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THE INFLUENCE OF CARBON TAX ON THE FINANCIAL SUSTAINABILITY OF SOUTH AFRICA'S CEMENT AND MINING INDUSTRY

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Abstract:
This paper examines the impact of the carbon tax on financial sustainability of cement and mining companies in South Africa listed on the Johannesburg Stock Exchange. A quantitative research method was used based on a correlational research design to investigate the relationship between carbon tax and profitability. Correlation analysis was used to analyze the data. Secondary data in form of annual integrated reports, sustainability reports and annual audited financial statements from 2016 to 2020 were used as sources of the variables. The results show that carbon tax adversely influences net profit margin. Therefore, this suggests that carbon tax also negatively impacts shareholders' dividends. Therefore, this suggests that carbon tax also negatively impacts shareholders' dividends. This study is significant to policymakers by providing valuable information relating to the effect of carbon pricing decisions on the profitability of the cement and mining sector in South Africa. It gives the policymakers an evidence-based opportunity to design and develop policies that consider carbon tax reducing the corporate sector's financial performance in South Africa. This study contributes to the contemporary literature on nexus between the carbon tax and financial sustainability from developing country perspective. Furthermore, this is the first empirical study in South Africa focusing on this relationship.

Keywords: Carbon Tax, Profitability, Net Profit Margin, Climate Change, Environmental Management, Carbon Emissions, South Africa.

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INTRODUCTION

Climate change remains a global puzzle. It is because its origination is directly linked to human actions and production processes generating enormous greenhouse gas (GHG) emissions. However, the global village cannot sustain itself without production processes. The best and shortest way to disentangle this problem is to govern GHG such as carbon emissions. Therefore, production processes and human actions must be controlled and aligned to sustainability to reduce climate change. The carbon tax was introduced as a tool first to ensure that production processes are aligned with sustainability through reduced impact on environmental well-being, enhanced financial sustainability and fewer social effects inflicted on society to strike a balance. Secondly, to narrow and curb production processes that generates carbon dioxide (CO2). It stems from the fact that CO2 is a significant cause of climate change (Gimenez et al., 2012; Kuo et al., 2016). Therefore, the traditional business objective of achieving higher financial returns is majorly contributing to climate change as many businesses employ conventional approaches that seek to elevating profitability at the expense of the natural environment. It made carbon tax relevant.

The carbon tax has been defined as a fee paid by the corporate sector for emitting carbon dioxide (Doua & Caob, 2020). Zhang et al. (2021) and Brännlund et al. (2010) argue that

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implementing a carbon tax in most developing countries, such as South Africa, has been a political tool to fight climate change. Despite the importance of carbon tax system on environmental protection, governments have only been concerned about the efficient collection of the tax as opposed to evaluating the tax's effectiveness in reducing carbon emissions in the corporate sector (Xie et al., 2018). Hence, Bruvoll and Larsen (2003) argue that introducing a carbon tax is merely a source of fiscal income for most governments.

The key intention of the carbon tax is to integrate costs for eradication of ecological impairment into pricing decisions. However, in most countries, the impact of carbon fees on corporate performance remains to be seen (Van Heerden et al., 2016). It can be partly attributed to the fact that carbon tax is a relatively new environmental management tool in emerging markets (Zhang et al., 2021). It is no exception to South Africa, which recently introduced a carbon tax system in 2019 on all sectors emitting carbon emissions. Therefore, the impact of carbon fees on corporate profitability still needs to be empirically validated in South Africa. The tax will, as expected, be reported as part of the corporate's expenses, and this, in theory, diminishes profitability of any company. Shuro (2021) and van Heerden et al. (2016) contend that the impact of the carbon tax on financial sustainability of South Africa's industrial sector remains a theoretical estimation because the system is still at its embryonic stage. It means that no scientific data is associated with the carbon tax's effect on financial performance within the cement and mining companies in South Africa. Therefore, this research attempts to close this gap by investigating the relationship between the carbon tax and South Africa's cement and mining sector profitability.

Many studies second the argument that environmental taxes lead to better environmental performance and low carbon emissions. Relying on data from Statistics Canada, Liu et al. (2018) investigated various economic effects "of a carbon tax on the Province of Saskatchewan" in Canada. Using the Province of Saskatchewan energy sector, carbon tax rates were applied to measure the relationships among carbon tax, greenhouse gas emission decline and economic growth. The study revealed that carbon tax raises the cost of applying fuels and persuades companies to minimize their use and identify suitable substitutes. Also, the study reveals that carbon tax in the Province of Saskatchewan was inadequate to reduce GHG emissions. It improves the province's gross domestic product (GDP) due to companies paying enormous amounts for their failure to combat carbon emissions. Liu et al. (2018) documented a positive relationship between the carbon tax and GDP. In contrast, this study chose to focus on the microeconomic level of cement companies in South Africa. Liu et al.'s (2018) study was limited to the provincial economy rather than specific industrial sectors or companies. The empirical study results, therefore, are of little relevance in the corporate sector.

Cadavid-Giraldo, Velez-Gallego and Restrepo-Boland (2019) tested the impact of carbon emission fees on choices that contribute to the minimization of CO2 in the cement sector in Colombia. Their empirical work note and affirm that a tax imposed on carbon emissions enables changing CO2 emissions into a cost. Therefore this impacts production costs. However, the study exhibits that the nexus between the carbon tax and emission minimization is non-linear. It is similarly echoed by Zakeri et al. (2015) and Wang and Yu (2021). However, Cadavid-Giraldo et al. (2019) concluded that carbon tax lead to a decline in carbon dioxide (CO2) emissions and therefore motivates cleaner production adoption. This view sounds convincing initially, but Cadavid-Giraldo et al. (2019) need to explain that the decline in CO2 emissions is not an immediate achievement because it requires considerable investment in time for the CO2 emissions to decline. For instance, the application of cleaner production demands a particular time for employees to be effectively trained on its use. During that period, the efficiency of cleaner production in reducing CO2 emissions was minimal.

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More recently, Tan and Lin (2020) found that carbon tax levying makes the industrial sector migrate from using "coal, with a greater carbon efficient, to lesser oil/gas and electricity." The study reveals that carbon tax improves energy efficiency. The study discovered that the carbon levy is, therefore, critical for the CO2 decline in China's high energy consumption sectors Using panel data from 2000 to 2015. However, despite the carbon levy reducing energy consumption and CO2 emissions, it raises the application of capital and labor and decreases the "gross industrial output" (Tan & Lin, 2020). The authors argue that the carbon tax surpasses the saved energy costs; therefore, the outputs are curbed. It is acceptable that an upsurge in carbon tax may limit the number of products produced. It may emerge from the idea that companies first incur carbon tax and then later recover from the customer. So, during this period companies may need more financial reserves to meet the production demands. In a more comparative study, Di Cosmo and Hyland (2013) analyzed the bearing of the carbon levy on carbon emissions for the Irish national economy. They empirically divulge that a 50% rise in environmental taxes can reduce carbon emissions in the region of 861 000 tons.

In a more comprehensive study, Garidzirai (2020) investigated the impact of the carbon tax on carbon emission, energy consumption and population growth from 1970 to 2018 in South Africa. The scholar argued that understanding this impact is critical because South Africa is among top carbon dioxide emitters contributing to climate change. The study found that the carbon tax harms carbon emissions in South Africa using time series data. It means that when carbon tax is increased, it reduces carbon emissions in the companies analyzed in South Africa. The results are inconsistent with prior research by Ahamada, Yusoff and Mohamed (2017) and Winkler (2017). Winkler (2017) confirms that companies migrate to cleaner production to escape carbon tax. However, Gadzirirai (2020) study concentrated on the residential sector. Therefore, the study cannot be generalized to the corporate sector, such as the cement sector. However, it intends to show how carbon tax interplays with carbon emissions and energy use from a macroeconomic level.

OECD (2020) tests the link between the carbon tax and companies' environmental and financial performance of 19 various sectors in France from 2001 to 2016. The study reveals that raising carbon tax from €44.60 to €86.2 per tonne decreases CO2 emissions by 6.2 million tonnes and contributes to the restructuring of 6,357 FTE expressive of approximately 8.7% of total emissions. OECD (2020) observe that a "10% rise in energy costs leads to a fall in energy use by 6% and a reduction in carbon emissions of 9%." The results deduce that another critical way to reduce carbon tax is directly increasing energy costs. It pushes down energy usage and carbon tax. It economically makes sense but socially persecutes the ordinary customer through increased selling prices. Applying a two-stage least square (TSLS) estimator, the study further reports that the present-day carbon levy percentage reduced CO2 emissions in 2018 by 5% compared to a situation where no carbon tax was adopted. In a related piece, Anderson (2019) projects a 6.7% decline in emissions over three years to be witnessed in Tokyo's manufacturing sector applying carbon tax. Also, Ellerman and Bucher (2008) established a 3.1% fall in 2005-6 and between 150 and 300 Mt CO2 in the cement sector in the European Union.

He et al. (2021) investigated the rapport between environmental levies and energy proficiency. The study was centered on panel data from 32 OECD nations from 1995 to 2016. the study used the panel ARDL model and undertook correlation, unit root, and co-integration tests to mitigate the possible lag between variables. The regression results indicate that the environmental levies can lead to an upsurge in energy efficacy over time. The authors posit that environmental taxes have increased environmental responsiveness encouraging companies to adopt clean production, enhance energy efficiency and lessen greenhouse emissions. Similarly, Lin and Li (2011) support the results in their study of five North European countries, establishing that carbon

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tax has produced positive effects in four countries except for Norway. These studies overlook that carbon tax can lead to massive costs that sometimes will under no circumstances produce a positive financial gain and accordingly reduce carbon tax.

Based on the description above, the authors chose the study's title, "The Influence Of Carbon Tax On Financial Sustainability Of South Africa's Cement And Mining Industry".

METHOD

Data were collected from the three cement companies' sustainability reports, annual integrated reports and annual audited financial statements on Johannesburg Stock Exchange's (JSE) website. The study used financial and emissions data for five years, from 2016 to 2020. It is because the King code III and IV mandate that companies listed on JSE extensively report and disclose their financial and emissions information. The study used secondary data. Therefore, data gathered from the documents are considered reliable and valid.

The three cement and 39 mining companies headquartered in South Africa and listed on JSE were considered in this study. A total of 42 companies were used as samples of the study.

A quantitative research method was used based on a correlational research design to investigate the relationship between carbon tax and profitability.

The study used a panel data analysis. Two forms of data were used in form of time series and cross-dimensional. It is based on the fact that the data has a time series and consists of observations on numerous occurrences. Fixed effects and random-effects methods are used to evaluate the data. Saunders et al. (2012) claim that the fixed effects analysis permits taking into account "unobserved time-invariant" features and the association with the "observed independent variable."

The study's dependent variable is net profit margin, whereas the independent variables are carbon emission intensity and scope 1 and 2 emissions. The study adopts company size, carbon intensity and capital intensity as control variables to minimize the omitted variable bias.

The study's regression model is identified as follows:

$$yit = \mu t + \beta itxit + \varepsilon$$

Where:

yit = dependent variable

μt = intercept

βit = coefficient

xit = independent variable and

ε = the error term.

The study used descriptive statistics to explain the basics' elementary features, providing a summary concerning the sample and measures. Descriptive statistics remains the general foundation of almost all quantitative evaluations of the findings by offering quantitative descriptions conveniently (Saunders et al., 2012).

RESULTS AND DISCUSSION

The gathered secondary data was evaluated and described in this section. The evaluated data is then deduced and presented in the next section. Table 1 underneath reflects a brief account of all the descriptive associated with the variables adopted in this study based on a carbon rate of R R120/tCO2. 27 (n) companies were observed during the five-year (P) period. We discovered that 60 (N) data points were noted down.

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Table 1. Descriptive statistics (in ten thousand)

Variable	Mean	Standard Dev.	Min	Max	Observations
Net profit	2698	6534	-5423	27452	N=60,n=27, T=5
Sales	21867	25765	-1572	82953	N=60,n=27, T=5
NPM120	0.724	0.973	-1.010	1.452	N=60,n=27, T=5
Firm size	1.975	1.071	0	3	N=60,n=27, T=5
Capital intensity	9.648	26.794	1.728	193.678	N=60,n=27, T=5

Source: Data Processed, 2022.

The standard deviation amounts for sales, net profits, capital intensity and firm size are significant. From a statistical point of view the data points are distant from the average value. In case of this study, this put forward that a difference exists in the size of companies on variables such as sales income and the magnitude of investments. It is also witnessed in significant variances between minima and maxima. A maximum value of 193.68 shows that several sampled companies are highly capital-intensive, which suggests that borrowing might not be necessary.

Table 2 below indicates that carbon emissions and intensity negatively link with net profit margin. The dummy variable approach was used to scan the data of cement companies of various sizes. Having size as the dummy variable, all companies under percentiles were categorized as minor size and allocated 0; companies within the range of 25 to 75 percentile were categorized moderate sized and allocated value 1, and the companies exceeding 75 percentiles were categorized as big sized and allocated a2 value.

Table 2. Correlation analysis

	Sales	Net Profit	Net profit margin
Sales	1		
Net profit	1.856	1	
Net profit margin	-1.647	1.014	1
Carbon emissions	0.079	-0.069	-0.135
Carbon intensity	-0.958	-0.621	-0.365
Dummy size	0.984	0.538	-0.718
Capital intensity	-0.572	-0.265	-0.543

Source: Data Processed, 2022.

Table 2 above reflects that the carbon emissions and intensity move into a non-linear link with net profit margin. It infers that an upsurge in emissions and the cost of carbon lessens companies' financial performance. The control variables, namely size, carbon intensity and capital intensity, also display a negative rapport with net profit margin.

The study results confirm that carbon levies directly affect the net profit margin of cement companies in South Africa. It concludes that the carbon tax also reduces shareholders' wealth. As anticipated, the higher the company produces carbon emissions, the higher the tax cost. Eventually, this reduces the net profit margin. Other empirical studies by Liu et al. (2018) and Luo and Tang (2014) have come to the same conclusion that carbon tax reduces the financial performance of companies. Further, Luo and Tang (2014), in examining the impact of the carbon tax on Australian companies, report that carbon tax adversely influence market share, leading to low financial returns. In line with this study, Liu et al. (2018) unearth that carbon tax negatively impacts savings and investment.

Additionally, Miao et al. (2018) and Cadavid-Giraldo et al. (2020) argue that applying carbon tax pushes companies to adopt cleaner production. By so doing, companies are forced to spend on new technologies that can, as much as possible, reduce carbon emissions. Gimenez et al. (2012) echo the idea that carbon tax pushes companies to spend on technologies and different production processes for diminishing environmental impacts leading to depressed financial performance.

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CONCLUSION

The carbon tax system is slowly becoming popular in emerging economies such as South Africa. It remains a new system in South Africa. Therefore, the government and the corporate sector need to be made aware of the carbon tax's quantitative influence on the corporate sector's financial performance, particularly the cement sector. The cement and mining sectors are significant because of their largest carbon dioxide emission from the production processes. Its significance is also because the cement sector plays a vital role in the national economy through substantial contributions to the gross domestic product. Thus, there is a need to examine the relationship between the carbon tax and the financial performance of cement companies. Therefore, this research intends to probe the association between the carbon tax and net profit margin of JSE-listed cement and mining companies. Secondary data in the form of annual integrated reports, sustainability reports and annual audited financial statements from 2015 to 2016 were used in the study.

Based on the results, the carbon tax adversely affects the sampled cement companies' net profit margin ratio. An increase in carbon tax reduces the net profit margin ratio and vice versa. It needs to be better for the cement sector because, with a strategic intervention, it poses a long-term viability challenge. Furthermore, the tax is eroding shareholders' returns. So, elevating the tax will harm the companies' net profit margin. As a result, the carbon tax can hinder investors in the cement sector. It might lead to retrenchments as companies might relocate or scale down operations. On the other hand, this might coerce companies to invest in cleaner production to address the downfall in profitability.

This study is essential and avails information for policymakers when evaluating possible measures to use for environmental conservation and setting a price on emissions. Also, the cement companies have first-hand evidence now that carbon emissions must be lessened to ensure improved profitability. The study is limited to JSE-listed cement companies. Future studies can focus on the non-listed manufacturing and other industrial sectors using a different research design.

REFERENCE

Ahamada, I., Fodha, M. & Kirat, D. (2017). Regional differences in CO2 emissions from the French residential sector: Determinants and distributional consequences. *Revue D'économie Politique*, 127(2):353-374.

Brännlund, R., Lundgren, T. & Studies, P. (2010). Environmental policy and profitability: Evidence from Swedish industry. *Journal of Environmental Economics*, 12(1-2):59-78.

Bruvoll, A. & Larsen, B.M. (2003). Do greenhouse gas emissions-do carbon taxes work? *Energy Policy*, 32.

Cadavid-Giraldo, N., Velez-Gallego, M. & Restrepo-Boland, A. (2020). Carbon emissions reduction and financial effects of a cap and tax system on an operating supply chain in the cement sector. *Journal of Cleaner Production*, 275, 1-13. https://doi.org/10.1016/j.jclepro.2020.122583

Cadavid-Giraldo, N., Velez-Gallego, N. & Restrepo-Boland, A. (2019). Carbon emissions reduction and financial effects of a cap and tax system on an operating supply chain in the cement sector. *Journal of Cleaner Production*, 275(2020):1-13.

Doua, G. & Caob, K. (2020). A joint analysis of environmental and economic performance of closed-loop supply chains under carbon tax regulation. *Computers and Industrial Engineering*, 146:1-13.

Ellerman, A. D. & Buchner, B. K. (2008). Over-allocation or abatement? A preliminary analysis of the EU ETS based on the 2005–06 emissions data, *Environmental Resources Economics*, 41: 267–

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• ISSN 2721 - 0871 (online)
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287.

Garidzirai, R. (2020). Time series analysis of carbon dioxide emission, population, carbon tax and energy use in South Africa. *International Journal of Energy Economics and Policy*, 10(5):353-360.

Gimenez, C., Sierra, V. & Rodon, J. (2012). Sustainable operations: Their impact on the triple bottom line. *International Journal of Production Economics*, 140(1):149-159.

He, P., Sun, Y., Niu, H. & Long, C. (2021). The long and short-term effects of environmental tax on energy efficiency: Perspective of OECD energy tax and vehicle traffic tax. *Economic Modelling*, 97(2021):307-325.

Kuo, T.C., Hong, I.-H. & Lin, S.C. (2016). Do carbon taxes work? Analysis of government policies and enterprise strategies in equilibrium. Journal of Cleaner Production, 139:337-346.

Liu, L., Huang, Z., Huang, G., Baetza, B. & Pittendrigh, S. (2018). How a carbon tax will affect an emission-intensive economy: A case study of the Province of Saskatchewan, Canada. *Energy,* pp. 159, 817–826. https://doi.org/10.1016/j.energy.2018.06.163

Luo, L. & Tang, Q. (2014). Carbon tax, corporate carbon profile and financial return. *Pacific Accounting Review,* 26(3):351-373.

Miao, Z.W., Mao, H.Q., Fu, K. & Wang, Y. (2018). Remanufacturing with trade-ins under carbon regulations. *Computer Operational Research.* 89, 253-268. https://doi.org/10.1016/j.cor.2016.03.014

Organization for Economic Co-operation and Development (OECD). (2020). The joint effects of energy prices and carbon taxes on environmental and economic performance: evidence from the French sector–environment working paper n° 154. www.oecd.org/environment/workingpapers.htm Date of access: 08 Jan. 2022.

Saunders, M., Lewis, P. & Thornhill, A. (2012). *Research methods for business students*. 6th ed. Harlow, Essex: Pearson Education Limited.

Shuro, I. (2021). *Effect of carbon footprint on profitability in metals & mining industry of South Africa.* Dissertation for Master in Business Administration. North West University, South Africa.

Tan, R. & Lin, B. (2020). The influence of carbon tax on the ecological efficiency of China's energy-intensive industries—A inter-fuel and inter-factor substitution perspective. *Journal of Environmental Management,* 261(2020):1-19.

Tan, R. & Lin, B. (2020). The influence of carbon tax on the ecological efficiency of China's energy-intensive industries—A inter-fuel and inter-factor substitution perspective. *Journal of Environmental Management,* 261(2020):1-19.

Van Heerden, J., Blignaut, J., Bohlmann, H., Cartwright, A., Diederichs, N. & Mander, M. (2016). The economic and environmental effects of a carbon tax in South Africa: A dynamic CGE modeling approach. *South African Journal of Economic and Management Sciences*, 19(5):714-732.

Wang, Y & Yu, L. (2021). Can the current environmental tax rate promote green technology innovation? Evidence from China's resource-based industries. *Journal of Cleaner Production*, 278(2021):1-12.

Winkler, H. (2017). Reducing inequality and carbon emissions: Innovation of developmental pathways. *South African Journal of Science,* 114(2):20–38.

Xie, J., Dai, H., Xie, Y. & Hong, L. (2018). Effect of carbon tax on the industrial competitiveness of Chongqing, China. *Energy for Sustainable Development*, 47:114-123.

Zakeri, A., Dehghanian, F., Fahimnia, B. & Sarkis, J. (2015). Carbon pricing versus emissions trading: a supply chain planning perspective. *International Journal of Production*, 164:197-205.

Zhang, H., Li, P., Zheng, H. & Zhang, Y. (2021). Impact of carbon tax on enterprise operation and production strategy for low-carbon products in a competition supply chain. *Journal of Cleaner Production,* pp. 287, 1–13. https://doi.org/10.1016/j.jclepro.2020.125058