Accounting for sustainability: The influence of green accounting practices on firm performance in Ghana's manufacturing sector

Augustine Badii
School of Business, Dr. Hilla Limann Technical University
E-mail: augustine.badii@dhltu.edu.gh
ORCID ID: https://orcid.org/0009-0001-6368-744X

Abdul-Aziz Jeriku Seidu*
School of Business, University for Development Studies
E-mail: azseidu@uds.edu.gh
ORCID ID: https://orcid.org/0000-0001-8662-8277

Tijani Abdullai,
School of Business, University for Development Studies
E-mail: atijani@uds.edu.gh
ORCID ID: https://orcid.org/0000-0002-0194-0622

Abstract

Purpose: This study explores the impact of green accounting practices on the financial performance of listed manufacturing firms in Ghana, focusing specifically on return on capital employed (ROCE), return on assets (ROA), and dividend per share (DPS). Anchored in stakeholder and legitimacy theories, the study provides empirical evidence from an emerging economy perspective, where sustainability practices are increasingly gaining attention but remain underexamined.

Methodology: A quantitative, longitudinal research design was employed, using panel data from one hundred and sixty (160) annual financial reports of eight (8) purposively selected manufacturing firms listed on the Ghana Stock Exchange. A linear panel regression analysis was conducted to evaluate the association between green accounting practices and selected financial performance indicators: ROCE, ROA and DPS.

Findings: The findings reveal a statistically significant positive relationship between green accounting and ROCE, suggesting that environmentally responsible practices may enhance capital efficiency. However, green accounting exhibited no significant influence on ROA and DPS. While a positive association was observed between green accounting and both ROCE and ROA, a negative relationship was noted with DPS, indicating potential trade-offs in shareholder payouts.

Implications: The study underscores the strategic value of green accounting in enhancing operational efficiency and long-term value creation. It recommends that manufacturing firms especially, prioritize environmental accounting as part of their core strategy. To promote environmental accountability and sustainable growth, policymakers and local accounting and regulatory bodies like the Institute of Chartered Accountants, Ghana (ICAG) should

institutionalize mandatory green reporting and integrate it as a prerequisite for listing on the Ghana Stock Exchange.

Originality: The study contributes novel insights into the financial implications of green accounting within the context of Sub-Saharan Africa. For instance, by bridging the gap between environmental responsibility and firm performance in an emerging market, the paper provides fresh empirical grounding for advancing sustainability discourse in accounting and finance literature.

Keywords: Green accounting; return on capital employed; return on assets; dividend per share; financial performance and sustainability reporting.

Paper type: Empirical

1. Introduction

According to Soares et al. (2017), green accounting is one of the sure paths to a viable future. Financial reporting in the contemporary era must extend beyond traditional performance metrics because, stakeholders, including investors and local communities are increasingly demanding and expecting firms to disclose their environmental and social impacts. As the link among environmental, social and financial performance becomes increasingly evident, the relevance of green accounting has gained significant traction among stakeholders and firms (Maama & Appiah, 2019). Green accounting, as an extension of traditional financial reporting, seeks to incorporate environmental and social impacts into organizational decision-making processes. It compels firms to integrate environmental sustainability and social responsibility into both operational and strategic activities, aligning internal policies with external stakeholder expectations and regulatory requirements. Such an integration is important in ensuring long-term value creation while at the same time mitigating reputational damage and ecological risks.

Building on the evolving discourse in corporate social responsibility, Info Cat, (2017) asserts that, firms' corporate social responsibility obligations now explicitly encompass environmental stewardship, reflecting a shit from purely economic and social responsibilities to a broader sustainability-oriented framework.

All expenses related to environmental protection are taken into account in green accounting, including the processing of emissions as waste materials, labour, and capital, also known as "non-product output," which is brought on by inefficient production processes (Riyadh et al. 2020). According to Adeniyi and Adebayo (2018), the rapid expansion of industrial activities within contemporary economies presents significant environmental and societal challenges that have far-reaching implications on various stakeholder groups. Clean water, clear air, land, greenhouse gases, energy, ecosystems, biodiversity, and other non-replenishable aspects of the environment are being destroyed, putting the sustainability of the environment in jeopardy (Oti & Mbu-Ogar, 2018). The mechanised agricultural system for better yield in commercial farming has resulted in deforestation, animal and plant habitat loss, and the extinction of several

significant environmental species as a result of the adoption of contemporary agriculture systems. As a rising industrial power with lots of natural resources like gold, bauxite, petroleum, limestone, timber, good vegetation, fertile land, and the sea and its habitats, Ghana is confronted with several environmental challenges. This pattern arises from the nation's pursuit of economic growth and improved social welfare, which has driven resource exploitation and industrial activities that impose significant environmental harm.

Rapid industrialization and resource exploitation have intensified environmental pressures in emerging economies. Such environmental degradation stems from these nations' growth-oriented policies, which prioritise resource-intensive economic expansion and social welfare improvements over ecological sustainability. For instance, countries often engage in extractive and industrial activities that deplete natural resources and increase pollution levels as a means to stimulate GDP growth and enhance citizens' welfare (Adeniyi & Adebayo, 2018). While these strategies may deliver short-term economic gains, they also impose substantial long-term environmental costs, thereby undermining sustainable development objectives.

In Ghana, the regulatory framework governing corporate disclosures does not mandate the inclusion of green accounting practices as a prerequisite for listing on the Ghana Stock Exchange. Nevertheless, the escalating incidence of environmental degradation, especially the pollution of water bodies, has heightened societal and institutional pressures for more robust environmental accounting mechanisms. Such pressures are most pronounced in the manufacturing sector, which extant research identifies as a dominant source of industrial pollutants and associated ecological externalities (Oti & Mbu-Ogar, 2018). Despite increasing global and domestic emphasis on sustainable business practices, most firms in emerging economies exhibit a limited willingness to commit adequate financial resources to environmental protection. This reluctance is often rooted in the perception that expenditures related to ecological stewardship constitute immediate financial liabilities rather than strategic investments in long-term legitimacy, stakeholder trust, and regulatory compliance (Adeniyi & Adebayo, 2018). Consequently, persistent underinvestment in environmental safeguards perpetuates ecological degradation and elevates systemic risks to public health and socio-economic stability.

Traditional financial accounting frameworks have historically excluded or obscured substantial environmental externalities, thereby rendering them inadequate for capturing the full economic consequences of corporate activities. Despite their widespread adoption, traditional cost-accounting methods prioritize short-term financial metrics and systematically exclude environmental liabilities from formal reporting structures. This omission, compounded by firms' limited willingness to internalize such costs, results in financial statements that inadequately reflect the broader socio-environmental consequences of business activities. Eze (2021) argues that excluding environmental degradation costs from corporate financial reports may create the appearance of enhanced shareholder value by sustaining targeted rates of return. However, such practices externalise significant social and ecological harms, ultimately undermining the firm's long-term viability. Excluding quantifiable environmental externalities from financial reporting frameworks not only obscures the true economic costs borne by

society but also undermines the accuracy of assessments regarding a firm's ability to generate returns sufficient to cover its cost of capital. Such omissions effectively shift ecological liabilities to external stakeholders, eroding the integrity of reported financial performance and raising critical questions about long-term value creation.

Stakeholder theory suggests that firms must account for the interests of diverse stakeholder groups rather than focusing solely on shareholder returns, while legitimacy theory emphasizes adherence to societal norms and regulatory expectations. Integrating these perspectives, recent research highlights the necessity for corporate strategies that balance economic performance with measurable social and environmental outcomes (Segun & Adebayo, 2020). Empirical evidence suggests that firms that integrate environmental and social responsibilities into their operations exhibit lower risks of moral hazard and adverse selection. This alignment enhances stakeholder trust, a factor empirically linked to superior financial performance (Emmanuel, 2021). Consistent with stakeholder and legitimacy theories, the integration of green accounting practices is theorized to reinforce corporate conformity to societal expectations, thereby supporting long-term financial sustainability. The traditional shareholder-oriented perspective, which emphasizes short-term wealth maximisation while disregarding the environmental consequences of corporate operations, has been increasingly challenged by evolving theoretical and regulatory frameworks. Emerging discussions in the literature suggest that firms with advanced sustainability practices may engage, through industry associations, voluntary standards, or collaborative initiatives in efforts that indirectly influence less environmentally progressive peers. However, the extent and consistency of such spillover effects remain subject to empirical verification and appear to vary across sectors and regions.

The extant literature reveals a notable paucity of research on green accounting practices within emerging economies. Among the limited studies available, most have concentrated on publicly listed firms without separately examining manufacturing enterprises, despite their disproportionately high contribution to environmental degradation. This omission constrains understanding of how environmental accounting initiatives influence financial outcomes in sectors that are principal sources of ecological externalities. Furthermore, prior empirical investigations have generally relied on relatively short financial reporting periods, typically between five and ten years, thereby limiting insights into the sustained effects of green accounting adoption. To address these gaps, the present study utilises a longitudinal dataset comprising 20 years of firm-level financial information drawn from the Ghana Stock Exchange, enabling a more rigorous assessment of the long-term relationship between environmental accounting practices and corporate financial performance.

The relationship between green accounting practices and firm profitability remains empirically contested. While several studies report a positive association between environmental accounting initiatives and financial performance (Yan & Li, 2020; Ogoun & Ekpulu, 2020; Maama & Appiah, 2019; Rizal & Yatminiwati, 2020; Nwaiwu & Oluka, 2018), other research provides evidence suggesting that the adoption of such practices may exert adverse effects on profitability metrics (Eze, 2021; Egbunike & Okoro, 2018; Chitom & Umeoduagu, 2017;

Segun & Adebayo, 2020; Adekanmi, Adedoyin, & Adewole, 2015; Dibia & Onwuchekwa, 2015).

The inconsistent findings regarding the relationship between green accounting practices and firm performance, particularly within the Ghanaian context, underscore the need for the present study.

The remainder of this paper is organised as follows: Section two reviews the relevant literature; section three outlines the research methodology; section four reports the empirical findings; section five discusses the results; section six presents the conclusions and implications; and section seven details the study's contributions and directions for future research.

2. Theoretical review and hypotheses development

The study is grounded in legitimacy and stakeholder theories since there is evidence to show that these two theories are commonly used in the study of the relationships between companies and stakeholders (Riyadh, 2020; Eze, 2021; Nkwoji, 2021). The stakeholder theory contends that a firm's survival in the long-term is dependent on how well it is able to manage the relationship between it and its stakeholders such as the local community, employees, customers, suppliers, investors etc. (Borah et al., 2022). Within the ambits of stakeholder theory, the goal of the firm is viewed more broadly beyond simply maximising profit at the expense of other interest groups. Emphasis is placed on value creation and ethical behaviour. Therefore, companies that establish and maintain a good relationship with their stakeholders tend to record improved reputation that builds for them customer loyalty, leading to better financial performance (Bastiaan, 2021). Sengottuvel (2018), also noted firms that include environmental sustainability concerns in their strategic decisions are the ones that are able to attract investors who are environmentally conscious. This way, the cost of obtaining capital from such investors becomes low, which can further lead to improved financial performance.

Meeting the concerns and expectations of different stakeholder groups sometimes puts the firm in a complex cobweb and the actions of the firm may not be in sync with regulatory standards and regulations, as well as community norms. Legitimacy theory addresses this dynamic by asserting that organizations must continually align their operations and reporting practices with societal values, laws, and expectations to maintain their legitimacy (Deegan et al., 2002). According to Rahmawati (2012), firms disclose information and engage in socially responsible practices to demonstrate conformity with stakeholder demands, thereby strengthening their social license to operate. Under this perspective, corporate social responsibility initiatives are not merely compliance obligations, but opportunities to reinforce societal acceptance, mitigate legitimacy risks, and align organisational objectives with broader social norms.

2.1. *Green accounting practices and firm performance (return on capital employed)*

Green accounting refers to the systematic identification, measurement, and disclosure of environmental costs associated with a firm's operations (Nkwoji, 2021). Taking into consideration a firm's environmental impact into financial reporting enables an economic assessment of the firm's environmental performance and also shows the extent to which the day-to-day operations and decisions of the firm contribute to the protection of its immediate environment. On the contrary, conventional accounting only provides shareholders with financial information for decision-making without including non-financial information that relates to the environment. As calls for corporate accountability intensifies, firms are beginning to incorporate environmental disclosures, more and more in their reporting as a way to demonstrate commitment to environmental stewardship and sustainability.

Return on capital employed (ROCE) is a one of the metrics used for measuring a firm's profitability rate. It reflects two things: capital utilisation and earnings efficiency, which makes it one of the important indicators that investors pay attention to when considering a decision to invest in a company. For any company, when the return on capital employed is high, it implies that such a company generates greater returns per unit of every capital employed, and this is generally regarded to be superior financial performance.

The extant literature germane to the relationship between firm financial performance and green accounting with Return on Capital Employed as the financial performance metric, leave much to be desired. In one breadth, some studies report that there is a position relationship, in that, firms that are environmentally responsible perform better, financially (Nandini, Sudharani, & Suresh, 2020; Yan & Li, 2020; Ogoun & Ekpulu, 2020; Maama & Appiah, 2019; Rizal & Yatminiwati, 2020; Nwaiwu & Oluka, 2018). Furthermore, Maama and Appiah (2019) report a significant positive association between green accounting and Return on Capital Employed. Whilst other studies report a neutral relationship between these two variables (Rizal & Yatminiwati, 2020; Chitom & Umeoduagu, 2017), there is also, evidence that show there is a negative relationship between green accounting and Return on Capital Employed (Eze, 2021; Egbunike & Okoro, 2018; Segun & Adebayo, 2020; Adekanmi, Adedoyin, & Adewole, 2015; Dibia & Onwuchekwa, 2015). Indeed, Eze (2021) noted that the implementation of green accounting negatively affected the financial performance of firms in the oil and gas sector of the Nigeria.

H1: *Green accounting practices are positively associated with return on capital employed.*

2.2. *Green accounting practices and firm performance (return on assets)*

Green accounting extends beyond conventional financial reporting by incorporating environmental considerations into organisational decision-making and disclosure frameworks. Lewis and Chopparapu (2017) conceptualise it as a systematic approach that reflects the extent to which a firm internalizes its environmental responsibilities within operational and financial practices. Despite its increasing global relevance, many businesses, particularly in emerging

economies, possess limited expertise regarding comprehensive environmental management. Where awareness exists, it often focuses narrowly on specific compliance activities, such as pollution control, energy consumption, or wastewater management, rather than on a broader strategy that integrates resource utilization data into long-term sustainability objectives (Malik & Mittal, 2015). The absence of robust environmental information systems can hinder a firm's ability to track resource efficiency, evaluate ecological risks, and support sustainable growth trajectories.

Financial performance is frequently assessed using the return on assets (ROA) metric, which measures the efficiency with which a company converts its total asset base into net earnings. A higher ROA indicates more effective utilization of resources and stronger managerial performance. Prior empirical studies have examined the relationship between environmental accounting disclosures and ROA, with Ezeagba, John-Akamelu, and Umeoduagu (2017), for instance, reporting a significant positive correlation within Nigeria's food and beverage industry.

H2: *Green accounting practices are positively associated with return on assets (ROA), although the effect may be statistically insignificant.*

2.3. *Green accounting practices and firm's performance (dividend per share)*

Green accounting refers to the identification, quantifying, and assigning environmental expenses, as well as incorporating them into business operations in order to make stakeholders of the firms aware of this information (Sengottuvel, 2018). This makes it a comprehensive method of ensuring appropriate corporate governance, which includes openness in its socially responsible actions. The lack of seriousness with which many businesses approach environmental accounting cause them to fall short of expectations (Riyadh et al. 2020).

The total of all declared dividends paid by a company for each outstanding share of its common stock is known as dividend per share (DPS). In a study titled "*the effect of green accounting on profitability of companies listed in Bombay Stock Exchange*", Nandini, Sudharani, & Suresh (2020) discuss this topic. A dependent variable in the study was dividends per share, while an independent variable was the amount spent on environmental protection. The findings showed that the dependent variable, dividend per share and the independent variable, environmental protection cost had a positive association.

H3. There is an insignificant negative relationship between green accounting practices and dividend per share.
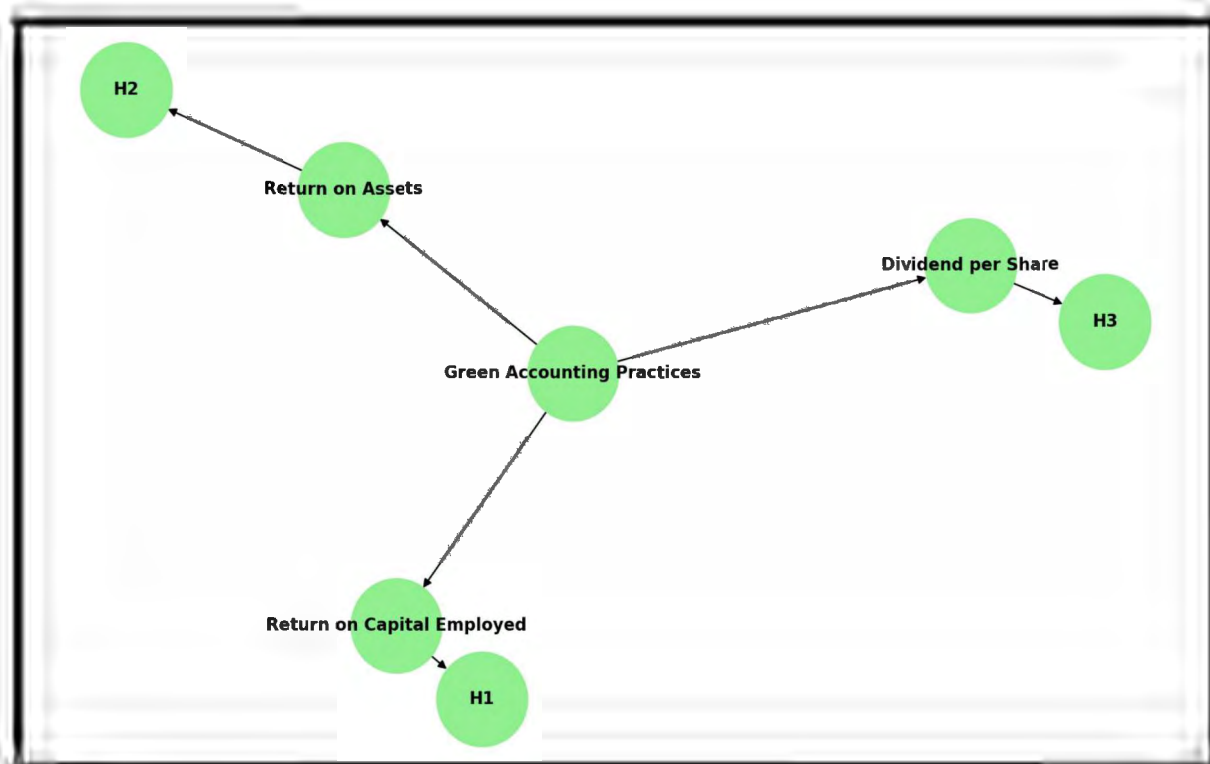
Figure 1: Conceptual framework

2.4. Empirical review

Several researchers have delved into the area of green accounting and firm financial performance in different contexts. For instance, Ogoun & Ekpulu (2020) investigated how environmental reporting by firms operating within the manufacturing sector in Nigeria affects their operational performance. For the purposes of the study, eleven manufacturing companies in Nigeria were selected. The study used the purposive sample approach since the researcher sought to use information from businesses that were listed on the Nigerian stock exchange. The Hausman test and panel research methodology were employed in the study to choose the best model for the ten-year study, which ran from 2009 to 2018. The findings indicated that there is a positive link between environmental reporting and businesses' operational performance. The study gave the political administration at the time of the study, the burden of passing laws and severely enforcing the GRI benchmark compliant disclosure standards for green accounting by mandating compliance from newly listed companies.

Additionally, Okafor (2018) assessed how the performance of oil and gas firms listed on the Nigerian Stock Exchange was impacted by environmental costs. The period of the study was from 2006 to 2016. In order to do the statistical analysis, regression analysis was done, and financial performance was measured using return on asset. The results showed that organisations can benefit from enhanced environmental performance.

Nwaiwu and Oluka (2018) also examined the association between environmental costs and financial performance metrics for listed oil and gas firms in Nigeria. The study employed the

Expo facto research methodology, and the study data covered the years, 2011 to 2015. The data for the study was culled from the published financial statements of the selected companies and used for the analysis. Waste management costs, environmental taxes and fines, rules and regulations, and abatement charges were used to illustrate environmental costs. The data was analysed using multiple regression analysis and the Pearson product moment correlation coefficient. The study found a strong link between financial performance and disclosure of environmental costs in Nigeria's oil and gas sector.

Maama & Appiah (2019) assess how widely firms listed on the Ghana Stock Exchange (GSE) have voluntarily implemented green accounting standards. The data for the study was obtained from the annual report of the firms listed on the Ghana Stock Exchange. The study purposefully sampled the companies and obtained data from reports of 23 publicly traded companies in Ghana from 2006 to 2015. The study noted that most companies in the mining, oil, and gas industries have included information on environmental sustainability in their accounting and financial reporting. However, the content analysis that was conducted revealed that the annual reports only contained positive qualitative disclosures with regard to the type of green disclosure. Again, almost all of the businesses have improved the calibre and volume of their environmental disclosures over time. Additionally, there was a positive association between financial performance and green accounting.

Emenike, Chitom, and Umeoduagu (2017) assessed the connection between return on equity and environmental accounting disclosures for the food and beverage businesses and discovered a substantial correlation between return on equity and environmental accounting disclosures. They further reported a negative correlation among return on equity and net profit margin and environmental accounting disclosures.

In the case of Eze (2021), the emphasis was on how environmental accounting disclosures impacted the financial performance of listed manufacturing companies in Nigeria. More particularly, the study investigated the effects of environmental accounting disclosures on the return on assets, return on equity, and share prices of Nigerian manufacturing enterprises. The investigation used an ex-post facto research design. Using a sample size of forty, the study collected data from registered companies on the Nigerian Stock Exchange for a period of ten years; 2010 - 2019. The data analysis employed descriptive statistics and panel regression. The study also ensured that the parameter was resilient by using the Arellano and Bond GMM estimator, which corrects for endogeneity problems. Among the findings of the study, it was noted that green accounting reporting for industrial firms listed on the Nigerian Stock Exchange did not show any impact on return on equity. There was also no connection between return on assets and the reporting of green accounts of manufacturing firms listed on the Nigerian Stock Exchange. The study came to the conclusion that green accounting disclosure had no discernible positive or negative effects on the share price of manufacturing businesses.

3. Methodology

3.1 Sample and data collection

The population of the study covered all companies that undertake any form of manufacturing and processing of products and are listed on the Ghana Stock Exchange. In all, there were twelve (12) manufacturing firms that served as the population of the study. Out of this population, eight (8) of the manufacturing companies that are publicly traded on the Ghana Stock Exchange served as the sample for the study. Though there were many manufacturing firms, eight of them were selected. These firms were selected based on the fact that they were listed on the Ghana Stock Exchange and also have published their annual reports consistently for a period of at least 20 years, between 2003 to 2022. This criterion was used because the researchers were interested in using data over a twenty-year period to expand on the work of earlier researchers who used 5 to 10-years' timeframe data for similar studies. The following firms which met the selection criteria were included in the study: Guinness Ghana Plc, Aluworks Plc, Fan Milk Ghana, Benso Oil Palm Plc, Uniliver Ghana, Cocoa Processing Company, Camelot Ghana limited and Sam Woode Ltd.

One hundred and sixty (160) annual reports from the selected companies, covering the period, 2003 to 2022, were used to gather the data. The rationale for choosing data for this period is because, the selected firms all had their published financial statements dating back to 2003 which is available on the Ghana Stock Exchange website. Additionally, owing to the fact that data collection was done in 2023, the study limited the data collection to 2022 financial year which was the last available data for the firms on the Ghana Stock Exchange at the time of collecting this data. The researchers initially obtained the data from the GSE using the selected companies' annual reports and for each of the 20 years, the reports were examined, and the three performance indicators: return on assets, return on capital employed, and dividend per share, were calculated manually for each firm. Additionally, the GRI standards document was used, and ten of the criteria were taken out in order to assess the level of green accounting being practiced by each of the selected companies. The companies were then graded based on the guidelines; a company received a score of one (1) if it followed a particular guideline in any given year, and a score of zero (0) if it did not in any of the years. The green accounting percentage for each company over the course of the twenty years was then calculated.

3.2 Measures

The dependent variables of the study were calculated using the formulae as indicated in the table below:

Table 3 .1 Formula for calculating the variable of the study

Variable	Formula
Return on Capital Employed (ROCE)	$\dfrac{Profit\ before\ interest\ and\ tax}{Total\ Asset\ less\ Current\ Liabilities}\ x\ 100$
Return on assets (ROA)	$\dfrac{Profit\ before\ interest\ and\ tax}{Total\ assets}\ x\ 100$
Dividend per share (DPS)	$\dfrac{Dividend\ paid/proposed}{Number\ of\ equity\ shares}$

3.3. Data analysis technique

Data analysis, according to Fouche & Delport (2019), is the act of giving a mass of data order, structure, and meaning. It entails sifting, sorting, selecting, and organizing obtained data to develop a deeper understanding of events. Data analysis is the process of arranging unstructured data in an effort to break it down into manageable pieces. This can be done by searching for patterns to identify important information (Patton, 2015). It entails the analysis of unprocessed data. It involves the interpretation of raw information obtained by using analytical tools as well as rational thinking to get patterns, relationships or trends.

Stata software was used to statistically analyse the data for the study. During the analysis, the study used descriptive statistics such the mean and standard deviation. Additionally, p-values and r-square values were used to carry out correlation and regression analyses. The variables' co-efficient show how dependent and independent variables are related to one another as well as the pertinent statistics needed to evaluate the performance of the given dependent variables. The study made use of mean, standard deviation, minimum and maximum values to describe the nature and extend of the study's variables.

Again, the linear panel regression was used in the data analysis, which allowed for the assessment of the relationship between dependent and independent variables (Bryman, 2022). Regression analysis is the process of examining relationships between independent and dependent variables using numerical approaches (Saunders et al., 2012). The p-values, r-square, co-efficient of the variables, and the modified r-square values were used in this study's regression analysis to establish the association between green accounting and financial performance.

4. Findings

Table 4.0 contains the descriptive analyses. The findings indicate that green accounting has a mean score of 0.5113 and a standard deviation of 0.1930. The manufacturing companies have, on average, accounted for 54.5% of the green reporting determinants out of the ten Global

Reporting Initiatives (GRI) standards on environmental issues used in this study. In addition, green reporting was observed to have a minimum score of 10% and a maximum score of 90%. This demonstrates that many of the manufacturing companies took environmental issues seriously. The minimum value suggests that some businesses did not take environmental issues seriously.

The observed mean and standard deviation for return on capital employed (ROCE) were (M=0.2780, SD= 0.5533), indicating that the average ROCE was 28%, which implies that the selected firms average return on capital employed was 28%. The minimum ROCE of -152% and a maximum ROCE of 224% was found, and it demonstrates that the return on assets of the firms fluctuates. As a result, some of the listed manufacturing firms were performing well in their profit margins while others were making significant losses. A firm could also perform well in a given year with regards to its return on capital employed but also experience some losses in subsequent years.

The average return on assets (ROA) for the companies was 9%, which indicates that the firms were making profit from their assets or economic resources on their balance sheet at a rate of 9%. The return on asset (ROA) has a mean and standard deviation of (M=.0901 and SD=.1525). The minimum ROA among the selected companies for the twenty-year period is -58%, and the maximum ROA for the period was 65%. This implies that some businesses were losing money using their financial resources or assets, while others were using their assets wisely and turning a 65% profit on their entire assets.

The average dividend per share that the listed manufacturing firms paid to their investors was (M=0.1764, SD=0.5954), meaning that the average dividend per share which the listed manufacturing firms were paying to their investors was Ghs0.1764, the minimum dividend per share for the period was Ghs0.00 and the maximum dividend per share for the same period was Ghs4.00. This means that investments in the manufacturing sector can be volatile.

Table 4.0: The descriptive statistics of the variables

Variables	obs	mean	std.dev.	min.	max.
GA	160	.5113	.1930	.1	0.9
ROCE	160	.2799	.5534	-.1.52	2.24
DPS	160	.1764	.5954	0	4
ROA	160	.0901	.1525	-.58	.65

Source; Authors' Calculation, 2023

In order to ascertain the connection between green accounting practices and return on capital employed for listed manufacturing firms, a regression analysis on the green accounting score and return on capital employed was conducted. A summary of the results is shown in table 4.2a.

Table 4.0 shows the model summary of one of the factors affecting firms' financial performance (return on capital employed) and it revealed that green accounting is not a significant factor in

determining firms' performance (return on capital employed), as indicated by the f-ratio of 7.50. However, the R square was found to be 0.393, which indicates that, all factors being equal, green accounting could account for 39.3% of the variation in firms' performance with regards to the return on capital employed as shown in the financial statements.

Table 4.1 shows that green accounting, the independent variable, is statistically significant on return on capital employed because a 'p' value of 0.007 at the 5% level of significance was observed. More specifically, the results show of a positive relationship between green accounting and the return on capital employed, as indicated by the coefficient of 0.61, which suggests that a unit change in the manufacturing firms' green accounting practices will lead to 61% change in the firm's financial performance with respect to return on capital employed.

Table 4.1 Model summary of green accounting on return on capital employed of listed manufacturing firms.

Variable	Number of obs.	F(1,158)	prob>F	R-square	Adj. R-square	Root MSE
ROCE	160	7.50	0.0069	0.4530	0.3930	.54242

Source	SS	df	MS
Model	2.2065	1	2.2065
Residual	46.4864	158	.2942
Total	48.6929	159	.3062

Source: Authors' Calculation, 2023

Table 4.2 Regression coefficient of green accounting index on return on capital employed of listed manufacturing firms in Ghana.

ROCE	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
GA	.6105	.2229	2.74	0.007	.1702	1.0508
_cons	- .0322	.1218	-0.26	0.792	-.2727	.2083

Source: Authors' Calculation ,2023

Table 4.3 contained the model summary showing that green accounting is not a significant determinant of firms' financial performance proxy (return on assets), with an 'f'-ratio of 0.05 and R square of -0.0060. This means that green accounting practice could not explain the firm's performance variation with respect to return on assets experienced by the listed manufacturing firm. Meanwhile the coefficient of 0.135 suggests that a unit change in green accounting practices of the listed manufacturing firms will result in a 13.5% same directional change in

the firm's performance (return on assets) of the sector when all other things remain the same. These statistics is shown below.

Table 4.3 Model summary of the effects of green accounting on return on assets of listed manufacturing firms.

Variables	Number of obs.	F(1,158)	prob>F	R-square	Adj. R-square	Root MSE
ROA	160	.05	0.8306	0.0003	- 0.0060	.15299

Source	SS	df	MS
Model	.0011	1	0.0011
Residual	3.6981	158	.0224
Total	3.6992	159	.0233

Source: Author's Calculation, 2023

Table 4.4 Regression coefficient for green accounting index on return on assets of listed manufacturing firms in Ghana.

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
GA	.01348	.0629	0.21	0.831	-.1107	.1377
_cons	.08324	.0343	2.242	0.017	.0154	.1511

Source: Authors' Calculation, 2023.

Table 4.4 shows the model summary of the firm's performance determinant (dividend per share) which revealed that green accounting is not a significant determinant of dividend per share, as the f-ratio showed a value of 3.45 and the R square of to be 0.0151, which means that green accounting practice could only explained about 1.51% of the dividend per share variation experienced by the manufacturing firms, whiles the other 98.49% of the variation in the dividend per share was as a result of other factors.

The regression analysis shown in table 4.4 further demonstrates that there is no significant association between green accounting practice and dividend per share because at a significance level of 0.05, a p value of 0.065 was discovered. Additionally, the coefficient of the dividend per share indicates a negative correlation between the two variables. The coefficient of -0.451 indicates that, if all other factors remain constant, a unit change in the green accounting practice of the firms will result in a change of 45.1 percent in the dividend per share of the firms but in the opposite direction.

Table 4.5 Model summary of green accounting on dividend per share of listed manufacturing firms.

Variable	Number of obs.	F(1,158)	prob>F	R-square	Adj. R-square	Root MSE
DPS .15299	160	.05	0.8306	0.0003	- 0.0060	

Source	SS	df	MS
Model	1.2030	1	1.2030
Residual	55.1613	158	.3491
Total	56.3642	159	.3545

Source: Authors' Calculation, 2023

Table 4.6 Regression coefficient for environmental accounting index on the dividend per share of listed manufacturing firms in Ghana.

DPS	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
GA	-.450794	.2428494	-1.86	0.065	-.9304438	.0288559
_cons	.4069059	.1326533	3.07	0.003	.1449034	.6689085

Source; Authors' Calculation, 2023

5. Discussions of results

The various dimensions of green practices of the selected firms that were examined include employee health and safety, environmental protection policies, corporate social responsibilities reveal, proper disposal of waste, recycling of waste products, support to community members and government. These dimensions of green accounting conform with those stated in the Global reporting initiatives guidelines 2005 and the definition of green accounting by Nkwoji (2021) which explains green accounting to mean the recognition and disclosure of environmental costs. He continued by saying that using green accounting, every sort of organization's environmental performance can be evaluated economically. The purpose of this is to share data on how the business operates on a daily basis to safeguard the environment, the inhabitants and the workers of the business.

The findings obtained conform with that of Maama and Appiah (2019) in their paper 'accounting for the environment: a lesson from a developing nation. They found that the mining, oil, and gas industries have included information on environmental sustainability in

their accounting and financial reporting. The content analysis reveals that the annual reports only contained positive qualitative disclosures with regard to the type of green disclosure. Again, almost all of the businesses have improved the caliber and volume of their environmental disclosures over time. Similarly, the findings revealed conform with Eze (2021) who looked into environmental accounting disclosure and its impact on the financial performance of listed manufacturing companies in Nigeria. Some environmental accounting disclosures in the annual reports of Nigerian manufacturing firms included employee's health and safety cost, cost of protecting the green cover of the immediate environment of the firm and among others.

Finally on the findings conform with Nwaiwu & Oluka (2018) who undertook a study to examine the association between environmental costs and financial performance metrics for listed oil and gas firms in Nigeria.

Regarding the relationship between green accounting practices and return on capital employed, it came out that there exists a significant relationship between green accounting and a firm's return on capital employed. This is in line with findings by Ifurueze, Lydon, and Bingilar (2013) who examined the impact of environmental costs on financial performance of oil companies in Nigeria's Niger Delta. The study employed return on equity and return on capital employed as a stand-in for corporate performance and employee health and safety expenses, waste management costs, and community development costs as stand-ins for environmental costs. The study found a strong correlation between environmental costs with employee health and safety, and business performance. Meanwhile these findings contradict the findings of Segun and Adeoye (2020) which found an insignificant relationship between green accounting and financial performance. Again, the findings of the current study disagree with that of Nandini, Sudharani, and Suresh (2020) who published a study titled "The Effect of Environmental Accounting on Profitability of Companies Listed in Bombay Stock Exchange." Spending on environmental protection was seen as an independent variable, but the return on capital employed, return on assets, return on net worth or equity, net profit margin, and dividend per share were all regarded as dependent variables. An adverse relationship between the independent and dependent variables was found in the study's analysis of the relationships between the variables.

Again, on the relationship between green accounting and return on assets the results showed that there is no significant relationship between green accounting practice and a firm's performance -return on assets. This disagrees with a study by Ezeagba et al. (2017) that looked at the relationship between green accounting disclosure and financial performance of food and beverage companies in Nigeria. Similarly, the results contradict that of Zahra et al. (2009), who argued that the stewardship theory predicts that stewards would act in a pro-social way that is focused on the interests of the principal, the community in which they operate, the entity's employees, and ultimately the organisation as a whole. And that doing so will improve the business's financial and long-term fortunes. This section of the research findings however is consistent with Nandini, Sudharani, and Suresh's (2020) paper on the impact of environmental accounting on profitability of companies listed in Bombay Stock Exchange, where the results

showed a positive relationship between environmental protection and return on asset. This particular finding is consistent with the central argument of the legitimacy theory. In terms of adhering to societal standards and values, the community wants the corporation to be legitimate. According to Ang and Marsella (2015), since companies benefit from using the resources of society, it is expected that some of the profits are reinvested in the community and the environment in addition. Additionally, by operating in a socially responsible manner, businesses can indirectly increase the level of community trust they enjoy as well as make a positive impression on investors and the general public hence increasing the value generation capacity of the firm's assets.

Finally, on the link between manufacturing companies' dividend per share and green accounting, the analysis revealed that there is a statistically insignificant correlation between green accounting practices and a firm's financial performance – dividend per share. More specifically, the findings shoe that, a unit change in green accounting practices will result in a 45.1% change in the firm's dividend per share negatively. The coefficient of correlation further revealed a negative link between green accounting practice and dividend per share, and this contradicts the findings of Nandini, Sudharani and Suresh (2020) who examine how environmental accounting affect the profitability of companies listed on the Bombay Stock Exchange, a favourable relationship between environmental protection and dividends per share was observed in that study.

Again, our findings on the relationship between green accounting practices and dividend per share is in line with findings by Amaechi, Egbunike, and Okoro (2018) which explore the effect of environmental accounting on the financial performance of Nigerian businesses. Ten non-consumer goods companies that were listed on the Nigerian Stock Exchange between 2012 and 2016 were selected using an expo-facto research design. There was no obvious association between environmental accounting and investment ratios like the dividend per share. In the same way, this finding confirms the findings of Ogoun and Ekpulu (2020) who carried out a study that investigated how environmental reporting by firms operating within the manufacturing sector in Nigeria, affects their operational performance. The findings indicated that there is a link between environmental reporting and businesses' operational performance. This again agrees with Maama and Appiah (2019) who papered a study titled 'accounting for the environment: a lesson from a developing nation'. The study's findings showed that there was a positive association between financial performance and green accounting.

6. Conclusion and implications

In the current study, we investigated the relationship between green accounting practices and the financial performance of manufacturing firms listed on the Ghana Stock Exchange. Indeed, from a review of the extant literature on the nexus between the variables of the study, it was observed that thus far, to the best of the knowledge of the researchers, and at the time of drawing this conclusion all the studies in this area have been longitudinal. In Ghana, the study of green accounting is still nascent and the few studies in this area have resorted to the use of panel data ranging between one to 10years. This reduces the robustness of the results. The current study

extends this to a period of twenty years, utilising 160 financial statements in total for the analysis to give a deeper understanding of the impact of green accounting on firms' financial performance.

The overarching objective of the study is to explore the relationship between green accounting practices and return on capital employed, return on assets and dividend per share of manufacturing firms in Ghana. To achieve this, the study gathered data from eight (8) listed manufacturing firms listed on the Ghana Stock Exchange between 2003 to 2022.

On exploring the relationship between green accounting practices and firm's financial performance in the manufacturing sector, a positive relationship between green accounting practices and return on capital employed and the relationship between green accounting practices and return on assets was ascertained using linear panel regression. Consequently, the conclusion was drawn that, green accounting practices positively affect return on capital employed and return on assets. In view of this, the expenses incurred by manufacturing firms on environmental protection led to increase profitability of the firm in the long-run.

Even though a negative connection between green accounting and dividend per share was found, this study makes an important theoretical contribution in that, it helps in articulating the underlying processes by which green accounting influences manufacturing firms' performance in the area of their profitability margins. Unlike previous studies such as (Egbunike & Okoro, 2018; Segun & Adebayo, 2020; Adekanmi, Adedoyin & Adewole, 2015) which found green accounting to have significant negative effect on firms' profitability, this study opposes that green accounting reduces firm profitability. This is because, firms' green practices increase their goodwill, which in turn increases customer loyalty, and increases stakeholder trust.

7. Limitations and future research suggestions

The study was confined to manufacturing firms listed on Ghana Stock Exchange. Future studies may look at the effect of green accounting on firms' financial performance in different countries. In addition, manufacturing firms may react differently towards green accounting practices due to different market conditions. Hence, future studies may assess how manufacturing respond to the issue of green accounting practices during market fluctuations. Additionally, this study was based on only secondary data. Future studies may consider adding interviews to seek in-depth information about the various dimensions of green practices and the costs attributed to them.

Because majority of manufacturing firms in Ghana are not listed, future studies may also resort to the use of both primary and secondary data to assess the extent of green accounting practices among manufacturing firms, be they listed or not. This will give a wider perspective of the issue of green accounting practices and the firm's performance. Future studies can also be carried out among only non-listed firms so that the results obtained can be compared with listed companies to find out if there is any significant difference between listed and unlisted firms with regards to green accounting practices and the firm's performance. These limitations give opportunity for future research to expand and validate the study's findings in different contexts.

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