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Carbon Disclosure, Board Climate Governance and Financial Performance of Listed Manufacturing Firms in Nigeria

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ABSTRACT

This study examined the challenges of carbon disclosure and its impact on the performance of quoted manufacturing firms in Nigeria. Using equity return (ROE) as the dependent variable and carbon performance (disclosure), board response, board climate incentives, and board environmental committee as the independent variables, the study used panel data analysis to analyze the secondary data gathered from 2014 till 2020. The Hausman test suggested the usage of the fixed effect regression. Findings from the regression result showed that all the independent variables of carbon performance (disclosure), board response, board climate incentives, and board environmental committee positively and significantly impact ROE. The study therefore recommended amongst others that firms should always disclose their carbon disclosure data on their annual data so as to assist both the board and the regulatory authorities in managing carbon emission.

Keywords: Carbon Disclosure, Board Climate Incentives, Return on Equity, Panel data Analysis, Board Environmental Committee

JEL Classifications: G34, M14, L60

1. INTRODUCTION

Over the years there have been rampant climate changes in the environment through the emission of Green House Gases (GHG) which have become one of the primary threats to the existence of life on earth. The excessive emission of greenhouse gas (GHG) in the earth's atmosphere has led to undesirable consequences in the ecosystem leading to Global warming/climate changes (Liu, 2015). The global social economic impact of climate change can be substantial as a changing climate change affects human beings as well as physical and natural capital. The consequences of climate change could lead to worker productivity losses and an adverse effect on the global gross domestic product (GDP) growth (Hardiyansah et al., 2021). There is no doubt that firm have always played a major role in creating climate change problems as they are among the largest emitters of greenhouse gases (GHG) (Ofoegbu et al., 2018).

In recent times, stakeholders, such as shareholders, consumers and regulatory authorities, creditors, have started exerting pressure on corporations to decrease their GHG emissions (Saka and Oshika, 2014; Raffaello et al., 2013).

As a result, firms are to play a vital role in reducing the emission of GHG and contributing in the stabilization of climate change by providing the necessary information's about climate change related activities as it is also referred to as carbon disclosure to satisfy the concerns of their top stakeholders.

The study and rapid growth of carbon disclosure over the years has been a major success in the struggle to build awareness and action against climate change activities to the firms and their stakeholder through environmental disclosures. The result of carbon disclosure is as a result of three core drivers: regulatory compliance, the

pressure from non-governmental organizations, managerial information systems intended to facilitate participation in carbon markets, reduce energy cost and manage its reputational risks.

Carbon disclosure is not just of great benefits to stakeholders of firms but also helps them to monitor and regulate their carbon emission which is of advantage to improving the firms' carbon performance. When the carbon performance of a firm is stable and highly improved it leads to a drastic change and improvement in their financial performance on a long term (Mohammad and Aisa, 2020).

Corporate carbon profiles are translated into risk and market opportunity assessments with clear financial implications for businesses and investors. Indeed, this constitutes the central logic behind the carbon disclosure movement (Mohammad and Aisa, 2020). The emphasis here is on the greater societal goal of reporting and accounting, rather than the total procedure and approach. Carbon disclosure is becoming more widely recognized as an example of informational governance, or governance based on data (Mohammad et al., 2020). Carbon disclosure, in particular, employs openness and accountability systems to influence the behavior of target investors.

The Carbon Disclosure Project (CDP) was founded in 2000 by a UK-based organization to encourage organizations to disclose their greenhouse gas emissions (Mohammad et al., 2020). It has since evolved into a strategic skill that appealed to a wide range of stakeholders while also providing widespread credibility for reporting standards. CDP today has over 3000 organizations in 66 countries measuring and disclosing their emissions and climate strategies (Mohammad et al., 2020). The data collected from these companies are made publicly available and can be used by investors, shareholders and policy makers.

Disclosure of carbon emissions has grown in importance as a governance organization, promoting awareness about climate change, sustainable energy, and energy efficiency, as well as legitimizing the notion of external accountability. Most crucially, the voluntary rise of carbon disclosure has shown businesses the viability of doing so as well as the potential benefits of carbon monitoring and reporting, such as reputation management and the cost of energy. As a result, political space is opened for the regulation of initiatives that compel Carbon accounting rules that should be made public and formalized.

Currently there are five programs under the CDP: CDP water disclosure, Investors CDP, CDP supply chains, CDP cities and CDP public procurement (Mohammad et al., 2020). With the increasing acceptance of climate change as one of the most discussed political, societal, and business issues globally, as well as the introduction of regulations to address the challenge of global warming, such as the European Union's Emission Trading Scheme (ETS) and carbon taxes (or similar pricing mechanisms) in several other countries (e.g. the United States), regulations to address the challenge of global warming, such as the Emission Trading Scheme (ETS) and carbon taxes (or similar pricing mechanisms) in several other countries. Specifically, for large corporations' carbon disclosure is becoming the de facto standard. Despite the gain, it is still uncertain what the future holds.

The organization's board committee has a significant impact on whether the organization makes positive or bad decisions around carbon disclosure. Corporate business activities are frequently accused of being the primary causes of climate change since they emit greenhouse gases (GHGs) (Lee and Min, 2015). The focus of carbon disclosure is primarily on external pressures, with little or no consideration made to business internal governance structures. Previous research has looked into the link between board members' overall attributes and corporate sustainability disclosure. Board size, board diversity (gender), board independence, and a sustainability-related committee are among these characteristics.

According to studies like Healy and Krishna (2001), the more diverse a board of directors is, the more it can assist managers in making choices. For starters, a supervisory team with a broad set of knowledge, skills, and experiences, as well as professional network connections, can be more inventive and creative. In the context of climate change, directors with a diverse social and environmental intellect are more likely to understand carbon disclosure and even be aware of more transparent channels aimed at various stakeholders, such as answering carbon disclosure project (CDP) annual questions to institutional investors and including carbon-related information in their sustainability report to the general public (He et al., 2016). As a result, it is reasonable to assume that the board will be favorably linked to the chance of releasing carbon-related information. Furthermore, a board with a higher level of embeddedness can gather more industry-specific data to assist the organization in dealing with a variety of uncertainties (He et al., 2016).

This study therefore looked into the extent to which disclosure of carbon emissions is linked to better carbon performance. This problem has to do with a long-standing topic about whether quick changes in carbon disclosure have influenced changes in carbon emissions performance.

It is of no doubt that carbon disclosure and performance is complex and has been affected by both the strength of climate governance and a multiplicity of factors. As a result of this, the relationship between carbon disclosure-performance may be conceptualized from two perspectives (the signaling and legitimacy theory). The signaling theory basically suggested that firms with strong carbon performance are more likely driven to give detailed information about their good performance and topics relating more to climate changes issues to their stakeholders and investors as they are likely to benefit from higher financial returns including market valuation and lower cost of capital (Diah and Efiti, 2016). On the other hand, the legitimacy theory suggested that firms are likely to use disclosure to green-wash and obfuscate poor environmental performance leading to a drastic harm to the climate (Donavan, 1984; Akhiroh and Kiswanto, 2016). Prior to this research, studies have shown that corporate governance such as board independence, board diversity etc. has a huge effect also on carbon disclosure and performance.

As a matter of fact, most firms are faced with issues relating to their climate governance/change as a result of the non-commitment of their board of directors to monitor its carbon emission and performance (Diah and Efiti, 2016). A sub-committee or director responsible for the provision of information regarding climate

change issues or even provision of incentives to other directors and management can help the firm in its carbon mitigation thereby limiting global warming, emission of GHS (greenhouse gases) and other negative environmental impact it may cause (Bae et al., 2013).

The outlined responsibilities of the board of directors to drive forward the firm's climate strategy can be found in most firms' annual reports, but it is not surprising that most firms see climate change as a matter overseen by the board, as most firms stated they will look at the composition of their board to see if they have the appropriate level of skills and experience in the area of climate change. Even if the board of directors is not a full-fledged climate specialist, it is critical that they take responsibility for understanding scientific consensus so that the firm's management team can assess climate-related risks, develop mitigation plans, and communicate the story to stakeholders like investors, consumers, and regulators.

With the goal of increasing productivity in small and medium enterprises, the domestic market, and large corporations in a developing country like Nigeria, which has a population of over 200 million people as of 2021, the country engages in a variety of economic operations that harm the economy and the environment (Hardiyansah et al., 2021). This has a negative impact on the environment, ranging from global warming to the disposal of toxic waste materials by manufacturing or oil and gas industries, as well as a massive emission of greenhouse gases into the atmosphere, which has sparked interest in corporate environmental reporting among stakeholders. Nigeria ranks second among the top 20 countries with the highest rate of gas flaring (Omaliko et al., 2020) and the seventh ranked by flare volume as at 2020. This has sparked widespread worry in the Niger Delta region (Rivers, Akwa Ibom, Bayelsa, and Imo states), as the high rate of greenhouse gas emissions traps heat in the atmosphere, contributing to global warming.

The current activities taken by individuals and companies involved in production that leads to emission is currently have an effect to the ecosystem (land, water and air) as not one seems to take responsibility for their actions. These actions have a tendency of affecting not only the present but also the future if it is not curtailed. The going concern concept is widely accepted in Nigeria, and most industries must take the required steps to ensure that their economic activities are socially and environmentally sustainable. Even though organizations need earnings to thrive, they must also recognize that social and environmental considerations can have a significant impact on their long-term financial performance.

Today, environmental or sustainability reporting has become a voluntary global reporting initiative adopted by most developed countries across the globe. However, this is not the same in a developing country like Nigeria (Omaliko et al., 2020). Businesses seek ways to reducing the negative impact on the environment through an appropriate dissemination of qualitative environmental disclosure (Omaliko et al., 2020). The concerns linked with industries' unrestricted carbon disclosure have an adverse impact on the environment that cannot be disregarded. As a result of this

issue harming the ecosystem, much effort has been focused over the years on lowering the impact of industrial activities on carbon emissions in the environment (Omaliko et al., 2020).

There is a study gap of what truly motivates companies to disclose their environmental information. Even though greenhouse gas (GHG) emissions have such a significant impact on the environment. A review from previous research work such as Omaliko and Okpala (2020) made observations by using the firm's size, firm's characteristics, and firm leverage on the level of carbon disclosure on other developing countries other than Nigeria.

Since there is a voluntary dissemination of information regarding carbon disclosure by firms in Nigeria it would be of great necessity that industries create a board environmental committee in the organization that has a positive influence towards climate governance and its effects on the carbon disclosure of the company and its carbon performance.

This study is motivated by the lack of research in developing countries as Nigeria. It aims to assist and remind the board of directors, senior management, stakeholders, and government in developing an integrated approach to reducing GHG emissions by businesses, resulting in a positive change in the climate.

2. CONCEPTUAL FRAMEWORK ON CLIMATE CHANGE AND THE NIGERIAN ENVIRONMENT

Global warming and its adverse effect to the climate change in Nigeria can be viewed in various notable ways which includes the economy, health, food production and the likes. Since Nigeria is predominantly contending with primary production of economic values as opposed to the industrial production, any adverse effect on the biosphere through climate change would have adverse implication on her economy (Siregar and Refandi, 2018). The impact of global warming is already evident in the environmental degradation afflicting the two extreme ecological zones. In the North Sahelian zone, desert encroachment is gradually but steadily depleting vegetation and grazing resources, thereby forcing more nomadic activities. In the coastal south, sea level rise is resulting in over flooding while pollution is exerting monstrous impacts on the biosphere thus endangering fishing and subsistence agriculture. This is putting the adverse effects of climate change, as far as Nigeria is concerned, in a composite. The ripple effects of the general environmental degradation would rob off negatively on other sub-sectors which we have earlier listed.

2.1. Brief Overview of Climate Governance

According to Gallego-Álvarez et al., (2015), the evolution of climate governance can be attributed to the inter-state diplomacy and then the creation of transactional networks and non-state players. The exact date of "creation" is quite difficult to pinpoint, but the United Nations framework convention on climate change (UNFCCC) in Rio is a watershed moment in its history. This has been termed "the first turning point in climate diplomacy." As climate governance has progressed on the international stage, a

number of transnational public and public-private actor networks, such as the Global Cities Covenant on Climate (also known as the ‘Mexico City Pact’) and the Cities for Climate Protection Programme, have sought to implement its goals in their own arena (CCPP). The UNFCCC (United Nations Conference on Environment and Development) in 1992 served as a “trigger” for this process. Existing regional and local networks accepted the goals and began to investigate how they could be met on a local level. Innovative climate governance methods, such as the “cap and trade” mechanism, have emerged under the cover of internationally agreed climate targets. The cap-and-trade mechanism is basically a method used in reducing the rate of emission from power plants by setting a limit on pollution and creating a market.

2.2. Various Perspective of Climate Governance

Climate governance is multi-scale, multi-actor, and has deeply embedded in our social and physical infrastructure:

Multi-Scale: At each degree of governance, climate governance occurs as policies are implemented at various levels and spaces. Supranational, national, regional, and local scales are all included in this. The connection between these domains raises crucial questions about who has authority and power to manage climate change.

Multi-Actor: The ambiguous positions of state and non-state actors in climate governance are exacerbated by their fragmented and hazy roles. Non-state actors, such as the United Nations Framework Convention on Climate Change (UNFCCC), play an important influence in determining national governments’ positions on international climate agreements.

Embedded: The fact that non-state entities are involved in climate governance is partially due to the deeply rooted social and economic structure of many of the processes that lead to GHG emissions. The complexity of mechanisms involving GHG emissions across the earth at all scales add to the challenges of tackling climate change.

2.3. Carbon Disclosure and Performance

The study of carbon disclosure has been gaining increasing importance in recent years to help firms communicate their climate change activities to their stakeholders through environment disclosures (Diah and Efitu, 2016). These disclosures can help stakeholders, such as shareholders and creditors, to make better investment decisions. Carbon disclosure can also help stakeholders, such as regulatory agencies, institutional investors and the public, to better monitor and regulate a firm’s carbon emissions, which is likely to contribute to its improved carbon performance. A carbon disclosure rating is a measure of the environmental sustainability of a company, based on voluntary disclosures by the company itself. The practice is intended to help investors who wish to incorporate environmental, social and governmental (ESG) factors into their investment decision-making process. The most widely used carbon disclosure ratings are administered by CDP, a United Kingdom-based non-profit organization formerly known as the Carbon Disclosure Project.

2.4. Firm Performance

The performance of any firm is attached to so many areas like the financial performance, sales performance, marketing performance, corporate governance performance, production performance, and so on. However, this study would examine the financial performance aspect of a firm success. Many variables are used to measure financial performance like profit after tax measurement, asset returns measurement, however, this study would use the equity returns measurement. Equity returns is simply the ratio of total profit after tax to the company’s total equity.

2.5. Theoretical Framework

2.5.1. Signaling theory

The signaling theory was proposed by Michael Spence in 1973 (Donavan, 1984), and it basically states that firms with strong carbon performance are more likely to be driven to give detailed information to their stakeholders and investors about their good performance and topics relating to climate change issues because they are more likely to benefit from higher financial returns, such as market valuation and lower cost of capital (Ennis et al., 2012).

Firms seek to differentiate themselves by signaling their superior carbon performance to stakeholders, gaining a competitive advantage, according to the Signaling theory. Firms with poor performance may exacerbate information asymmetry by reducing carbon disclosure, rather than hiding underlying performance or avoiding responsibility for poor performance. Some researches demonstrated a positive association between environmental performance and environmental disclosure (Dibia and Onwuchekwa, 2015), which was consistent with a signaling perspective. Good environmental performance is associated with more extensive disclosure of quantifiable pollution-related measures, according to He et al. (2016). Gayo and Vera, (2020), for example, found a link between carbon disclosure and carbon performance.

2.6. Empirical Framework

Mohammad et al. (2020) examined the combined influence of climate governance on carbon disclosure, where climate governance is linked to carbon disclosure and performance alignment. They chose the S&P 500 as their sample size because these are the largest publicly traded companies on the New York stock exchange (NYSE). With such a high level of capitalization, these companies are subjected to considerable stakeholder and public pressures to reduce carbon emissions and take the lead on climate change initiatives. They also analyzed their data with regression models. The findings show that broad disclosure minimizes over-acclaiming of high performance, with low-polluters disclosing more to differentiate themselves. The impact of incorporating climate change considerations into governance systems on the relationship between carbon disclosure and carbon performance is examined in this paper.

According to Lee and Min (2015), changes in carbon disclosure levels are positively related to subsequent changes in carbon performance (examined through direct and indirect carbon emission intensities). Regardless of whether disclosure has been used to justify earlier bad performance, their research shows that

carbon disclosure stimulates organizations and provides a 'outside-in' driven effect that leads to subsequent change and improvement in carbon performance. They based their findings on a change analysis of Global 500 firms' carbon emission and disclosure data from 2008 to 2012. Panel data was used in their analysis to control unobservable firm heterogeneities, allowing the hypotheses to be effectively evaluated. They used CDP data from 2008 to 2012 to ensure consistency and acquire as much information as feasible.

During this time, business leaders have progressively grasped the importance of managing climate change, thanks to market incentive systems such as the European Union ETS, which encouraged corporate carbon management and innovation (He et al., 2016). Their research was prompted by an increase in carbon disclosure but a paucity of studies on whether this rise may be translated into improved carbon performance. Despite the fact that extensive study has been done on the relationship between environmental performance and disclosure, there is little information on the actions and changes that firms may make as a result of disclosures. In a nutshell, their results help regulators to monitor carbon disclosure and assist investors with investment decisions.

In a study of 95 companies from the S&P 500, Ennis et al. (2012) looked at the link between boardroom diversity and corporate social performance. Diversity of boards (DOB), which includes board size, board independence, outside directors, and leadership duality, and diversity in boards (DIB), which includes director gender, age, experience, tenure, and ethnicity, are the independent variables included in their study. Other board structures (board size, board independence, outside directors, leadership duality, experience, tenure, and ethnicity) had no significant relationship with corporate social performance, according to the findings.

Eze et al. (2016) provided a comprehensive understanding of the governance-related factors and financial consequences of carbon performance and disclosure. Its inspiration stems from the growing political, social, scholarly, and practical necessity of monitoring and reporting on carbon-related concerns on a global scale. They used a systematic literature review as a methodological approach. As a result, 73 quantitative peer-reviewed empirical studies in the field were identified and classified using a legitimacy theory-based framework. Panel data was utilised in their research.

Diah and Efita (2016) attempted to investigate the relationship between corporate governance and the quality of sustainability reporting of listed companies in Nigeria. Board governance factors (board size, board independence, board gender diversity, and board expertise) and audit committee traits are used in their study to assess corporate governance (audit committee size, audit expertise and audit meeting). Their research is based on a sample of 120 companies from the 165 that are listed on the NSE over a six-year period (2013–2018). Using the ordered logistic regression strategy, enterprises are classified into different sectors using a stratified sample method, specifically from eight sectors on the NSE. Finally, they measured corporate governance using board governance (board size, board independence, board gender

diversity, and board expertise) and audit committee qualities to see if there was a link between corporate governance and SRQ in Nigeria (audit committee size, audit expertise and audit meeting). They found that corporate governance had a substantial impact on SRQ utilizing a sample size of 120 enterprises and the ordered probit and logistic regression methods from 2013 to 2018.

2.7. Gaps in Literature

Despite the fact that much has been written and published, major authors either focus extensively on climate governance or carbon disclosure and performance and those who have written articles on the topic have focused more on developed countries such as the United States, the United Kingdom, Asia, and others while few studies are on developing countries.

Furthermore, the majority of this study work is measured using a specific approach; there are a few that have employed alternative measurement techniques, but the most of them were not subjected to developing country constraints.

3. MODEL SPECIFICATION

The study adopted and modified the model from the study of Hardiyansah et al. (2021). The explicit model form was:

$$ROE_{it} = \alpha + \beta_1 BRES_{it} + \beta_2 BINC_{it} + \beta_3 BENV_{it} + CPER_{it} + \varepsilon_{it}$$

Where:

$CPER_{it}$ = Carbon Performance (disclosure) of firm i in period t

$BRES_{it}$ = Board Response of firm i in period t

$BINC_{it}$ = Board Climate Incentives of firm i in period t

$BENV_{it}$ = Board Environmental Committee of firm i in period t

ROE_{it} = Equity Return of firm i in period t

ε_{it} = Error Term.

The study used panel data for the period 2014 till 2020 and was extracted from the annual reports of the selected manufacturing companies and the Nigeria Stock Exchange fact-book. The data was analyzed using the panel data regression analysis. The selected sample size was 15 listed manufacturing industries in the Nigerian stock exchange, and they included: Unilever Nigeria Plc, Nestle Nigeria Plc, Nigeria Breweries Plc, Flour mills of Nigeria Plc, PZ Cussons Nigeria Plc, Guinness Nigeria Plc, Cadbury Nigeria Plc, Honeywell Flour mill plc, Dangote Group, Lafarge Cement, Champion Breweries plc, Bua food plc, International Breweries Plc, United Africa company of Nigeria (UAC), British American tobacco Nigeria limited, Golden Guinea Breweries Plc, and Union Dion salt Plc.

4. RESULTS

4.1. Unit Root Test

The study used the panel unit root test to examine the stationarity of the data. The probability values of the Levin et al. t-statistics and the Augmented Dickey-Fuller - Fisher Chi-square (ADF - Fisher Chi-square) would be examined to determine the stationarity at both levels and first difference. If

Table 1: Panel unit root test (levels)

Variable	Levin, Lin and Chu T* statistics	Probability Values at 10% Significant level	Stationarity	Intercept/trend and intercept	Remark
CPER	-4.89106	0.0000	Stationary at levels	Trend and intercept	I (0)
BRES	-4.23002	0.0000	Stationary at levels	Trend and intercept	I (0)
BINC	-8.04963	0.0000	Stationary at levels	Trend and intercept	I (0)
BENV	-3.48103	0.0002	Stationary at levels	Intercept	I (0)
ROE	-6.84100	0.0000	Stationary at levels	Trend and intercept	I (0)

Source: Researchers compilation using E-views 9. CPER: Carbon performance, BRES: Board response, BINC: Board climate incentives, BENV: Board environmental committee, ROE: Equity return

the probability values are less than 0.10 or significant at 10% level of significance, then the null hypothesis would be accepted and it would be agreed that there is the presence of a unit root and the data is stationary. From Table 1, all the variables were stationary at levels with values of 0.0000, 0.0000, 0.0000, 0.0002, and 0.0000 which were significant at 10% level of significance (lesser than 0.10) to prove the presence of a unit root and that the data was stationary.

4.2. Hausman Test

Panel data regression is made up of the fixed effect and the random effect regression. Hence, to determine which to use for the study analysis, the Hausman test was adopted. The decision criterion was to reject the null hypothesis if the probability value of the Chi-square Statistic of the Hausman test was significant at 5% level of significance. The null and alternate hypothesis adopted to test the Hausman test is:

H_0 = Random effect

H_1 = Fixed effect.

From Table 2, the Chi-square statistic probability value of 0.0000 was significant at 5% level of significance. The significant result showed that the null hypothesis would be rejected and this means that the fixed-effect model was appropriate for this study.

4.3. Fixed-Effect Regression

From Table 3 and examining the coefficient signs, it was evident that there existed a positive relationship between BRES, BINC, BENV, and CPER with the dependent variable ROE. The nature of the relationship was positive based on the signs of the entire coefficients. This implied that an increase in any of the independent variables would lead to an increase in the dependent variable.

Also, the regression output also showed the significance of each independent variable in the model, which was used to test the study hypothesis. Based on the rule of thumb and the significant level of 0.05, the probability value of BRES, BINC, BENV, and CPER were all significant with probability values of 0.0294, 0.0068, 0.0000, and 0.0353 respectively.

The coefficient of determination (R-squared) of the model under consideration which measured the goodness of fit of the model had a value of 0.68. This indicated that all the independent variables explain about 68% of the variations in the dependent variable (ROE). After adjusting for degree of freedom, the adjusted R-squared was 0.61 (61%).

Table 2: Hausman test result to determine the best regression output to use

Test summary	χ^2 statistic	χ^2 df	P
Cross-section random	5.490210	6	0.0000

Source: Researchers compilation using E-views 9. Df: Degree of freedom

Furthermore, the F-statistics showed the joint significance of the independent variables on the dependent variable. Examining its probability value (Prob(F-statistic)) of 0.000003 which was significant at 5% level of significance, all the independent variables and the control variables together jointly have a significant impact on the dependent variable ROE.

Finally, the durbin-watson test was used to show the presence or absence of autocorrelation in the model. Autocorrelation means that all or some of the independent variables are related this makes the regression result spurious. The value of the durbin-watson variable must be estimated at 2 to ensure that there is no autocorrelation in the model. The durbin-watson value of 1.86 was approximately 2 to show that there was no autocorrelation in the model.

4.4. Breusch Pagan LM Test for Auto/Serial Correlation

This was used to test for autocorrelation in the panel data and was used to confirm this assertion. The null hypothesis showed no presence of autocorrelation and vice versa.

H_0 : There is no presence of autocorrelation in the model

H_1 : There is the presence of autocorrelation in the model.

From the result in Table 4, the probability value of 0.1032 was not significant at 10% level of significance to show that there was no autocorrelation in the model.

5. DISCUSSION OF FINDINGS AND POLICY IMPLICATIONS

5.1. Discussion of Findings

Result from the Hausman test revealed that the fixed effect regression was perfect for the data analysis. The findings from the fixed effect regression showed that carbon performance, board response, board climate incentives, and board environmental committee all had positive and significant impacts on return on equity of the selected firms. Hence, the company board is saddled with the responsibilities of not only taking effective decisions on managing the firm but also taking decisions on climate impact, environmental impact, and carbon disclosure impact of the fumes that emanate from the manufacturing processes from their firms.

Table 3: Fixed-effect regression

Variable	Coefficient	SE	T-statistic	P
C	-0.225017	13.57517	-0.016576	0.9868
BRES	0.523066	0.238819	2.190216	0.0294
BINC	1.720508	0.631059	2.726383	0.0068
BENV	1.357659	0.150447	9.024154	0.0000
CPER	0.106135	0.051543	2.059147	0.0353
R ² =0.68	Adjusted R ² =0.61	Durbin-Watson test=1.86	F-statistics=3.747747	P (F-statistic)=0.000003

Source: Researchers compilation using E-views 9. SE: Standard error, BRES: Board response, BINC: Board climate incentives, BENV: Board environmental committee, CPER: Carbon performance

Table 4: Breusch Pagan LM test result

Test	Statistic	df	P
Breusch-Pagan LM	500.1209	55	0.1032

Source: Researchers compilation using E-views 9. Df: Degree of freedom

The board's ability to manage this would lead to a clean and green environment and would improve productivity and sales and ultimately boost performance especially financial performance of such firms.

5.2. Recommendations

1. The firm board should ensure a safe, clean, green production environment is maintained in the work environment as this would boost production, sales, and financial performance of the firms.
2. The firm board should ensure that quick responses are taken to curtail any situation of carbon spillage in the production area for increased performances.
3. Environmental factors like carbon spillage that negatively affect the climate should be curtailed and controlled by the firm board for maximum performance.
4. Policies to manage carbon emission from the firm production unit should be made by the board so as to boost performance.
5. Firms should always disclose their carbon disclosure data on their annual data so as to assist both the board and the regulatory authorities in managing carbon emission.

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