Effect of Corporate Environmental Investments on Financial Performance in Mining and Manufacturing Companies Listed on the Johannesburg Stock Exchange Social Responsibility Index

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Abstract: This article investigates the relationship between corporate environmental investment and financial performance. The article examines the effect of carbon emission reduction and hazardous solid waste disposal on companies' return on assets. The paper adopts a quantitative research design by analysing secondary data from the financial statements of companies listed on the Social Responsibility Index consecutively from 2008 to 2017. Panel data analysis consisting of the random and fixed effects models was used to analyse the data. The study adopted the Hausman test to determine the most appropriate model. Data were tested for multicollinearity and heteroscedasticity in order to enhance the reliability of the regression results. The results produced a mixed result showing positive gains between carbon emissions reduction and return on assets while the hazardous solid waste reduction was negatively related to return on assets. Our results have significant managerial implications as it was established that corporate environmental investment to reduce carbon emissions is vital as they result in different cost savings. Conversely, investments to reduce hazardous solid waste disposal are equally essential to establish and maintain a sustainable operational environment and to enhance stakeholder relations but have no direct influence on return on assets.

Keywords: environmental investment; financial performance, return on assets; carbon emission reduction; hazardous solid waste

JEL Classification: M1; Q01

1. Introduction

Corporate environmental investments have traditionally been deemed to be an unnecessary cost to companies, with investors against their undertaking because of perceived no or insignificant returns. However, recent research and literature highlight financial benefits accruing from environmental investments. In recent

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years, there has been a growing demand for companies to improve their sustainability practices, environmental and good corporate citizenship initiatives (Brown, Malmqvist & Wintzell, 2016). According to Streimikiene, Navikaite and Varanavicius (2016), mounting pressure from stakeholder groups has led top executives of many companies to implement corporate environmental investments (Streimikiene et al., 2016). Implementing environmental-related investments enable businesses to give back to both the environment and community in which they operate (Depoers, Jeanjean & Jérôme, 2016). Presently, environmental matters have received a much higher priority in business decisions with management having to incorporate environmental variables in business operations. In support of this view, Brown et al. (2016) reveal that companies in the United States of America (USA) spent more than $120 billion to comply with environmental laws and regulation in addition to several billion spent on research and development.

Additionally, Strezov and Evans (2016) state that the top 10 American firms are now spending over 5 billion annually on research and development. In expending huge amounts on compliance with environmental laws and regulation, companies can voluntarily reduce their pollution levels beyond compliance (Brown et al., 2016). The obvious question for any investor would be: is there any return for the investment in carbon emission reduction and hazardous solid waste? Literature is inconclusive about the effect of corporate environmental investment and financial performance of listed firms. According to Strezov and Evans (2016), corporate investments in environmental technologies have traditionally been considered to drain a firm's resources, creating an inherent conflict between environmental and financial performance. Conversely, Christopher, Hutomo, and Monroe (2013) argue that good corporate environmental performance attracts resources to the firm, including better quality employees and expanded market opportunities. Therefore, this study aims to demystify the above inconclusiveness by empirically examining the correlation between corporate environmental investment and shareholder value (return on assets).

The article is structured as follows; the next section will discuss the literature review, followed by an outline of the research methodology. The remainder of the article will present and discuss the findings of the study.

2. Literature Review

The article uses the stakeholder and legitimacy theory to define the company's external engagement with the society and environment. Management of companies has the fiduciary responsibility to manage the business assets profitably and to create wealth for their shareholders. They also should ensure compliance with all environmental regulations in their effort to create wealth. In most instances, this creates conflicts of interest between environmental performance and shareholders' value. According to Strezov and Evans (2016), corporate investments in environmental technologies have traditionally been considered to drain a firm's resources, creating an inherent conflict between environmental and financial performance. Garcia, Ribeiro, Oliveira Roque, Ochoa-Quintero and Laurance (2016) agree that any environmental costs or expenses incurred beyond regulatory compliance result in declining firm performance and value, therefore, these are not in the best interest of shareholders. Complementing the above, Gans and Hintermann (2013) agree that voluntary environmental initiatives, or for compliance with regulation, have been deemed to increase a firm's cost structure resulting in low financial returns.

In the above studies, corporate environmental investments are considered only to be a cost to the company with no shareholders' value associated with them. However, there is a little reference to the benefits gained by businesses that have undertaken such investments. In contrast, Christopher et al. (2013) argue that good corporate environmental performance attracts resources to the firm, including better quality employees and expanded market opportunities. Gans and Hintermann (2013) found that companies which had poor pollution control records experienced a more negative return than those with effective pollution control systems in place. They argued that the negative return might arise because investors were discriminating between firms on the grounds of pollution control expenditure and past pollution control records. Despite this, investors still view environmental investments as a financial loss to the enterprise, that is, an investment with no return. Such investor's perception can create conflict between management and shareholders as the latter may view management not to be acting in their best interest by investing in reducing negative environmental performance. This belief may result in shareholders' shying away from companies which embed environmental investments in their operations (Ioannou & Serafeim, 2015). Substantiating the above, Ioannou and Serafeim (2015) found that investors have started discounting the returns of companies that are poorly positioned to a green economy since customers are increasingly considering environmental performance of businesses when making purchasing decisions.

Notwithstanding, there is a need to enlighten shareholders of the gains accruable to the firm from environmental investments. The need to enlighten shareholders lends credence to the fact that there is no mechanism to translate costs incurred in environmental investment into shareholder value. In encouraging environmental investments, a study was done by Depoers, Jeanjean and Jérôme (2016) show that the stock market reacts negatively to the release of information about high polluting firms and that environmental awards result in positive stock returns. Conversely, Hart and Ahuja (1996) argue that pollution and waste in the production process signify inefficiencies, and that waste is an unrecoverable cost. It follows, therefore, that, investments aimed at reducing environmental impact may significantly reduce wastage in the production process. As such, King and Lenox (2001) in agreement with Hart and Ahuja (1996) note that not only does the installation and operating costs of end-process pollution mechanisms reduce cost significantly; it also tends to increase productivity and efficiency. The contrasting literature reviewed in this paper gives more premises to investigate the relationship between environmental investments and financial performance. This is vital to establish if and when returns can be made from investing in environmental performance.

Additionally, Goncalves, Robinot and Michel (2016) posit that management should find a balance where environmental investments are profitable and cause a return on assets. Finding the optimal level of environmental investment is key to creating shareholder value by generating returns to assets. Flammer (2013) affirms that any environmental investment beyond the optimal level erodes shareholder value. In support, Rexhãuser and Rammer (2014) attest that failure by management to determine and maintain an optimal level of environmental investment generates a negative relationship between shareholder value and environmental investments. Moreover, other studies by Guerrero, Maas, and Hogland (2013) supported by Yook, Song, Patten and Kim (2017) support the notion that environmental investments erode shareholder value as they are not meant to yield returns for companies, they, therefore, represent marginal expenditure.

On the contrary, Chapple, Clarkson and Gold (2013) supported by Sebastianelli, Taimimi and Iacocca (2015) argue that environmental investments reflect responsible management which is adapted to change sending a signal of their innovativeness and competitiveness of the company. Additionally, Matsumura, Prakash, and Vera-Munõz (2013) state that environmental investments generate shareholder value by attracting new business and differentiating the company from those that do not have an investment in the environment. Environmental investments also shield companies from future environmental-related penalties given the ever-increasing scrutiny on environmental pollution. In support, Aravena, Riquelme, and Denny (2016) agree that environmental investment also reduces future expenditure in environmental rehabilitation costs which also generates shareholder value. Kunapatarawong and Martînez-Ros (2016) in agreement with Clarke and Friedman agree that investors discount the value of non-environmental investing companies premised on the fact that they are not competitively positioned in an evergreening global business environment. Therefore, there are benefits to be derived from corporate environmental investments. This study is not meant to guarantee that corporate environmental investments always result in an increased return on assets; it instead seeks to establish that, in most instances, costs and expenditure incurred in environmental investments can partly or wholly compensate for gains derived from other spheres of the same investment.

3. Research Methodology

The paper adopted a quantitative research design by analysing secondary data from the financial statements of companies listed on the Social Responsibility Index consecutively from 2008 to 2017. Panel data analysis consisting of the random and fixed effects models was used to analyse the data. The study adopted the Hausman test to determine the most appropriate model. Data was also tested for multicollinearity and heteroscedasticity in order to enhance the reliability of the regression results. In this study, return on assets (ROA) was used as a dependent variable, and independent variables are an investment in carbon emissions reduction (INVCER) and investment in hazardous solid waste reduction (INVHSW). The study used two control variables namely, the cash flow adequacy ratio and leverage factor. Breusch-Pagan test for heteroscedasticity was performed in order to ensure reliability in the regression model results.

Formula

$ROA\_it=\alpha+\beta_1*INVCER_1\_it+\beta_2*INVHSW_2\_it\beta_3*CSHFAR_1\_it+\beta_4*LEVF_2\_it+\varepsilon$ (1)

Where ROA = return on assets

$INVCER_1$= investments in carbon emissions reduction

$INVHSW_2$ = investments in hazardous solid waste disposal

$CSHFAR_1$= cash flow adequacy ratio

$LEVF_2$ = leverage factor

α = intercept

ε = error term

4. Results and Discussions

The study produced intriguing results from both the Fixed-effects and Random-effects models. Panel data multiple regressions were first tested on the Fixed-effects model. The model attempts to establish the nature of the relationship between return on assets and investment in carbon emission reduction. The result shows an insignificant relationship tested at 95% confidence level between investment in carbon emission reduction and return on assets including the control variables of leverage factor and cash adequacy ratio. The disclosure of summary data in Figure 1 provides a comprehensive overview of the number of observations, minimum, mean and maximum figures of the data used in the study. Table 1 below shows the summary statistics performed in this study.

Table 1. Summarized data

Variable	Obs	Mean	Std. Dev.	Min	Max
Roa	640	19.9224	61.43096	-51	805.43
Carbon emission reduction	640	5659988	8043694	52451	8.55E+07
Hazardous solid waste	640	444870.2	870243.3	-3046.02	5076700
Leverage	640	3.70987	12.80384	-13	155.65
Cash flow adequacy	640	158.8304	1069.23	-7734	6314

Source: Authors' results of descriptive statistics from Stata

Table 1 displays the data from the summary statistics carried out in the study. The study identified 640 observations for which no error was found for on each variable. The mean, a measure of central tendency in grouped data shows investment in carbon emission reduction with the largest average of 5659988 followed by investment in hazardous solid waste with a mean of 444870.2 while the remaining variables have significantly smaller averages. The standard deviation which shows the degree of dispersion in data distribution has an investment in hazardous solid waste and investment in carbon emission reduction as the most spread variables. This is due to the varying large amounts invested by the different companies which also vary in company size and financial muscle. Moreover, minimum and maximum figures which measure the range between the smallest and the most significant amount in a data set are also significantly huge. The wide range refers to the different company sizes which influence their financial resources.

Table 2. Two-sample t test with equal variances

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Leverage	640	3.70987	0.84426	12.80384	2.046359	5.37338
Cash flow adequacy	640	158.8304	70.50297	1069.23	19.91299	297.7479
Combined	1280	81.27015	35.40118	759.2707	11.70168	150.8386
Diff	-155.121	70.50802	-293.68	-16.5612		

diff = mean(leverage) – mean (cash flow adequacy); t = -2.2000; Ho: diff = 0; degrees of freedom = 458; Ha: diff < 0; Ha: diff! = 0; Ha: diff > 0; Pr(T < t) = 0.0142; Pr(|T| > |t|) = 0.0283; Pr(T > t) = 0.9858

Table 3. Correlation matrix

	Return on Assets	Inv in CE	Inv in HSW	Leverage factor	Adequacy ratio
_ROA	1.000				
Inv in CE	0.1411	1.000			
Inv in HSW	0.0710	0.5479	1.000		
Leverage factor	-0.0336	-0.0509	-0.0326	1.000	
Adequacy ratio	-0.2158	-0.0275	-0.0445	-0.0520	1.000
_cons	-0.5185	-0.3469	-0.2040	-0.1111	1.000

Table 3 presents a correlation matrix to establish the nature of the one to one relationships between the measured variables. The correlation is between 0.0 and 1.0, with 0.0 stipulating the absence of a relationship and 1.0 indicating the presence of a relationship. The closer the number is to 1.0, the stronger the relationship. A positive correlation stipulates a direct correlation where an increase in the independent variables results is an increase in the dependent variable and an inverse relationship for the negative correlation. In Figure 2 both independent variables, investment in carbon emission and hazardous solid waste have positive correlations of 0.1411 and 0.0710 respectively. The result shows that any investment in carbon emission and hazardous solid waste is likely to lead to an increase equal to the correlation between return on assets. However, the controlling variables of leverage and adequacy ratio show a negative correlation to return on assets of -0.1620 and -0.2158.

Nonetheless, all these relationships are not strong since they are not close to 1.0. However, the correlation matrix result does not ensure the absence of autocorrelation in the data set. The following section tests for autocorrelation in the data set in order to enhance the result of the actual relationships being examined within the data.

Figure 3. Durbin-Waston Multicollinearity test.

Durbin-Waston d- statistic (5, 230) = 1.563044

The Durbin-Waston statistic is a number that examines the autocorrelation in residuals from a statistical regression analysis. The Durbin-Waston statistical test was performed to test for autocorrelation within the panel data set. The test was appropriate to enhance the reliability of the regression result being examined by testing for any bias arising from autocorrelation. With a large data set being examined in this study, the large quantum of data may give rise to relationships within the data itself thereby affecting the authenticity of the panel data regression. The Durbin-Waston statistic is between 0 and 4. A value of 2 indicates the absence of any autocorrelation within the data set. A value that is substantially less than 2, or closer to zero signifies serial autocorrelation within the data set. This study had a Durbin-Waston d-statistic of 1.563044 which is closer to 2 signifying the absence of autocorrelation within the data set used for this study. Therefore, the variables used in the study had no relationships within themselves apart from that being tested in this study. The following section shows the scatter plot result of all the variables for ten years. This is vital to show how one variable is affected by another variable.

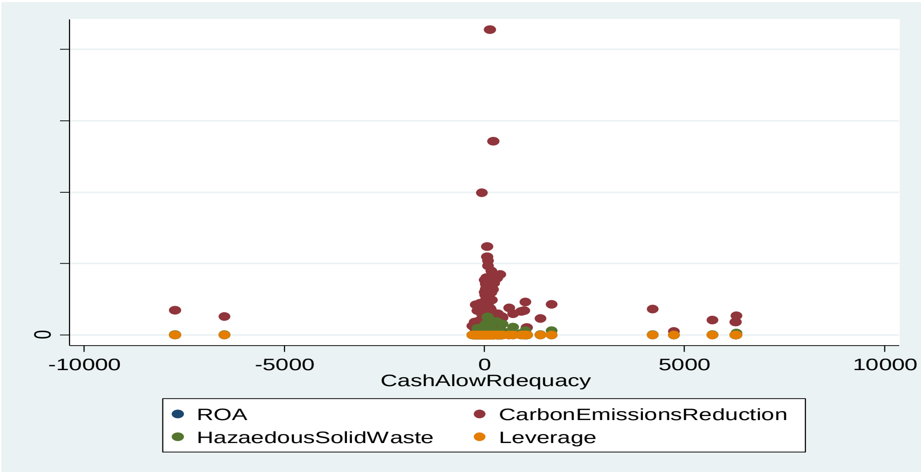

Figure 4. Scatter diagram for all variables

Scatter plots are used to represent correlations between variables. Scatters plots measure correlation which is always between -1 and +1. With an amount near -1 indicating perfect negative correlation, amounts near 0 indicating no correlation and amounts near +1 signalling a positive relationship. Figure 4 shows a scatter diagram with a significant amount of the variables clustered around zero. Although, there are a few outliers' variables of investment in carbon emission reduction and leverage factor clustered around 5000 and slightly before -5000, most variables cluster around zero. Figure 4 indicates a correlation of zero showing that there is no relationship between the variables. The following is a Breusch-Pagan test, a test which is used to measure heteroscedasticity within a data set.

Figure 5. Breusch-Pagan/Cook-Weisberg test for heteroscedasticity

Ho: Constant variance

Variables: fitted values of return on assets

$chi^{2(1)}$ = 47.50

Prob > chi^2 = 0.0000

The Breusch-Pagan test was performed to test the dependent variable, return on assets, testing for heteroscedasticity. If error terms lack a constant variance, they are heteroskedastic, on the contrary when the variance of an error term is constant the data set is said to be homoscedastic. A large chi-square indicates heteroscedasticity; however, return on assets has a probability chi-square of 0.000 which proves that heteroscedasticity is not present. Heteroscedasticity test was also performed on the independent variables to check if the data set does not have a constant error term.

Figure 6. Breusch-Pagan/Cook-Weisberg test for heteroscedasticity

Variables: carbon emissions reduction; hazardous solid waste; leverage; cash flow adequacy ratio

$chi^{2(4)}$ = 51.68

Prob > chi^2 = 0.0000

The Breusch-Pagan test for heteroscedasticity performed on the independent variables produced results consistent with those produced by the same test on return on assets. The independent variables produced a probability chi-square of 0.0000 indicating that the error term in the independent variables does not have a constant variance. Therefore, heteroscedasticity was not found in the independent variables. The following section details the findings of the study. The study used a multiple least squares regression analysis to examine the nature of the relationship between investments to reduce carbon emission reduction, hazardous solid waste disposal and return on assets.

Fixed Effects Regression Model on Carbon Emission and Hazardous Solid Waste

The fixed and random effects regression model on carbon emission and hazardous solid waste are depicted in Figure 7 and Figure 8 respectively. The difference between the results emanates from the absorption into the intercept of time-invariant variables in the equation by the fixed effects while the random effects incorporate them into the equation.

Figure 7. Fixed effects regression model of investment in carbon emission reduction and hazardous solid waste reduction

Fixed-effects (within) regression   Number of obs = 640

Group variable: cocode   Number of groups = 64

R-sq: within = 0.0467   Obs per group: min = 10

between = 0.4958   avg = 10.0

overall = 0.0002   max = 10

F(4,203) = 2.48

corr(u_i, Xb) = -0.3748   Prob > F = 0.0449

ROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Carbon emission reduction	7.75E-08	5.43E-07	-0.14	0.887	-1.15E-06	9.94E-07
Hazardous solid waste	-9.77E-07	5.94E-06	0.16	0.870	-1.1E-05	1.27E-05
Leverage	-1.04468	0.333445	-3.13	0.002	-1.70214	-0.38722
Cash flow adequacy	-0.00096	0.004004	-0.24	0.810	-0.00886	0.006931
_cons	23.95508	5.556715	4.31	0.000	12.9988	34.91136
sigma_u	33.88968					

sigma_e	56.44817	
Rho	0.264945	(fraction of variance due to u_i)

F test that all u_i=0: F(22, 203) = 2.99 Prob> F = 0.0000

The fixed-effects multiple regression models of investment in carbon emission reduction in Figure 7 shows a positive relationship between return on assets and investment in carbon emission reduction. The result shows a positive coefficient of 7.75E-08 in Figure 7. The result indicates that for every unit investment in carbon emission reduction, return on assets will generate a value equal to the coefficient. Moreover, the fixed effects model has a T-statistic of -0.14 which is less than 1.96 when tested at 95% confidence level. A T-statistic of such a size shows that investment in carbon emission reduction is not significant enough to influence return on assets. Also, investment in carbon emission reduction has a P-value of 0.887 which is greater than the significance level 0.05 (model tested at 95% confidence) which further explains the inability of investment in carbon emission reduction to influence return on assets significantly.

The control variables of leverage factor and cash adequacy ratio (see Figure 7) also indicate a negative relationship with return on assets as evidenced by a negative coefficient of -1.04468 and -0.00096 respectively. The T-statistic of both leverage factor is and adequacy ratio is -3.13 and -0.24 respectively which are all smaller than 1.96 when tested at 95% confidence level. Therefore, the control variables cannot in any significant way influence on return on assets. The P-value for the leverage factor is 0.002, and cash adequacy ratio is 0.810. As such, leverage is not significant enough to explain the movements in return on assets as the P-value is below the confidence level of 0.05%. Cash flow adequacy ratio has a P-value greater than 0.005; therefore significant to influence changes in return on assets. However, based on the interpretations of coefficients and T-values both control variables are insignificant to explain the movements on return on assets. Therefore, for the fixed-effects multiple regression models, after controlling for leverage and cash adequacy, investment in carbon emission reduction generates a negative relationship with return on assets.

In figure 7, hazardous solid waste generates a negative coefficient of -9.77E-07 to return on assets. An indication that one unit of investment in hazardous solid waste reduction will result in a return on assets losing 9.77E-07 units. Also, hazardous solid waste has a T-statistic of 0.16 which is less than 1.96 when tested at 95% confidence level. This T-statistic stipulates that hazardous solid waste not significant enough to materially influence the movements on return on assets. The P-value of 0.870 is higher than the confidence level of 0.05 further showing the inability of hazardous solid waste to explain any movements on return on assets. The following section presents the random effects multiple regression model of investment in carbon emission reduction and hazardous solid waste reduction.

Figure 8. Random effects regression model of carbon emission reduction and hazardous solid waste

Random-effects GLS regression	Number of obs	= 640
Group variable: cocode	Number of groups	= 64
R-sq: within = 0.0234	Obs per group: min	= 10
between = 0.0345	avg	= 10.0
overall = 0.0063	max	= 10
	Wald $chi^{2(4)}$	= 2.21
corr(u_i, X)= 0 (assumed)	Prob > chi^2	=0.6968

Roa	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
Carbon emission reduction	-3.29E-07	5.12E-07	-0.64	0.520	-1.33E-06	6.74E-07
Hazardous solid waste	-2.33E-06	4.92E-06	-0.47	0.636	-1.2E-05	7.32E-06
Leverage	-0.30073	0.320345	-0.94	0.348	-0.9286	0.327132
Cash flow adequacy	-0.00303	0.003828	-0.79	0.429	-0.01053	0.004477
_cons	24.417	6.061226	4.03	0.000	12.53721	36.29679
sigma_u	12.01465					
sigma_e	56.44817					
Rho	0.043339	(fraction of variance due to u_i)				

The random effects multiple regression model of investment in carbon emission reduction and hazardous solid waste in Figure 8 shows negative coefficients of -3.29E-07 and -2.33E-06 respectively. The result indicates that every unit of investment in carbon emission reduction and hazardous solid waste will lead to a return on assets decreasing by the same amount. Investment in carbon emission reduction and hazardous solid waste have P-values of 0.520 and 0.636 which are both higher than the confidence level of 0.05 is signifying the strength of the negative relationship. The controlling variables of the leverage factor and cash adequacy ratio also show negative coefficients of -0.30073 and -0.00303 respectively stipulating a negative relationship with return on assets. The P-values of carbon emission reduction and hazardous solid waste are 0.348 and 0.429 respectively, further reflecting the inability of the control variables to influence the dependent variable. As such, after controlling for leverage and cash adequacy, investment in hazardous solid waste and carbon emission reduction generates a negative correlation with return on assets using the random effects regression model.

Given the different strengths of the models analysed above, it was necessary to perform the Hausman test as a determinant of the most appropriate model to adopt for the study. The fixed effects model absorbs time-invariant variables into the intercept thereby holding them constant while analysing the causal relationship between the environmental variables and return on assets. The random effects model includes all time-invariant variables into the analysis in an attempt to portray a more real-life relationship between the variables under study. The Hausman test was utilised to determine the appropriateness of the model to be adopted for this study.

Figure 9. The Hausman test for investment in carbon emission reduction and hazardous solid waste

	(b) 1. **Fixed**	**(B)** **Random**	**(b-B)** **Difference**	**Sqrt (diag (V_b-V_B)** **S.E.**
Carbon emission reduction	-7.75e-08	-3.29e-07	2.52e-07	1.82e-07
Hazardous solid waste	9.77e-07	-2.33e-06	3.30e-06	3.33e-06
leverage	−1.044676	−0.3007331	-0.7439432	0.092545
Cash flow adequacy	−0.0009629	−0.0030269	0.0020639	0.011723

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$chi^{2(2)}$ = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 65.96

Prob>chi^2 = 0.0000

Figure 9 presents a Hausman test on investment in carbon emission reduction and hazardous solid waste to determine which multiple regression model is appropriate for this study. The Hausman test shows a probability of 0.0000 which is less than the confidence level of 0.05. Such a low probability accepts the fixed effects regression model and rejects the random effects regression model. A low probability chi-square of 0.000 on the Hausman test indicates that the results of the fixed effects regression are also significant. The coefficients and t-values also support the significance of the fixed effects regression model in figure 7. Therefore, the fixed effects regression model results showing a positive relationship between investment in carbon emission reduction and return on assets is accepted.

The study found a positive correlation between corporate investments in carbon emission reduction and return on assets. Corporate investments in carbon emission reduction technology resulted in significant increases in return on assets. These results are consistent with studies by Strezov and Evans (2016) which found that corporate environmental investment is not only a cost to the company but act as a differentiation tool to the company's operations and products thereby opening new markets and opportunities for the business. Other similar results were in a study by Christopher, Hutomo, and Monroe (2013) which found that corporate environmental investment in carbon emission reduction induces energy efficiency in operations ultimately resulting in growth in return on assets.

The study also examined the relationship between corporate investment in the reduction of hazardous solid waste disposal and the return on assets. The study found that investments to reduce hazardous solid waste disposal result in recognisable increases to return on assets. These results are consistent with findings by Depoers, Jeanjean and Jérôme (2016) and Ioannou and Serafeim (2015) which found that reducing hazardous solid waste disposal minimises waste within the production process thereby increasing efficient utilisation of resources within the manufacturing process. They also found that reducing hazardous solid waste disposal reduces the risk of future liabilities through environmental damage lawsuits, strikes and fines for environmental damage which creates significant growth to return on assets.

5. Conclusions

This paper examined the relationship between corporate environmental investment in carbon emission reduction, hazardous solid waste disposal reduction and return on assets. The results of the study show a positive correlation between investments to reduce carbon emissions and return on assets and a negative correlation between investment hazardous solid waste disposal and return on assets.

Corporate environmental investments are intended to reduce carbon emissions results in significant shareholder gains to return on assets which are contrary to the traditional view that they are an unnecessary cost to the company. The study shows that corporate environmental investments in carbon emissions reduction result in energy efficiency, waste reduction, reduced future liabilities which all ultimately increase return on assets. Other gains are derived from the differentiation of the company associated with environmental investment which opens up new market opportunities for the enterprise. Companies are also poised to benefit from reduced pollution fines and taxes such as the new carbon tax in South Africa.

This paper also establishes that environmental investments to reduce hazardous solid waste are not related to return on assets. The study concedes that investment in hazardous solid waste disposal is essential and necessary to maintain a sustainable operational environment and to preserve good stakeholder relations necessary for the survival and sustainable growth of companies and does not result in gains to return on assets. As such, investments to reduce hazardous solid waste should be to the level of regulatory compliance as any investment beyond that will begin to erode shareholder value.

This study is contrary to the traditional perspective which regarded environmental investment as increasing the expenditure of the company. The positive relationship established in this study is significant as it will encourage company management to invest in reducing the environmental footprint of their businesses. This study justifies the notion of adopting sustainable business practices especially in mining and manufacturing companies that have traditionally been considered as the heaviest polluters of the environment. Not only are companies encouraged to adopt sustainable business practices but the study reveals that there is shareholder value measured by return on assets attributable to such investments.

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