EXTERNAL ENVIRONMENTAL COSTS AND CORPORATE FINANCIAL PERFORMANCE OF SELECTED LISTED FIRMS IN NIGERIA

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ABSTRACT

The study examined external environmental cost and corporate financial performance of selected listed firms in Nigeria. Specifically, the study analysed the effect of external environmental cost on return on assets and return on equity. This *study purposefully chose 26 organizations whose financial statements were ready and accessible during the study's time frame from oil and gas industries and the industrial goods sector.* Financial statements and annual financial reports of these selected firms were used to compile the data for this study spanning from 2005 to 2019. The estimation technique adopted included correlation, static panel estimation which consists of pooled, fixed and random effects estimation techniques as well as post-estimation tests such as the restricted F-test and Hausman test. The findings showed that external environmental cost had a significant positive effect on return on asset with coefficient estimation of $(0.0981382, p < 0.05)$ which means a 1% rise in external environmental expenses resulted in a 0.098 percent increase in return on asset as a measure of financial performance of the sampled firms. Also, the results of the second model showed that external environmental cost had a positive significant effect on return on equity with a coefficient of $(0.082470, p < 0.05)$, that is a 1% increase in external environmental expenditures resulted in a 0.082 percentage increase in return on equity as a measure of financial performance. According to this study, an increase in an organization's external environmental expenditures has the potential to significantly improve positively the firm's performance in terms of both return on asset and return on equity.

Keywords: *External environmental cost, Listed Firms, Corporate Financial Performance.*

1.0 Introduction

Many business stakeholders, particularly in developed countries, have become more conscious of their company's environmental sustainability in recent years, including government agencies, non-governmental institutions, community groups in local areas, consumers, business associates, staff members, funding institutions, and shareholders. This, in whatever form it takes, has an impact on an organization's financial success. For instance, if a firm who as a result of contravening environmental laws bring about an environmental hazard, such organization will not only have to be fined and penalized but have to incur loss of confidence and status or a loss of customers' patronage. It is possible that these uncertainties will have a negative impact on a company's future profits worth. Conversely, Iwata and Okada (2010) submitted that an organization that is vigorously concerned about her environmental responsibilities will undoubtedly advance positive reputation amongst stakeholders and this may perhaps impact them to be successful in reducing environmental hazards and in the long run reduce production costs.

Existing literature have shown that negligence of firms in handling environmental matters is expected to encounter an adverse outcome on firm's regard with concerned investors and customers, including its allure to existing and prospective personnel. The cost implication of environmental failure by firms in terms of litigation costs and penalties will also rise significantly. All of these negative consequences are almost certain to impair a company's competitiveness and lower its stock market value. Nevertheless, environmentally accountable companies are further expected to be recognized as apparent, reliable, harmless and attractive when it comes to future financial expectation by investors and other shareholders. These positive impacts are expected to advance the economic wellbeing of firms when it comes to improved stock market value and decrease in capital's cost (Cormier & Magnan, 2007). As a result, the focal point of

this study was on the correlation/relationship between costs incurred on environmental sustainable activities and overall financial performance of Nigerian publicly traded enterprises.

For example, environmental issues have prompted public uproar in Nigeria's oil and gas industry as well as in the manufacturing sector. These industries' activities are frequently linked to serious environmental deterioration, which has resulted in societal unrest and the disruption of several businesses' operations in the recent past (Uwaoma & Ordu, 2016). As the local populace has become more aware of environmental issues such as discharge of pollutants from powerful industrial machinery, a shortage of pure clean water, the disappearance of marine seafood due to oil leakage, and so on, the concerns have intensified (Uwuigbe & Jimoh, 2012). Several studies, such as (Wagner, Phu, Azomahou & Wehrmeyer, 2002; Nyirenda, Ngwakwe & Ambe, 2013; Rajashekar & Keshavarz, 2019) have used different measures such as sulfur dioxide, nitric oxide, chemical oxygen demand, carbon emissions, energy usage, water usage, biodiversity, effluents and waste to capture environmental costs or management. Limited existing literature have focused on the cost incurred on external environmental activities which include but not limited to community development in form of access to good road, provision of health facilities, donations and other company's community responsibility costs and the relationship these have on corporate financial performance. However, this study examined what effect external environmental costs have on the performance of selected firms which cut across both manufacturing and oil and gas sectors.

2.0 Literature Review

External Environmental Costs

An external cost refers to the cost of environmental harm that occurs outside the control of the firm. Those costs can indeed be paid for such that their financial equivalent amounts can also be estimated through cost management which estimates the full value individual company will be prepared to pay to lessen the suffering or accept the minimal amount of recompense if they must experience it. Full environmental cost equal the addition of internal and external costs, where the internal costs are comprised of direct, indirect, and contingent charges. External costs include the unpaid expenses of prospective health and environmental repercussions (excluding stratospheric ozone depletion), as well as the costs of external environmental health impacts, such as global warming and biodiversity loss. Economic efficiency is attained from the perspective of the entire society, including the enterprise and the rest of society. In this circumstance, total environmental expenses are reduced, especially if the company extends internal environmental initiatives to the point that both internal and external expenses are reduced. Environmental expenses that are uncertain or unknown are costs that may develop in the future and have an influence on the operations of company. Adjustments in the quality of a product as a result of legislative changes that impact negatively on the cost of raw materials, production techniques, permissible greenhouse gases, unexpected exposure to recovery expenses, employee benefits and sense of achievement, customer expectation and commitment costs and capital operating expenses or the desire to mobilize capital are indeed examples of contingent costs. External costs are usually somewhat vital to a business than internal costs, only if the external costs result in liabilities.

External Environmental Costs' Disclosure

In a production sector of the economy, waste is inevitable; waste is a component of economic activities carried out by households, firms, the government which is a contribution to economic activities through resource recovery (material or energy) Akinlo and Iredele (2014). Waste management involves implementing the waste order through the 3Rs (reduce, reuse and recycle) in order to promote a clean environment and a healthy society. According to Miradha et al., (2017), waste minimization may be done by lowering material inputs to high-waste-potential commodities and deploying improved waste processing facilities. Reuse of waste involves utilization of waste as materials for the same or other purposes while recycling comprises of further processing of waste for several other functions. Firm's disclosure on waste management strategy portrays a positive picture of organizations inclination to eco-efficiency which in turn

impacts on performance, as consumers will be more willing to demand for products which in its entire life cycle is environmentally friendly Oti and Mbu-Ogar (2018).

Furthermore, community development, an aspect of organizations social responsiveness holds that companies' duty towards the society and business decisions should be connected to ethical values and respect for individuals, society and environment. Thus, organizations as corporate citizens are expected to give back to the society especially communities where they operate (ICAN, 2014). Community development aligns with the philanthropic expectation placed on organizations at any given time Carrol (1991). Also, Oti *et al.,* (2017) emphasized that community development is anchored on firm's initiative at cushioning the effect their externalities have on the host communities. Disclosure on community developments costs depict a firm in good light and convince stakeholders that an organization performs its tasks in an ethical manner. Dessy and Rosita (2015) posited that utilizing local labour in a community as a form of job expansion strategy is very important as it reduces labour cost incurred by the company and impacts positively on the community. Environmental disclosure and public effort disclosure can be employed to manage a company's connection with its host community, resulting in a stable corporate climate free of protests or conflicts motivated by significant stakeholders Banwarie, (2011).

Financial Performance

According to Kurawa and Garba (2014), profit is determined by turnover variables from the firm and the community in which the business activities are carried out. The better the performance, the faster the turnover is. If the value or number of existing assets continues to rise, so will the expenses associated with them, diminishing performance. As a result, calculating performance in terms of returns on assets, returns on equity, and returns on capital used is the most economical method. Profitability ratios, on the other hand, are defined by Rahman et al. (2011) as the level of an organization's overall output and performance. Furthermore, it is widely assumed that performance and management efficiency are positively related; poor levels of performance may jeopardize management efficiency, and vice versa; poor management efficiency may jeopardize level of performance; thus, it has to do with shareholders' goals; capital optimization and asset ratio investments, which are only possible if an adequate yield is achieved; and thus, it has to do with shareholders' goals; capital optimization and asset ratio investments, which are only possible if an adequate yield is achieved. According to Vishnani and Shah (2007), if an unjustifiable investment in total assets is made the return on investment will suffer. The primary goal of appropriate environmental management, including associated costs, is to allow management to better handle financial resources of firms so that a balance can be struck between firm performance and risk associated with that performance. However, profit is used to calculate performance measures. To exist and flourish through time, a firm must make a profit (Rahman et al., 2011). As a result, performance levels are critical for management decisions on whether to prioritize customer, employee, or supplier concerns over social consequences.

Theoretical Framework

Legitimacy Theory

The legitimacy argument is the most prevalent basis for environmental disclosure. This theory was offered by Dowling and Pfeffer (1975). Environmental disclosure is determined by the extent of public and political pressure a company confronts in respect to its environmental performance, according to Cho and Patten (2007). Companies want to submit a lot more environmental data in relation to this demand. Campbell, Craven, and Shrives (2003) looked at the apparent legality gap, as well as the addition of an optional social, environmental, and financial disclosure requirement. According to Deegan (2000), legitimacy theory is crucial for every business body that wishes to operate within the bounds and norms of its local community. When evaluated through the lens of a set of socially established norms, values, ideas, and conceptions, legitimacy, according to Suchman (1995), is a commonly held conviction or assumption that an entity's acts are desirable, proper, or essential. Corporate organizations, according to Dowling and Pfeffer, (1975) strive to create a relationship between the social values associated with or implied by their operations and the social norms of acceptable behavior in the wider social environment in which they operate. Similarly,

Richardson (1987) considered accounting to be a legitimate institution that provided instruments for connecting social principles to economic activities.

Empirical Review

Osemene, Kolawole, and Oyelakun (2016) established a clear and substantial relationship between the cost of sustainable development and the performance of Nigerian manufacturing enterprises. Their investigation focus on the relationship between environmental accounting rules and the long-term growth and performance of Nigeria's publicly listed industrial businesses. The data came from 36 publicly listed Nigerian firms whose annual reports and financial statements were picked at random. The information obtained was evaluated using panel data regression analysis. The findings revealed a statistically significant positive relationship between the cost of sustainable development and equity and asset returns. Environmental accounting and return on equity have been demonstrated to have a direct and statistically significant link. As a result, it was underlined that in order to enjoy a bigger and more consistent net profit and profits per share, businesses should account for and disclose the environmental implications of their economic activities to stakeholders.

The financial impact of environmental sustainability expenses on Nigerian enterprises was investigated by Raymond, John-Akamelu, and Chigbo (2016). The researchers employed historical data as well as an ex post facto qualitative study approach. The company's year-end financial reports and accounts in Nigeria provided the data for this study. A multiple regression analytical approach was used to measure the hypotheses created during the project inquiry. According to the study, environmental costs have a positive influence on corporate profit development in Nigeria.

Furthermore, Odesa, Igbru, and Agbasi (2016) analysed the influence of environmental costs on business performance using the manufacturing and oil industries in Nigeria as a case study. The data for the years 2010-2014 was gathered from the chosen firms' end-of-year reports. Descriptive statistics, correlation, and regression analysis were used in the research. The regression results demonstrate a significant positive relationship between corporate social responsibility, employee health and safety expenses, and firm performance, but a negative and insignificant relationship between community development costs and firm performance. As a consequence, the research recommends that corporations engage more in their host communities in order to boost their corporate image and maintain solid relationships with them.

Obara, Ohaka, Nangih, and Odinakachukwu (2017) found that waste management expenses had a direct and substantial influence on operating profit, ROA, and ROE, correlating with the findings of Odesa et al (2016). The research investigates the influence of waste management expenses on Nigeria's oil industry's success. The research used three organizations as a case study to look at four operational factors, including waste management cost, return on asset, return on equity, and operating profit. Statistical methods like simple linear regressions were utilized to construct and test research questions and hypotheses. Waste management has a positive and statistically significant influence on the return on assets, return on equity, and operational profit baseline, according to data examined at the 0.05 level of significance.

The link between environmental cost accounting and the financial performance of Nigerian food and beverage firms was investigated by Charles, John-Akamelu, and Umeoduagu (2017). The investigations were done using Pearson's correlation and multiple regression techniques, and secondary data was acquired from the financial records of the firms under examination from 2006 to 2014. Explanatory elements were ROE, ROCE, NPM, and EPS, which stood for return on capital, return on capital employed, net profit margin, and earnings per share, respectively. According to the study, environmental cost accounting and return on equity of selected enterprises show a significant association. The environmental accounting, return on capital employed, and net profit margin of the chosen enterprises all exhibited a negative correlation.

In contrast to earlier research, which ended in 2014, Ebieri (2018) extended the study period to 2015. The study looks into the impact of sustainability expenses on the net value of firms listed on the Nigerian Stock Exchange. The study spans the years 2005 to 2015, when the Nigerian economy underwent major

deregulation. The study gathered cross-section data from eleven years of annual reports from twenty publicly traded businesses using an ex post facto research plan and a non-probability sampling technique. The lists of twenty companies were chosen based on their success in three different industries: industrial goods, consumer goods, and financial services. A panel data regression approach and the ordinary least square statistical method were used to analyze the data. Sustainability expenditures, according to the report, have a considerable influence on the net value of listed firms in Nigeria.

In their study, Umoren, Akpan, and Okafor (2018) discovered no significant relationship between environmental accounting and ROCE, NPM, DPS, or EPS. The study looks at Nigerian oil companies' performance as well as environmental accounting. Eleven (11) publicly listed oil companies were picked at random from the Nigerian Stock Exchange. Secondary data for the study was gathered from these firms' audited financial records over a three-year period and analyzed using a multiple regression analytical approach. Among the performance metrics are the costs of air pollution, water pollution, land degradation, employee welfare, community welfare, and litigations, with the costs of air pollution, water pollution, land degradation, employee welfare, community welfare, and litigations serving as explanatory factors. According to the study, environmental accounting expenditures showed no statistically significant associations with performance indicators like ROCE, NPM, DPS, or EPS.

In a similar vein, Oti and Mbu-Ogar (2018) investigate the environmental and social costs of publicly listed Nigerian oil and gas companies, as well as their financial success. The ordinary least square regression approach was used to examine five years of time series data from five oil companies. Employee health and safety (EHS), waste management (WM), and community development (CD) are among the study's explanatory components, with return on capital serving as the dependent variable (ROCE). According to statistical study, charges for employee health and safety and community development have no substantial influence on company success, however waste management expenditures have a favorable and considerable impact on financial performance. Oil businesses should review their waste management strategies on a regular basis, according to the study, and utilize specialist waste management equipment to minimise their environmental effect.

Meanwhile, Akinleye and Olaoye (2021) examined community development cost and financial performance of oil and gas firms in Nigeria. Specifically, the study analyzed the effect of community development cost on return on asset of selected oil and gas firms. Six (6) oil and gas firms were sampled for the study and data were collated from published annual reports of these firms over the period of 10 years, spanning between 2010 and 2019. Data were analyzed using panel based estimation techniques and evaluations were done for the most consistent and efficient result based on restricted F-test and Hausman test. This study showed that increase in the level of community development cost significantly influenced the performance of oil and gas firms in Nigeria.

Also, Akinleye (2022) examined internal environmental cost and financial performance of selected listed firms in Nigeria. This study's population included all oil and gas and industrial goods companies registered on the Nigerian Exchange Group. *Multistage and purposive sampling approaches were used to select the study's sample.* Financial statements and annual financial reports of the evaluated listed corporations on the Nigerian Exchange Group from 2005 to 2019 were used to compile the data for the study. The estimation technique adopted included correlation, static panel estimation which consists of pooled, fixed and random effects estimation techniques as well as post-estimation tests such as the restricted F-test and Hausman test. The results of findings indicated that internal environmental cost had a significant negative effect on return on asset of listed firms sampled in the study and that internal environmental expenditures had a significant negative impact on listed companies' performance when assessed in terms of return on equity. However, this study sought to investigate the effect of external environmental costs on performance of selected manufacturing companies as well as oil and gas companies listed on Nigerian Exchange Group market.

3.0 Methodology

Model Specification

This study adapted the model of Akinleye (2022), which specified financial performance as a function of environmental cost as presented in equation (i) and (ii).

$$ROA_{it} = \beta_0 + \beta_1 INEVC_{it} + \beta_2 SIZ_{it} + \beta_3 LEV_{it} + e_{it} \quad \text{………..………………….} \quad (ii)$$

$$ROE_{it} = \beta_0 + \beta_1 INEVC_{it} + \beta_2 SIZ_{it} + \beta_3 LEV_{it} + e_{it} \quad \text{…..………………….…} \quad (iii)$$

Where ROA and ROE are return on asset and return on equity respectively, INEVC represents internal environmental cost while SIZ and LEV are size and leverage respectively as control variables.

This study modified the model stated in equation (i) by specifying return on asset (ROA), return on equity (ROE) as a function of external environmental cost (EXEVC) measured in terms of donations, provision of medical facilities and other social benefits to the host community. Thus the model is presented in equations (iii) and (iv) which also included size and leverage of the sampled firms as control variables.

$$ROA_{it} = \beta_0 + \beta_1 EXEVC_{it} + \beta_2 SIZ_{it} + \beta_3 LEV_{it} + e_{it} \quad \text{………..………………….} \quad (iii)$$

$$ROE_{it} = \beta_0 + \beta_1 EXEVC_{it} + \beta_2 SIZ_{it} + \beta_3 LEV_{it} + e_{it} \quad \text{…..………………….…} \quad (iv)$$

Population and Sample Size for the Study

Oil and gas sector and industrial goods companies listed on the Nigerian Exchange Group make up the population of this study. The Nigerian Exchange Group contains 12 listed oil and gas firms as of December 2019, with a total of 34 listed industrial products/goods companies (encompassing both consumer and industrial products sub-sectors). As a result, there are 46 business organizations in this survey.

Sample Size and Sampling Techniques

Multistage and purposive sampling approaches were used to select the study's sample. Given the study's unique focus, this included the oil and gas sector as well as the industrial products/goods sector. In the second stage of the sampling process, almost half of the population was purposively sampled from the two areas of concern. Purposive sampling was used to pick the sample based on each stratum, assuming that not all of the enterprises would have their financial statements ready during the study period. Furthermore, certain companies' financial statements may be unavailable. As a result, this study purposefully chose 26 organizations whose financial statements were ready and accessible during the study's time frame.

Source(s) of data and Method of Data Analysis

Financial statements and annual financial reports of the evaluated listed corporations on the Nigerian Exchange Group from 2005 to 2019 were used to compile the data for this study.

4.0 Results and Discussions

Correlation Analysis

Table 1: Correlation statistics

	ROA	ROE	EXEVC	SIZ	LEV
ROA	1.0000				
ROE	0.7440	1.0000			
EXEVC	0.1869	0.2942	1.0000		
SIZ	0.0898	0.0683	0.0740	1.0000	
LEV	-0.2006	-0.1000	0.0127	-0.0919	1.0000

Source: Author's Computation (2023)

The correlations for pairs of variables utilized in the study's models are shown in Table 1. The direction and magnitude of the association between the pairs of variables utilized in the study are shown by correlation estimates. The table also showed correlation coefficients of 0.0993 for external environmental cost and internal environmental cost, 0.0740 for external environmental cost and firm size, 0.0127 for external environmental cost and leverage ratio, 0.3956 for internal environmental cost and firm size, -0.1057 for internal environmental cost and leverage ratio, -0.0919 for firm size and leverage ratio, and 0.3956 for internal environmental cost and leverage ratio.

As indicated by the reported correlation coefficient in Table 1, the weak strength of the association between the majorities of pairs of variables included in the estimated models of the study show that there is no likelihood of multi-collinearity among the explanatory variables.

Table 2: Estimation Result (Model 1)

Series: ROA EXEVC SIZ LEV

Coefficient	Pooled	Prob	Fixed	Prob	Random	Prob
C	1.699509	0.003	2.855343	0.000	**3.262218**	**0.000**
EXEVC	0.0774085	0.000	.0984942	0.001	**0.098138**	**0.000**
SIZ	-0.0067512	0.827	-.1016415	0.025	**-0.08741**	**0.031**
LEV	-.02188319	0.000	-.1436277	0.001	**-0.152104**	**0.000**
	R-square= 0.6331 Adj R-square= 0.6264 F-statistics= 19.75 Prob(F-stat)= 0.0000		R-square= 0.7033 Adj R-square= 0.6725 F-statistics= 19.61 Prob(F-stat)= 0.0000		**R-square= 0.6062 Wald chi2(5)=28.58 Prob> chi2 = 0.000**	
	Restricted F-test= 17.12 (p=0.000 < 0.05)					
			Hauman Test = 2.66 (P= 0.4473 > 0.05)			

Note: *parameter estimates are expressed in percentage change since variables used for the model estimation were converted to natural log form. Also, deviation intercept terms for the fixed effect estimation were presented in the Appendix of the study*

Source: *Author's Computation (2023)*

As shown in Table 2, restricted F-statistics revealed evidence to reject the null hypothesis that all differential intercepts for each cross sectional unit (selected oil and gas businesses and industrial enterprises) were zero. Due to the large cross-sectional heterogeneity impact across the sampled firms, the pooled OLS estimation constraint was rejected, and cross-sectional fixed effect estimation was used instead. Furthermore, the Hausman test showed insufficient evidence to reject the null hypothesis that the coefficients of fixed and

random effect estimates were not substantially different. As a consequence, random impact estimation has been demonstrated to be the most accurate and efficient method of estimation.

External environmental cost had a significant positive effect on return on asset with coefficient estimation of (0.0981382, $p < 0.05$) when the heterogeneity effect across firms sampled in the study was incorporated into the model via the error term, whereas firm size and leverage ratio had a significant negative effect on return on asset with coefficient estimation of (0.0981382, $p < 0.05$). A 1% rise in environmental expenses resulted in a 0.098 percent increase in return on asset as a measure of financial performance of selected Nigerian firms when the company size and leverage ratio were maintained unchanged. When the heterogeneity impact was subsumed into the random term, the reported R-square was 0.6062, indicating that external environmental costs, together with firm size and leverage ratio, accounted for almost 61 percent of the systematic variance in return on asset. This result affirmed the result of findings in the study of Raymond et.al. (2016) and Charles et.al. (2017).

Table 3: Other Post Estimation Test

Wald test		
Null hypothesis	**Statistics**	**Probability**
Panel homoscedasticity	1.6495	0.6340
Pesaran test		
Null hypothesis	**Statistics**	**Probability**
No cross sectional dependence	1.152	0.5641
Wooldridge test		
Null hypothesis	**Statistics**	**Probability**
No AR(1)panel autocorrelation	0.2072	0.4638

Source: *Author's Computation (2023)*

There was no evidence to reject the null hypotheses of panel homoscedasticity, no cross sectional dependence, and no AR (1) panel autocorrelation based on reported probability statistics of $0.6340 > 0.05$ for Wald test, $0.5641 > 0.05$ for Pesaran test, and $0.4638 > 0.05$ for Wooldridge test (Table 3). As a consequence, the study demonstrated that the estimated model's assumptions of equal variance residual terms, cross-sectional independence, and the absence of serial autocorrelation were correct.

Table 4: Estimation Result (Model 2)

Series: *ROE EXEVC SIZ LEV*

Coefficient	Pooled	Prob	Fixed	Prob	Random	Prob
C	1.45819	0.032	1.709612	0.078	**1.867551**	**0.029**
EXEVC	.0806399	0.002	0.0862047	0.019	**0.082470**	**0.013**
SIZ	.0553403	0.132	0.0600853	0.271	**0.046233**	**0.341**
LEV	-.2235864	0.000	0.0062129	0.904	**-0.03727**	**0.430**
	R-square= 0.4180 Adj R-square= 0.4112 F-statistics= 17.22 Prob(F-stat)= 0.0000		R-square=0.5854 Adj R-square=0.5532 F-statistics=18.20 Prob(F-stat)=0.0000		**R-square=0.6625 Wald chi2(5)= 8.36 Prob> chi2 =0.0392**	
	Restricted F-test=16.28 (p= 0.0000 < 0.05)					
			Hauman Test = 6.06 (P=0.1085 > 0.05)			

Note: *parameter estimates are expressed in percentage change since variables used for the model estimation were converted to natural log form. Also, deviation intercept terms for the fixed effect estimation were presented in the Appendix of the study*

Source: *Author's Computation (2023)*

The null hypothesis that all differential intercepts corresponding to each cross sectional unit (selected oil and gas businesses and industrial enterprises) were equal to zero was rejected by restricted f-statistics for the second model. This suggested that the sampled firms had a strong cross-sectional heterogeneity impact, requiring cross-sectional fixed effect estimate instead of pooled OLS estimation. The Hausman test likewise revealed insufficient evidence to reject the null hypothesis that no significant differences in coefficients existed between fixed and random effect estimates. As a result, there is a random impact. Estimation yielded the most precise and accurate results.

When the heterogeneity effect across firms sampled in the study was incorporated into the model via the error term, external environmental cost had a positive significant effect on return on equity with a coefficient of (0.082470, $p < 0.05$), firm size had a positive insignificant effect on return on equity, and leverage ratio had a positive insignificant effect on return on equity. A 1% increase in external environmental expenditures resulted in a 0.082 percentage increase in return on equity as a measure of financial performance when firm size and debt were maintained constant. When the heterogeneity effect was subsumed into the random term, the R-square was 0.6625, indicating that external environmental costs, together with firm size and leverage ratio, accounted for around 66 percent of the variance in return on equity.

Table 5: Other Post Estimation Test

Wald test		
Null hypothesis	**Statistics**	**Probability**
Panel homoscedasticity	0.1045	0.2332
Pesaran test		
Null hypothesis	**Statistics**	**Probability**
No cross sectional dependence	1.089	0.3456
Wooldridge test		
Null hypothesis	**Statistics**	**Probability**
No AR(1)panel autocorrelation	1.3600	0.5184

Source: *Author's Computation (2023)*

There was no evidence to reject the null hypotheses of panel homoscedasticity, no cross sectional dependence, and no AR (1) panel autocorrelation based on reported probability statistics of 0.2332 > 0.05 for Wald test, 0.3456 > 0.05 for Pesaran test, and 0.5184 > 0.05 for Wooldridge test (Table 4.8). As a consequence, the study demonstrated that the estimated model's assumptions of equal variance residual terms, cross-sectional independence, and the absence of serial autocorrelation were correct.

The result of this findings negate the findings of Osemene et.al., (2016), Obara et.al., (2017), Umoren et.al., (2018), Oti and Mbu-Ogar, (2018), Akinleye and Olaoye, (2021) and Akinleye, (2022) who all found a negative impact of environmental costs on corporate performance of listed firms.

5.0 Conclusion and Recommendation

Based on the above results, this study established that external environmental cost has significant positive effect on financial performance of listed firms in Nigeria, both when performance was measured in terms of return on asset (ROA) and return on equity (ROE). As such, this study concluded that external environmental cost has capacity to influence the level of financial performance of listed firms in Nigeria.

Following the findings of this study that external environmental cost has a significant effect on the financial performance of selected listed firms in Nigeria both in the short and long run. Industrial goods firms as well as oil and gas companies in Nigeria should take full advantage of external environmental cost by objectively

spending more on the environment of the business especially via their corporate social responsibility (CSR). This will in turn guarantee conducive environment for it to compete favourably and to improve its stock value.

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