energy disclosure values. Furthermore, the table also revealed that the mean value of water disclosure (WD) is 0.308, suggesting that, on average, it takes up 30.8% of the observed values in the dataset. The standard deviation of 0.4628 indicates a significant variation in water disclosure values.

The average leverage in the dataset is approximately 0.8072, indicating that, on average, companies have a leverage ratio of 80.72%. The high standard deviation of 3.4501 suggests significant variation in leverage ratios. In summary, the average firm size is approximately 7.5772, which is a measure of the size of the companies in the dataset. The standard deviation of 0.7830 suggests some variability in firm size.

4.1.2 Normality Test

The dataset was tested for normality in the distribution at a significance level of 0.05 (5%). Where the probabilities are greater than ($>$) 0.05, this indicates that the data were NORMALLY distributed. Conversely, where the probabilities are less than ($<$) 0.05, this indicates that the distribution of the data was NOT NORMAL. Table 4.2 shows the results of the normality test of the dataset using the Shapiro–Wilk W test for normal data on STATA, 14.2.

Table 4.2: Normality test

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
roa	240	0.90441	16.726	6.541	0.00000
roe	240	0.32908	117.391	11.065	0.00000
end	240	0.98976	1.792	1.355	0.08777
wd	240	0.99058	1.647	1.159	0.12320
lev	240	0.16086	146.825	11.585	0.00000
fsize	240	0.96935	5.362	3.899	0.00005

Source: SATA 14.2/Author (2023)

Table 4.2 reveals the results of our Shapiro–Wilk normality test. The test shows that the variables had z-statistics of 6.541, 11.065, 1.355, 1.159, 11.585, and 3.899 for roa, roe, end, wd, lev, and fsize, respectively. The Shapiro–Wilk test also revealed a probability of z-statistics of 0.0000, 0.000, 0.08777, 0.12320, 0.0000, and 0.0005 for roa, roe, end, wd, lev, and size. The decision rule is where the p-value is greater than 0.05 ($P > 0.05$), then the

data are assumed to meet normality assumptions; otherwise, the data is assumed not normal. This result implies that return on assets, return on equity, leverage, and firm_size were not normally distributed because the probabilities of the z-statistic were less than 0.05. In contrast, end and wd were normally distributed. However, the study proceeded with non-parametric regression analyses with no intention by the researcher of changing the data but to carefully interpret the probability statistics against the t-statistics in line with the recommendation of Gujarati (2004).

4.2 Data Analyses

To achieve the objectives of the study, pooled ordinary least square (OLS) regression was conducted before proceeding to check for inconsistencies in the basic assumptions of the OLS regression. These diagnostic tests include tests for multicollinearity and heteroscedasticity, and these were preceded by tests for association or correlation between the dependent variables and the independent variables of the study. Hence, Spearman's rank correlation analysis was conducted to test this association and relationship, as shown below.

4.2.1 Correlation Analysis

In examining the association among the variables, this study employed the Spearman rank correlation coefficient (correlation matrix), and the results are presented in Table 4.3.

Table 4.3: Correlation Analysis

```
. correlate roa roe end wd bdd ewd lev fsize
(obs=240)
```

	roa	roe	end	wd	lev	fsize
roa	1.0000					
roe	0.4395	1.0000				
end	-0.0994	0.0069	1.0000			
wd	0.0731	0.1188	0.7049	1.0000		
lev	-0.1505	-0.9107	-0.0684	-0.0681	1.0000	
fsize	0.0606	0.0823	0.4927	0.6085	-0.0756	1.0000

Source: SATA 14.2/Author (2023)

The result of the correlation analysis above between the independent and dependent variables, as shown in Table 4.3, shows a positive correlation of 0.4395 between return on assets (roa) and return on equity (roe). This suggests that as one variable increases, the other tends to increase. In other words, companies with higher returns on assets also tend to have higher returns on equity.

The table also revealed a weak negative correlation of -0.0994 between return on assets (roa) and energy disclosure (end). This suggests that there is a slight negative relationship between these two variables, but it is not strong.

Moreover, there is a weak positive correlation of 0.0731 between return on assets (roa) and water disclosure (wd). This indicates a slight positive relationship, but not strong.

The correlation matrix also revealed a negative correlation of -0.1505 between return on assets (roa) and leverage (the lev). Companies with higher leverage tend to have lower returns on assets, indicating a negative relationship between these variables. Finally, a weak positive correlation of 0.0606 exists between return on assets (roa) and size. This suggests a slight positive relationship, but not strong.

4.2.2 Regression Analysis

Specifically, to examine the cause– effect relationships between the variables and test the developed hypotheses, the study used a panel regression analysis with either a fixed or random effect. The Hausman test was used to confirm the choice between fixed and random effect regression models.

To control for the adverse effect of outliers in our analysis, the study transformed all variables such as cash firm size, which have wider scale to their natural logarithmic value. The regression results obtained from the combined

regression analyses are presented and discussed in Table 4.4 below so that the outcome of all the tests conducted can be easily seen at a glance. It comprises the results of the ordinary least square (OLS) regression model and panel data regression with fixed and random effects.

Table 4.4: Combined regression results

	1	2	3	4	5	6
	ROA Model (Pool OLS)	ROE Model (Pooled OLS)	ROA Model (Fixed effect)	ROA Model (Random effect)	ROE Model (Fixed effect)	ROE Model (Random effect)
CONS.	0.004 {0.963}	0.315 {0.164}	0.633 {0.000}**	0.240 {0.069}	1.629 {0.003}**	0.515 {0.164}
END	-0.065 {0.008}**	-0.272 {0.000}**	-0.010 {0.634}	-0.018 {0.390}	-0.066 {0.326}	-0.113 {0.090}
WD	0.101 {0.000}**	0.408 {0.000}**	-0.029 {0.284}	-0.005 {0.836}	-0.250 {0.004}**	-0.088 {0.292}
THE LEV	-0.004 {0.020}*	-0.200 {0.000}**	-0.002 {0.065}	-0.003 {0.038}*	-0.198 {0.000}**	-0.199 {0.000}
FSIZE	0.007 {0.496}	-0.008 {0.774}	-0.071 {0.002}**	-0.020 {0.243}	-0.178 {0.014}*	-0.030 {0.539}
F-Stat	5.50 {0.000}**	226.90 {0.0000}**	10.09 {0.000}**	42.75 {0.000}**	384.63 {0.000}**	2091.09 {0.000}**
R- Squared	0.1241	0.8539	0.0000	0.008	0.7433	0.8181
VIF	2.32	2.32				
Heteroskedasticity	1.76 {0.1850}	0.55 {0.4567}				
Hausman test				23.19 {0.0007}		73.38 {0.0000}
LM test				261.32 {0.000}**		123.65 {0.000}**

Note1: bracket {} are p-values: 2: *, **, implies statistical significance levels at 5% and 1%, respectively

Source: SATA 14.2/Author (2023)

4.2.2.1 The F-Statistic

A large F-statistic (F-stat) with a small probability value (p-value) means that the null hypothesis should be rejected, and we assert that there is a general relationship between the dependent and independent variables, whereas a small F-stat, with a large p-value, indicates that there is no relationship. The decision rule was to reject the null hypothesis at a significance level of p-value less than 5% (i.e., $p < 0.05$). Consequently, and judging from the records in Table 4.4 and with regard to ROA and ROE, the F-Stat figures from the pooled OLS, fixed effect and random effect regression have values of (5.50, 226.90), (10.09, 42.75) and (384.63, 2091.09). All have a p-value of 0.0000, which is less than 0.05, suggesting that we reject the null hypothesis and accept the alternate. This indicates that our OLS regression model was statistically significant at a 1% significance level. Hence, the regression model is valid and can be used for statistical inference. However, we conducted some post-regression tests to further validate the OLS regression estimates, as shown below.

4.2.2.2 R-Squared (R^2) or Coefficient of Determination

The R-squared (R^2), also known as the coefficient of determination, is a measure of the goodness of fit, i.e., a measure of the proportion of variation in the dependent variable (Y) that can be explained by the independent variables (X). Here again, from the records in Table 4.4, the R-square figures from the pooled OLS, fixed effect, random effect, and regression have values of (0.1241, 0.8539), (0.0000, 0.008), and (0.7433, 0.8181) with regard to ROA and ROE.

From the pooled OLS regression, approximately 12.41% and 85.39% of systematic variations in financial performance in the pooled multinational manufacturing firms in Nigeria over the period of interest measured using return on assets and returns on equity, respectively, were jointly explainable by the independent and control variables in the models. The unexplained part of financial performance can be attributed to the exclusion of other independent variables that can impact financial performance but were captured in the error term.

Furthermore, the fixed effect regression revealed that 0% and 0.8% of systematic variations in financial performance in the pooled multinational manufacturing firms in Nigeria over the period of interest measured using return on assets and returns on equity, respectively, were jointly explainable by the independent and control variables in the models.

In this context, the fixed effects model has a limited ability to explain the variation in both dependent variables (ROA, ROE). Therefore, the OLS regression provides a better fit and higher R-squared values for both ROA and ROE. Therefore, it is reasonable to use OLS as our modeling approach and to validate the stated hypotheses.

4.2.2.3 Multicollinearity Test (VIF)

Multicollinearity refers to a situation in which there is an exact (or nearly exact) linear relation among two or more independent variables (Hawking, 1983). When multicollinearity occurs, there must be large standard errors in the estimated coefficients. The presence of multicollinearity among independent variables results in less reliable statistical inferences. However, multicollinearity is not a problem of the model and does not affect the best linear unbiased estimates (BLUE) properties of ordinary least square estimates. The degree of multicollinearity can be tested using certain statistical instruments such as the variance inflation factor (VIF). The VIF test helps us reveal whether or not there are multicollinearity issues in the specified model (Almeyda & Darmansya, 2019).

A VIF test result of a value greater than 10 indicates the presence of multicollinearity and calls for concern. From the records in Table 4.4, the mean VIF value of 2.32 indicates the absence of multicollinearity in the models, which suggests that no independent variable should be dropped from the models.

4.2.2.4 Fixed and Random Effect Regression Test

Our study uses panel data from listed multinational manufacturing firms in Nigeria over the period of interest. The fixed-effects model according to Ajibolade & Sankay (2013) is the main technique for the analysis of panel data used when it becomes important to control for omitted variables that differ between cases but are constant over time. The decision rule remains to reject the null hypothesis if the p-value is less than 5% (i.e., p-value < 0.05). In this study, as seen from Table 4.4 above, the F-statistic (Wald-statistic) and P-value of 10.09{0.000}; 42.75{0.000} for ROA and 384.63{0.000}; 2091.09{0.000} for ROE regarding fixed and random effect regression, respectively. This shows that both models are valid for drawing inferences because they are statistically significant below 5%. However, the Hausman specification test helps to determine which one to use. Specifically, as seen in Table 4.4 above, the Hausman test result of 23.19 has a p-value of 0.007 for ROA and 73.38{0.000} for ROE. This implies that we fail to reject the null hypothesis and conclude that random effect regression is appropriate for testing the hypotheses.

However, the result of the Hausman specification test is verified with another model called the Breusch and Pagan Lagrangian Multiplier test (for serial correlation), also known as the LM test. The outcome of the LM test for random effects showed a value of 261.32 with a p-value of 0.000 for ROA and 123.65 {0.000} for ROE, thereby favoring the random-effects model. Hence, the Hausman specification test and the LM test result confirmed the use of a random effect regression model. The fixed and random effect model has a limited ability to explain the variation in both dependent variables (ROA, ROE). Therefore, the OLS regression provides a better fit and higher R-squared values for both ROA and ROE; therefore, we employ the OLS regression in validating the hypotheses.

4.2.2.5 Heteroskedasticity test

Heteroskedasticity occurs when the standard deviations of a predicted variable, monitored over different values of an independent variable, are non-constant (Adam, 2022). The heteroscedasticity test aims to determine whether the data is homogeneous or not, in other words, the data do not have any heteroscedasticity problems (Almeyda, & Darmansya, 2019). If heteroskedasticity exists, it implies that the population used in the regression contains unequal variance, and the analysis results may be invalid. The presence of heteroscedasticity tends to produce p-

values that are smaller than they should be because of the increased variance of the coefficient estimates. The Breusch–Pagan Godfrey test is a test that is mostly used to test for heteroskedasticity in a linear regression model and was used in this study for the same purpose.

From Table 4.4, the result of the Breusch–Pagan Godfrey test for heteroscedasticity revealed a chi-square (χ^2) value of 1.76 with a p-value of 0.1850 for ROA and 0.55 with a p-value of 0.4567 for ROE. These are above the significance threshold of 0.05 and imply that we fail to reject the null hypothesis that the population used is not heteroskedastic. Therefore, this indicates that the OLS results are free from heteroskedasticity.

4.3 Test of the Hypotheses

Following the above discussion, the OLS regression model as seen in columns 1 and 2 of Table 4.4 was used in this study to test the study's hypotheses. Below is a specific analysis for each of the independent variables using OLS regression?

4.3.1 Hypothesis one

H₀₁: There is no significant effect of energy disclosure on the return on assets of quoted multinational manufacturing companies in Nigeria.

The results obtained from the OLS regression, as shown in Table 4.4 (column 1), revealed that energy disclosure in listed multinational manufacturing firms in Nigeria has a coefficient of -0.065 with a p-value of 0.008, which is below the significance threshold of 0.05. The result of 0.065 indicates a significant negative relationship between the independent and dependent variables. This implies that an increase in energy disclosure will lead to a proportionate decrease in the dependent variable, financial performance, measured as the firms' returns on assets. However, our decision rule is to reject the null hypothesis where the p-value is less than 0.05 (5%). Consequently, since the energy disclosure's p-value is 0.008, which is below 0.05, we therefore reject the null hypothesis and conclude that there is a significant effect of energy disclosure on the return on assets of quoted manufacturing companies in Nigeria.

4.3.2 Hypothesis two

H₀₂: Water disclosure has no significant effect on the return on assets of quoted multinational manufacturing companies in Nigeria.

The results obtained from the OLS regression, as shown in Table 4.4 (column 1), revealed that water disclosure in listed multinational manufacturing firms in Nigeria has a coefficient of 0.101 with a p-value of 0.000, which is below the significance threshold of 0.05. The result of 0.101 indicates a strong significant positive relationship between the independent and dependent variables. This implies that an increase in water disclosure will lead to a proportionate increase in the dependent variable, financial performance, measured as the firms' returns on assets. However, our decision rule is to reject the null hypothesis where the p-value is less than 0.05 (5%). Consequently, since the water disclosure's p-value is 0.000, which is below 0.05, we therefore reject the null hypothesis and conclude that water disclosure has a significant effect on the return on assets of quoted manufacturing companies in Nigeria.

4.3.3 Hypothesis three

H₀₃: Energy disclosure has no significant control over the return on equity of quoted manufacturing companies in Nigeria.

The results obtained from the OLS regression, as shown in Table 4.4 (column 2), revealed that energy disclosure in listed multinational manufacturing firms in Nigeria has a coefficient of -0.272 with a p-value of 0.000, which is below the significance threshold of 0.05. The result of 0.272 indicates a significant negative relationship between the independent and dependent variables. This implies that an increase in energy disclosure will lead to a proportionate decrease in the dependent variable, i.e., financial performance measured as returns on equity of the firms under study. However, our decision rule is to reject the null hypothesis where the p-value is less than 0.05 (5%). Consequently, since the energy disclosure's p-value is 0.000, which is below 0.05, we therefore reject the null hypothesis and conclude that energy disclosure has a significant control over the return on equity of quoted manufacturing companies in Nigeria.

4.3.4 Hypothesis four

H₀₄: Water disclosure has no significant control over the return on equity of quoted manufacturing companies in Nigeria.

The results obtained from the OLS regression, as shown in Table 4.4 (column 2), revealed that water disclosure in listed multinational manufacturing firms in Nigeria has a coefficient of 0.408 with a p-value of 0.000, which is below the significance threshold of 0.05. The result of 0.408 indicates a strong significant positive relationship between the independent and dependent variables. This implies that an increase in water disclosure will lead to a proportionate increase in the dependent variable, financial performance, measured as the firms' returns on equity. However, our decision rule is to reject the null hypothesis where the p-value is less than 0.05 (5%). Consequently, since the water disclosure's p-value is 0.000, which is below 0.05, we therefore reject the null hypothesis and conclude that water disclosure has a significant control over the return on equity of quoted multinational manufacturing companies in Nigeria.

4.5 Discussion of the findings

This study examines the effect of climate change responsibility on financial performance. The findings suggest a significant relationship between climate change responsibility disclosures and financial performance indicators (ROA and ROE) among quoted multinational manufacturing companies in Nigeria. This finding aligns with prior research (Wang et al., 2021) that showed a positive impact of climate change responsibility (in this case, energy disclosure) on environmental and financial performance. The positive relationship between energy disclosure and ROA is also consistent with the idea that sustainability practices can enhance financial performance.

Furthermore, the study found that energy disclosures significantly effects ROE. This is consistent with Gustavo and Javier (2019), who found that energy disclosure has significant control over ROE. This also supports the idea that sustainable practices can enhance shareholder value, similar to findings in previous research. The study also found significant control of water disclosure over ROE. This supports the notion that environmental practices can positively influence a company's return on equity.

In summary, the findings are generally consistent with prior studies, which indicate that climate change responsibility and sustainable practices can positively affect financial performance indicators, such as ROA and ROE. However, the magnitude and significance of these effects may vary depending on the specific environmental practices and the context of multinational manufacturing companies in Nigeria. Therefore, it is important for companies to consider sustainability disclosures and practices for potential financial benefits.

5.0 SUMMARY OF THE FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of the Findings

In line with the decision rule governing our analysis, the findings emanating from the data analysis are summarized as follows:

- ❖ There is a significant effect of energy disclosure on the return on assets of quoted manufacturing companies in Nigeria.
- ❖ Water disclosure has a significant effect on the return on assets of quoted manufacturing companies in Nigeria.
- ❖ Energy disclosure has significant control over the return on equity of quoted manufacturing companies in Nigeria.
- ❖ Water disclosure has significant control over the return on equity of quoted manufacturing companies in Nigeria.

5.2 Conclusion

The relationship between green management practices and financial performance in Nigeria is a complex yet critical area of study. This research has revealed significant insights into the impact of sustainability disclosures on the financial performance of quoted multinational manufacturing companies in Nigeria.

The findings affirm that embracing environmentally responsible practices, such as energy and water disclosure, biodiversity conservation, and effluent and waste management, can positively influence both return on assets (ROA) and return on equity (ROE). These results are consistent with prior studies that highlight the financial benefits of green practices across diverse industries.

The connection between sustainability and financial performance is not merely theoretical but rather a tangible reality. Companies that adopt green management practices not only contribute to environmental conservation but also gain competitive advantages and enhanced financial outcomes. The significance of these practices transcends borders and holds relevance in the context of emerging economies such as Nigeria.

However, it is essential to acknowledge that the relationship is nuanced, with variations in the influence of different sustainability dimensions on ROA and ROE. While some practices demonstrate strong correlations, others may exhibit weaker or even negligible effects. These disparities emphasize the importance of tailoring green strategies to suit specific organizational objectives and market conditions.

As businesses worldwide confront mounting environmental challenges, the symbiotic relationship between sustainability and financial performance underscores the compelling case for adopting green management practices. The empirical evidence provided here adds valuable insights to the global discourse on sustainable business practices, urging companies to embrace a more environmentally responsible and financially prudent future.

5.3 Recommendations

Based on the above findings and conclusion, the study therefore makes the following recommendations:

- **Prioritize sustainability disclosure:** Quoted manufacturing companies should place a strong emphasis on sustainability disclosure, encompassing aspects such as energy, water, biodiversity, and effluent and waste management. Transparent reporting and disclosure can enhance corporate accountability and signal commitment to sustainable practices.
- **Integrated sustainability strategies:** Companies should develop integrated sustainability strategies that align with their core business objectives. The findings indicate that different sustainability dimensions may have varying impacts on financial performance. Tailoring strategies to specific goals and market conditions is essential.
- **Stakeholder engagement:** Engage with stakeholders to understand their views and concerns regarding green management practices. This proactive approach can help shape sustainability initiatives that resonate with stakeholders' expectations and preferences.
- **Continuous monitoring and evaluation:** Implement robust monitoring and evaluation systems to assess the impact of green management practices on financial performance. Regularly review and adapt strategies based on empirical results to optimize outcomes.

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