ENVIRONMENTAL COST ACCOUNTING AND CORPORATE PERFORMANCE OF LISTED MANUFACTURING FIRMS ON NIGERIAN STOCK EXCHANGE

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Abstract

This study examined the effect of environmental cost on corporate performance of selected listed manufacturing firms on Nigerian Stock Exchange. Specifically, the study examined the effect of environmental prevention costs, environmental damage costs and environmental management and education costs respectively on return on investment of the listed firms. The ex post facto research design was used in this study. The Population and Sample size of the study comprises of sixteen manufacturing firms in the industrial goods and natural resources sectors of the Nigerian Stock Exchange. The main variables of the study were Return on Investment used to proxy firm performance, the dependent variable; and environmental costs, the independent variable. Data for the sixteen firms were extracted from their annual reports from 2012 to 2019 financial years and analyzed using descriptive statistics, Hausman test and the Panel Least Squares Regression statistical techniques. Findings revealed that cost relating to the prevention of environmental degradation, management and education have negative effect on financial performance while cost on environmental damage was found to be positive and significant in determining performance. It was concluded that increased environmental cost reduces performance. It was recommended among others that companies could take up more preventive measures that are embedded in business strategy and save the firm’s financial resources such as reducing waste-prone operations and using environmentally friendly materials for manufacturing.

Keywords: Environmental Costs, Accounting, Manufacturing Firms, Nigeria, Nigerian Stock Exchange
Introduction

There has been several reports of degradation of the earth and the components; air, water, the greenhouse layers and the crust. This unfavourable development has been as a result of many factors, one of which is the growth and complexities of industrialisation since the industrial revolution of the eighteenth century till present day. Dian, Tjiptohadi and Wiwie (2019) support this asserting that the growth of an advanced industry is proportional to the rise of pollution generated from the industrial production process such as production waste that can increase air and water pollution at dangerous levels. These environmental problems cut across climatic changes, ozone layer depletion, soil erosion, desert encroachment, water resources, forest resources, wastes, fish resources, eutrophication, combustion, toxic contamination, urban environment quality, biodiversity and landscape. Bringing it closer to the common man, the level of radiation is increasing, water is being polluted and some soils rendered useless as a result of pollution from man’s activities.

The constant evolution of accounting has ushered in the inculation of environmental information into conventional accounting procedures to improve the relevance, reliability and decision-usefulness of accounting information. This has brought in the term ‘environmental accounting’. Environmental accounting is the measurement and analysis of the environmental performance of corporations and the reporting of such results to concerned groups, both within and outside the corporation (Muhammad, 2018). Rankos and Antohe (2014) opine that environmental costs are the basis of the environmental accounting. Environmental costs are the totality of the expenses borne by the productive economic entity [either voluntarily or as a result of the legal settlements into force] for the recondition or protection of the environment as a result of their operations. For companies that use natural capitals as sources of raw materials, their operations have great implications on the environment, because aside production processes, their raw materials are natural resources. Aluminum Extrusion Plc for instance uses aluminum; Thomas Wyatt uses Pulp from trees and Cement companies use limestone. The processes and waste disposal of these companies especially those that deal in chemicals like Chemical & Allied Products (CAP) Plc and other industrial goods manufacturing firms. Therefore, there is need for an accounting system which provides full measure of business performance and shareholder value creation, integrating economic, environmental and social factors into corporate behaviour with the aim of sustaining resources for future generations; hence the need for environmental accounting.

Environmental cost accounting allows firms have a correct assessment of the impact of their activities on the environment. It reveals costs that would have been otherwise hidden in the conventional cost accounting approach. This spells out better decision making in the areas of pricing, cost reduction and corporate social responsibility. Rankos and Antohe (2014) stated that potential cost savings and other benefits may need to be recognized if companies are to take appropriate action to reduce waste and prevent pollution. This translates to environmental cost accounting in this study. By responding to these environmental impacts, companies may benefit both the environment and their own bottom line. Despite the benefits, Doorasam (2015) opines managers may sideline environmental cost accounting unless they are made to understand the amount of money they could save by adopting cleaner production techniques and technologies. Saving money by reducing costs will improve returns on investment. Noodehz and Moghimi (2015) however, have a different opinion on this. They opine costs for remediation of the environment, fines and penalties relating to environmental laws will reduce profits. Dian et al (2019) also explained that costs incurred by organizations reduce the organizations’ performance and environmental costs are not exempted. These have
instigated the conduct of this study to empirically ascertain the effect of environmental cost accounting on corporate performance.

Accounting has moved from conventional methods and issues to inculcate different areas to maintain relevance in the continuously evolving civilization. Some of these areas include environmental accounting, carbon accounting and human resource accounting. Specifically, environmental accounting has risen from the progressive degradation of the environment and has been embraced in developed countries over two decades ago but it is still at a minimal stage in Nigeria (Dike & Leyira, 2018).

Environmental accounting in present day, lays an approach for the accountant who assists in the preparation of financial statements for the directors to identify, classify, measure, report and interpret these activities so that investors and other users of financial statements can get a holistic view of the organization and not just the conventional performance measures. While the identification and reporting aspects of environmental accounting can be summed as environmental disclosures, measuring these activities in monetary forms refer to environmental costs. However, companies have not seemed to embrace this accounting development as annual reports contain no or very little information about environmental activities (environmental disclosures) and costs incurred for or financial consequences of these activities (environmental costs).

A review of previous studies revealed that most of existing literature focused on manufacturing sub-sectors like food and beverages as well as oil and gas firms (Agbiogwu, Ihendinihu & Okafor, 2016; Ofoegbu & Megbuluba, 2016; Osemene, Kolawole & Oyelakun, 2016 and Uyagu, Okpanachi, Nyor & Muhammad, 2018).

Enahoro (2009) examined the level of independence of tracking of costs impacting on the environment; level of efficiency and appropriateness of environmental costs and disclosure reporting of manufacturing firms in Nigeria. For this purpose, cross-sectional and longitudinal content analyses were carried out. The test statistics applied in this study were the t-test statistics, Pearson Product-Moment correlation tests, ANOVA, and Multivariate Linear Regression Analysis. Findings are that environmental operating expenditures are not charged independently of other expenditures. There is also, absence of costing system for tracking of externality costs. Environmental accounting disclosure does not however, take the same pattern among listed companies in Nigeria. Considering the current limited exposure of many organizations to environmental accounting methodology, this study proffers an insight into new bases and design for environmental accounting. Furthermore, Uwuigbe and Olayinka (2011) investigated the level of corporate social environmental disclosure among listed companies in the brewery and building material industry in Nigeria for the periods 2004-2008. The content analysis technique was used as a basis of eliciting data from the annual report, the t-test statistics was used in the process of analyzing if there was a significant difference in the level of corporate social environmental disclosure between the sampled industries. The findings revealed that there is a significant difference in the level of corporate social environmental disclosures between the selected industries. The study concluded that corporate social environmental disclosures among the selected listed companies is basically very low and still at its embryonic stage. Oyedokun, Egberioyinemi and Tonademukaila (2019) examined the effect of environmental accounting disclosure on firm value of listed industrial goods companies in Nigeria from 2007-2016. The ex-post facto research design was adopted in this study while the data were gathered through the individual sample company annual financial statement. Multiple regression was used to analyze the effect of environmental accounting disclosure on firm value measured by Tobin Q. From the
result, it is evident that environmental accounting disclosures have a positive significant effect on firm value.

None of the related works were found to jointly study environmental accounting in the industrial goods and natural resources sectors in Nigeria. This study thus sought to direct focus on studying environmental cost accounting and its effect on performance in both the industrial goods and natural resources sectors.

Furthermore, there is a lack of consensus in findings of previous empirical studies from positive to negative to insignificant results. Studies such as Oba and Fodio (2014) and Ofoegbu and Megbuluba (2016) were also found to use disclosure score index from disclosure lists as proxy for environmental cost accounting. This study therefore fills the research gap by using most recent available data of sampled companies to determine the effect of environmental cost accounting on corporate performance of listed companies in the industrial goods and natural resources sectors on Nigerian Stock Exchange.

**Objectives of the Study**

The broad objective of this study is to determine the effect of environmental cost accounting on corporate performance of listed manufacturing firms on Nigerian Stock Exchange. Specifically, the study will:

1. Ascertain the effect of environmental prevention costs on return on investment of listed manufacturing firms on Nigerian Stock Exchange.
2. Determine the connection between environmental damage costs and return on investment of listed manufacturing firms on Nigerian Stock Exchange.
3. Examine the effect of environmental management and education costs on return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Research Hypotheses**

The following null hypotheses were formulated to guide the study:

Ho$_1$: Environmental prevention costs do not significantly affect the return on investment of listed manufacturing firms on Nigerian Stock Exchange.

Ho$_2$: Environmental damage costs have no significant effect on return on investment of listed manufacturing firms on Nigerian Stock Exchange.

Ho$_3$: Environmental management and education costs do not significantly influence return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Methodology**

The *ex post facto* research design was used in this study. This design utilizes past events that cannot be modified by the researchers to investigate the effect of the independent variables on the dependent variables. The design was adopted because the study made use of data from past periods sourced from annual reports of the manufacturing companies.

The population of this study comprises of listed firms in the Industrial goods and natural resources sector provided as thus:
The study sampled all the sixteen firms that constituted the population of study. Secondary data which comprises of annual reports of the firms from 2012 to 2019 financial years were used for the study. The areas of the annual reports where data were extracted from were Directors’ Reports, Statement of Comprehensive Income, Statement of Financial Position and Notes to the Accounts.

The variables of interest for this study and their measurement bases are as follows:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Industrial Goods Sector</th>
<th>S/N</th>
<th>Natural Resources Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Austin Laz &amp; Company Plc</td>
<td>15</td>
<td>Aluminum Extrusion Industries Plc</td>
</tr>
<tr>
<td>2</td>
<td>Avon Crowncaps Plc</td>
<td>16</td>
<td>Thomas Wyatt Plc</td>
</tr>
<tr>
<td>3</td>
<td>Berger Paints Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Beta Glass Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Chemical and Allied Products Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>BUA Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Cutix Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>First Aluminum Nigeria Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Greif Nigeria Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Lafarge Africa Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Meyer Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Paints And Coatings Manufactures Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Portland Paints &amp; Products Nigeria Plc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Premier Paints Plc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### S/N | Dependent and Independent Variables | Proxy | Formula |
---|---|---|---|
1 | Environmental Cost | Environmental Prevention Cost | Amount spent on environmental prevention-related projects as stated in Directors’ report |
2 | Environmental Damage Cost | Amount spent on repairs of environmental damage-related projects as stated in the Directors’ report |
3 | Environmental Management and Education Cost | Amount spent on environmental management-related projects as stated in Directors’ report |
4 | Corporate Performance | Return on Investment | \( \frac{Profit \ after \ Tax}{Total \ Investment} \) |

The data collected for the research were analyzed using Panel Least Squares Multiple Regression statistical technique on Econometric Views (E-Views) Version 9. The F-test was employed to test the hypotheses. Panel regression analysis was chosen to determine whether the independent variables affect the dependent variables while accounting for the different firms and years.

Before the regression, the Hausman diagnostic tests were carried out on the data to determine the appropriateness of regression and the type of panel regression (fixed effects panel regression or random effects panel regression) to be used. The result of the Hausman test indicated that the fixed effects panel regression was more appropriate for the analysis of study data.

The model for this study was adopted from Okafor (2018) but modified to suit this study:

\[
ROI_{ij} = f (EPC_{ij}) \\
ROI_{ij} = f (EDC_{ij}) \\
ROI_{ij} = f (EMEC_{ij}) \\
ROI_{ij} = f (EPC_{ij}, EDC_{ij}, EMEC_{ij})
\]

The full specification of the regression equation using unranked OLS was assumed to be:

\[
ROI_{ij} = a_0 + a_1 (EPC_{ij}) + \mu \\
ROI_{ij} = a_0 + a_1 (EDC_{ij}) + \mu \\
ROI_{ij} = a_0 + a_1 (EMEC_{ij}) + \mu \\
ROI_{ij} = a_0 + a_1 (EPC_{ij}) + a_2 (EDC_{ij}) + a_3 (EMEC_{ij}) + \mu
\]
ROI = Return on Investment
\( \alpha_0 = \text{Intercept} \)
\( \alpha_{1-3} = \text{Coefficient of the independent variables} \)
\( X_1 = \text{EPC (Environmental Prevention Cost)} \)
\( X_2 = \text{EDC (Environmental Damage Cost)} \)
\( X_3 = \text{EMEC (Environmental Management and Education Cost)} \)
\( \mu = \text{Residual or error term} \)

The null hypothesis is rejected if the p value of f statistic is less than 0.05 otherwise accept alternate hypothesis.

Data Analyses

**Descriptive Statistics of Study Variables**

<table>
<thead>
<tr>
<th></th>
<th>ROI</th>
<th>PREVENTION COST</th>
<th>DAMAGE_COST</th>
<th>MGT_AND_EDU_ COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.062456</td>
<td>256783.5</td>
<td>146440.8</td>
<td>30590169</td>
</tr>
<tr>
<td>Median</td>
<td>0.064623</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.792676</td>
<td>9500000.00</td>
<td>6500000.00</td>
<td>7.08E+08</td>
</tr>
<tr>
<td>Minimum</td>
<td>-1.795168</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.254140</td>
<td>126240.64</td>
<td>778777.2</td>
<td>1.24E+08</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>2799.813</td>
<td>6320.955</td>
<td>9598.533</td>
<td>2003.158</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Observations</td>
<td>123</td>
<td>123</td>
<td>123</td>
<td>121</td>
</tr>
</tbody>
</table>

*Source: E-View 9*

The table above shows the descriptive statistics of the reported costs of environmental activities. In terms of prevention of negative environmental externalities, sampled companies on average spend N256,783.50. Costs incurred for repairs of environmental damage averaged N146,440.80 while environmental management and awareness cost averaged N30,590,169. For each component of environmental cost examined in this study, more than half of sampled companies do not incur costs to forestall environmental footprints (as depicted by the median values of 0.00). Mean Returns on Investment was 6.25%. Highest and lowest ROI of sampled companies were 79.27% and -179.5% (loss on investment). The dataset was found to follow a normal distribution pattern with probability values of Jarque-Bera estimates being less than 0.05.

Test of Hypotheses

**Hypothesis One**

\( \text{H}_0: \) Environmental prevention costs do not significantly affect the return on investment of listed manufacturing firms on Nigerian Stock Exchange.

\( \text{HA}_1: \) Environmental prevention costs significantly affect the return on investment of listed manufacturing firms on Nigerian Stock Exchange.
Correlated Random Effects - Hausman Test

Equation: Untitled
Test cross-section random effects

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>9.553035</td>
<td>1</td>
<td>0.0076</td>
</tr>
</tbody>
</table>

Source: E-Views 9

The diagnostic test for panel regression, the Hausman test shows the p value of chi square to be lower than 0.05. This implies that fixed panel regression is fit for the analysis of data for this hypothesis.

Fixed Panel Regression: ROI and Environmental Prevention Cost

Dependent Variable: ROI
Method: Panel Least Squares
Date: 04/22/21  Time: 12:24
Sample: 2012 2019
Periods included: 8
Cross-sections included: 16
Total panel (unbalanced) observations: 123

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.064494</td>
<td>0.017762</td>
<td>3.631092</td>
<td>0.0004</td>
</tr>
<tr>
<td>PREVENTION_COST</td>
<td>-7.94E-09</td>
<td>1.60E-08</td>
<td>-0.494558</td>
<td>0.6219</td>
</tr>
</tbody>
</table>

Effects Specification

Cross-section fixed (dummy variables)

<table>
<thead>
<tr>
<th>R-squared</th>
<th>0.506094</th>
<th>Mean dependent var</th>
<th>0.062456</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted R-squared</td>
<td>0.431543</td>
<td>S.D. dependent var</td>
<td>0.254140</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.191612</td>
<td>Akaike info criterion</td>
<td>-0.339015</td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>3.891791</td>
<td>Schwarz criterion</td>
<td>0.049661</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>37.84943</td>
<td>Hannan-Quinn crtier.</td>
<td>-0.181136</td>
</tr>
<tr>
<td>F-statistic</td>
<td>6.788495</td>
<td>Durbin-Watson stat</td>
<td>0.844267</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: E-Views 9

The intercept of the equation is 6.44%. This represents the average ROI of the companies when there are no environmental costs. The panel regression coefficient of environmental prevention cost is -0.0000000000794. The co-efficient depict that for every unit decrease in cost incurred, ROI increases by the percentage value of the co-efficient. The probabilities of the t-values of the intercept and independent variable are 3.6311 and -.4945 respectively. Though the coefficient for prevention cost is not significant (p=.62 >.05), that of the intercept in the model is significant (p=.00<.05).

On the significance of the model, the value of the R-squared (0.5061) explains that the model has a predictor power of 50.61%. The DW coefficient is 0.844 and less than 2 revealing no serial correlation between variables.

The F statistic at 6.7885 is found to be significant with p value less than 0.05 (0.00). Therefore, the alternate hypothesis is accepted and the null hypothesis rejected (p<.05). Thus,
environmental prevention costs significantly and negatively affect the return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Hypothesis Two**

**H_0_2**: Environmental damage costs have no significant effect on return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**H_A_2**: Environmental damage costs have significant effect on return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Correlated Random Effects - Hausman Test**

Equation: Untitled

Test cross-section random effects

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>6.438960</td>
<td>1</td>
<td>0.0071</td>
</tr>
</tbody>
</table>

**Source: E-Views 9**

The Hausman test result shows the p value of chi square to be lower than 0.05. This implies that fixed panel regression is fit for the analysis of data for this hypothesis.

**Fixed Panel Regression: ROI and Environmental Damage Cost**

Dependent Variable: ROI  
Method: Panel Least Squares  
Date: 04/22/21  Time: 12:26  
Sample: 2012 2019  
Periods included: 8  
Cross-sections included: 16  
Total panel (unbalanced) observations: 123

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage_COST</td>
<td>8.72E-10</td>
<td>2.47E-08</td>
<td>0.035343</td>
<td>0.9719</td>
</tr>
<tr>
<td>C</td>
<td>0.062329</td>
<td>0.017670</td>
<td>3.527322</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

Cross-section fixed (dummy variables)

R-squared  0.504961  Mean dependent var  0.062456  
Adjusted R-squared  0.430238  S.D. dependent var  0.254140  
S.E. of regression  0.191831  Akaike info criterion  -0.336722  
Sum squared resid  3.900725  Schwarz criterion  0.051954  
Log likelihood  37.70841  Hannan-Quinn criter.  -0.178843  
F-statistic  6.757773  Durbin-Watson stat  0.838795  
Prob(F-statistic)  0.000000

**Source: E-Views 9**

The intercept of the equation is 6.23%. This represents the average ROI of the companies when there are no environmental costs. The panel regression coefficient of environmental prevention cost is 0.00000000000872. The co-efficient depict that for every unit increase in cost incurred, ROI increases by the percentage value of 0.00000000000872. The probabilities of the t-values of the intercept and independent variable are 3.5273 and -0.0353 respectively. Though the coefficient for damage cost is not significant (p=.97>.05), that of the intercept in the model is significant (p=.00<.05).
On the significance of the model, the value of the R-squared (0.5049) explains that the model has a predictor power of 50.49%. The DW coefficient is 0.8387 and less than 2 revealing no serial correlation between variables.

The F statistic at 6.7577 is found to be significant with p value less than 0.05 (0.00). Therefore, the alternate hypothesis is accepted and the null hypothesis rejected (p<.05). Thus, environmental damage costs have a positive and significant effect on return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Hypothesis Three**

**Ho₃**: Environmental management and education costs do not significantly influence return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Ha₃**: Environmental management and education costs significantly influence return on investment of listed manufacturing firms on Nigerian Stock Exchange.

**Correlated Random Effects - Hausman Test**

Equation: Untitled
Test cross-section random effects

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>5.263811</td>
<td>1</td>
<td>0.0232</td>
</tr>
</tbody>
</table>

**Source: E-Views 9**

The Hausman test result shows the p value of chi square to be lower than 0.05. This implies that fixed panel regression is fit for the analysis of data for this hypothesis.

**Fixed Panel Regression: ROI and Environmental Management and Education Cost**

Dependent Variable: ROI
Method: Panel Least Squares
Date: 04/22/21 Time: 12:27
Sample: 2012 2019
Periods included: 8
Cross-sections included: 16
Total panel (unbalanced) observations: 121

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.070284</td>
<td>0.020112</td>
<td>3.494735</td>
<td>0.0007</td>
</tr>
<tr>
<td>MGT_AND_EDU_COST</td>
<td>-3.45E-10</td>
<td>3.33E-10</td>
<td>-1.034399</td>
<td>0.3033</td>
</tr>
</tbody>
</table>

**Effects Specification**

Cross-section fixed (dummy variables)

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.514091</td>
<td>Mean dependent var</td>
<td>0.059744</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
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<td>S.D. dependent var</td>
<td>0.254725</td>
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</tr>
<tr>
<td>S.E. of regression</td>
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<td>Akaike info criterion</td>
<td>-0.346309</td>
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</tr>
<tr>
<td>Sum squared resid</td>
<td>3.783360</td>
<td>Schwarz criterion</td>
<td>0.046488</td>
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</tr>
<tr>
<td>Log likelihood</td>
<td>37.95172</td>
<td>Hannan-Quinn criter.</td>
<td>-0.186780</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>6.877002</td>
<td>Durbin-Watson stat</td>
<td>0.817248</td>
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</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.000000</td>
<td></td>
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**Source: E-Views 9**
The intercept of the equation is 7%. This represents the average ROI of the companies when there are no environmental costs. The panel regression coefficient of environmental prevention cost is -0.00000000000345. The co-efficient depict that for every unit decrease in cost incurred, ROI increases by the percentage value of 0.0000000000872. The probabilities of the t-values of the intercept and independent variable are 3.4947 and -1.0343 respectively. Though the coefficient for damage cost is not significant (p=.30>.05), that of the intercept in the model is significant (p=.00<.05).

On the significance of the model, the value of the R-squared (0.514) explains that the model has a predictor power of 51.4%. The DW coefficient is 0.8172 and less than 2 revealing no serial correlation between variables.

The F statistic at 6.8770 is found to be significant with p value less than 0.05 (0.00). Therefore, the alternate hypothesis is accepted and the null hypothesis rejected (p<.05). Thus, environmental management and education costs negatively and significantly influence return on investment of listed manufacturing firms on Nigerian Stock Exchange.

Discussion of Findings

The study supports the proposition that the cost incurred in preventing environmental degradation negatively affects the return on investment of firms in the industrial goods and natural resources sectors of the Nigerian Stock Exchange. In other words, firms that spend financial resources to ensure that they reduce environmental footprints end up with lower profit figures and in turn, reduced ROI ratio. Our result conforms to the findings of Adediran and Alade (2013), Chang (2015) which also found that higher environmental costs lead to lower financial performance metrics and vice versa. Ijeoma (2015), Asuquo (2012), Bassey et al (2013) and Magara et al (2015) however, found that environmental cost accounting positively affects firm performance. Daniel (2013) also found no significant relationship between environmental accounting and profitability measures.

Environmental cost relating to repairs of environmental damages imposed by the operations of sampled firms had a positive effect on ROI. When firms take responsibilities for damages caused by them, they improve the positive perception of stakeholders, which in turn raises patronage and bottom-line figures. In the same vein, firms that incur costs to fix damages are more likely to find alternative means to maintain cheaper operations leading to higher returns. This is supported by the findings of Ezejiofor et al (2016) that found that environmental cost impacts profit generation positively. The findings of Omodero and Ihendinihu (2016) and Osemene at al (2016) contradict the results of this study. They found significant negative and positive effect of environmental accounting on firm performance respectively. They also found a significant negative relationship between environmental accounting and return on equity.

Lastly, cost relating to environmental management and education was found to have an indirect effect on performance. Stated differently, a company that reduces the amount it spends on environmental management would have better ROI, while more expenses on environmental management would increase total cost and reduce profit made from total revenue. This finding is in consonance with the result of Adediran and Alade (2013) which was a significant negative relationship between Environmental Accounting and Return on Capital Employed. Asuquo et al (2016) and Umoren et al (2018) on the other hand, found that environmental accounting does not affect performance.
Conclusion and Recommendations

This study examined the effect of environmental cost on corporate performance of selected listed manufacturing firms on Nigerian Stock Exchange. It specifically examined the effect of environmental prevention costs, environmental damage costs and environmental management and education costs respectively on return on investment of selected listed manufacturing firms on Nigerian Stock Exchange. Findings of the study revealed that environmental prevention costs and environmental management and education costs negatively affect return on investment of the selected listed manufacturing firms. However, the study found out that environmental damage costs have positive effect on return on investment of these selected firms. The implication of the findings of this study is that the operations of manufacturing firms have consequences on the environment, hence make it imperative for these companies to incur environmental costs.

In line with the above, the following recommendations were made:

1. Firms should take up more preventive measures of operation (such as reducing waste-prone operations and using environmentally friendly materials for manufacturing) that are embedded in business strategy so as to reduce the effect of the operational costs on their financial resources.

2. Firms could improve ROI by fixing damages their operations have imposed on host communities to increase patronage and reduce compliance fines and penalties.

3. Cost incurred for management of environmental activities and promotion of eco-friendly manufacturing practices should be efficiently managed by getting an environmental expert and conducting time-to-time audit to achieve a cost-benefit balance.
References


