

CITATION

Awe-Mathias C, Tonade AM, Kajola SO, Aderibigbe AA, (2026). The Role of Firm Size in Moderating the Relationship Between Environmental Accounting and Financial Performance of Listed Manufacturing Firms in Nigeria. *Sinergi International Journal of Accounting and Taxation*. 4 (1), 10-19.
doi: 10.61194/ijat.v4i1.970

TYPE Original Research

PUBLISHED 28 February 2026
DOI 10.61194/ijat.v4i1.970
VOL 4 Issue 1 February 2026

COPYRIGHT

© 2026 Awe-Mathias, Tonade, Kajola and Aderibigbe. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

The Role of Firm Size in Moderating the Relationship Between Environmental Accounting and Financial Performance of Listed Manufacturing Firms in Nigeria

Chris Awe-Mathias^{1*}, Abiola Mikail Tonade², Sunday Olugboyega Kajola³, Amos Adejare Aderibigbe⁴

¹²³⁴Crescent University, Abeokuta, Nigeria

Correspondence: chrissundayawemathias@yahoo.com¹

Abstract

This study determine the moderating role of firm size (FS) on the effect of environmental accounting (EA) on the financial performance (FP) of listed manufacturing firms in Nigeria. Secondary sourced from annual reports of 20 selected firms (2010–2024) were employed for the study. EA was proxied by environmental compliance cost (ECC), environmental protection cost (EPC), waste management expenditure (WME), energy intensity (EIT), and environmental impact per energy (EI_GJ), while FP was measured using ROE and NPM, (FS) measured by log of total assets. Panel regression technique was employed, including Random Effects and Fixed Effects models, with interaction terms to capture moderation effects. Model selection was ensured through diagnostic tests such as the Hausman test, variance inflation factor, Wooldridge test for serial correlation, heteroskedasticity, and cross-sectional dependence tests. The findings reveal that EIT exerts a positive and significant effect on ROE, meaning that efficient energy management enhances shareholder returns significantly. In contrast, EI_GJ shows a negative and significant relationship with return on equity, indicating that higher environmental burdens reduce profitability. For NPM, ECC exhibit a positive and significant direct effect in the non-moderated model, while EPC becomes positive and significant when firm size is introduced. Interaction effects involving firm size are insignificant across the two models. The study concludes that EA significantly influence financial performance, although firm size does not significantly moderate this relationship. It recommends that manufacturing firms strategically integrate efficiency-oriented and preventive environmental investments into their core operations to enhance profitability and long-term value creation.

KEYWORDS

environmental accounting; financial performance; firm size; manufacturing firms; nigeria.

Introduction

Financial Performance (FP) is one of the core aspects of corporate survival, competitiveness, and long-term value creation in developed and developing economies. The capacity of companies to produce sustainable profits, maximise stakeholder wealth, and efficiently use assets is being considered as the focus of economic development and industrial revolution, especially in capital-intensive industries like the manufacturing industry (Frances & Nworie, 2025). The high FP in the developed economies is always linked with the better valuation of the firms, the reduced cost of capital and the increased availability of external financing, which confirms the strategic significance of the performance optimisation of the corporate decision-making.

In addition to conventional financial and operational determinants, Abaidoo & Agyapong (2024) acknowledge that firm FP is influenced by the larger environmental and

sustainability factors. The increasing levels of regulatory pressure, investor activism and demands of stakeholders have shifted the concept of environmental responsibility from being a peripheral issue but a strategic driver of corporate performance. They further posited that developed market firms with aggressive environmental activities are more likely to have a positive operational efficiency, litigation and regulatory risks, and reputational capital, which in turn will convert to better FP in the long run.

In developing economies, environmental engagement has FP implications that are determined by the structural and institutional conditions instead of being driven by environmental initiatives (Mondal et al., 2024). Despite the increasing popularity of environmental responsibility using international frameworks, a large proportion of companies are functioning in an environment that is characterised by poor regulatory practices, monitoring, and insufficient institutions of support. These circumstances tend to limit the capacity of firms to internalise costs associated with the environment without putting strain on the short-term profitability, especially in capital-intensive industries like the manufacturing sector (World Bank, 2020). Such settings view investments in environments as part of the compliance, but not value-enhancing strategic instruments, and the market mechanisms that can reward sustainability, including green financing, environmental risk pricing, and investor activism, are not well-developed (Khan et al., 2021). Therefore, the translation of environmental involvement to enhanced FP depends on wider economic incentives, institutional trustfulness and firm-level ability as opposed to the environmental practices alone.

In Africa, the manufacturing industry has become a strategic sector in the diversification of the economy and creation of employment, but is also a significant contributor to environmental degradation due to energy use, waste discharge, and emissions. They perform within the infrastructural limitations, unpredictable macroeconomic factors, and changing regulatory environments, all of which influence FP performance (Abaidoo & Agyapong, 2024). FP issues are especially acute among the manufacturing companies that are listed on the Nigerian Exchange Group (NGX). Simultaneously, the process of Nigeria entering the world of global financial markets and sustainability has fueled the pressure on enhancing environmental accountability and disclosure, particularly in the case of publicly listed companies (Financial Reporting Council of Nigeria, 2025).

EA has thus become a crucial tool in which companies determine, quantify, and report on environmental expenses, liabilities and other performance metrics alongside the traditional financial data. EA aims to reflect environmental externalities in corporate reporting frameworks, which would enable informed decision-making, improve transparency, and align organisational operations with those of sustainable development (Akinlade et al., 2025). The institutionalisation of EA in developed economies has comprised mandatory disclosure regimes and integrated reporting frameworks, which allow stakeholders to evaluate the financial impact of environmental risks and opportunities more appropriately.

Adoption of environmental accounting in developing nations like Nigeria is not even and voluntary. On the one hand, some companies have adopted environmental disclosure as a strategic instrument to promote legitimacy and investor trust, but on the other, they see this as a cost-inducing responsibility that does not have any substantial immediate financial returns (Amoako et al., 2021). One of the most important aspects that determines this relationship is the size of firms, which dictates the ability to do environmental accounting and the level at which they influence FP (Osemene et al., 2024). The larger companies usually have better financial capabilities, better accounting systems, and better managerial capabilities, which allow them to absorb the cost

of the environment and use the practices of sustainability as a competitive advantage. In addition, big companies are more visible to society, vulnerable to more regulation, and have more significant incentives to disclose the environment and be accountable in full (Akhter et al., 2023).

The manufacturing industry in Nigeria currently struggles to address the need to ensure environmental responsibility and long-term financial performance, although the sector is the key towards industrialisation and building capital markets (Akinlade et al., 2025). The environment in which manufacturing companies are based is characterised by the growing environmental pressure, stakeholder pressure, and sustainability expectations, and at the same time, being confronted with the high cost of energy, lack of infrastructure, erratic exchange rates, and narrow profitability margins (CBN, 2022). Responding, regulatory and institutional activities have increased with the advancement of environmental disclosure principles, sustainability reporting principles, and compliance with international financial reporting principles in order to enhance transparency and long-term corporate resilience (Financial Reporting Council of Nigeria, 2025).

Nonetheless, these efforts have not always led to better or more reliable FP for manufacturing companies, since EA's work is not always seen as adding value but as a source of costs. In addition, it can be observed how the capacity of firms, especially firm size, differs, and it can be posited that larger firms might absorb environmental costs and use disclosure as a reputational and market benefit. However, smaller firms are still more susceptible to the financial burden connected with environmental compliance (Obasan, 2025). Despite the expanding literature on EA and FP, significant conceptual and empirical gaps persist within the Nigerian context. While prior studies document mixed evidence on the EA–FP nexus (Hanen & Mahmud, 2024; Mondal et al., 2024; Sundarasan et al., 2024), most rely on aggregated environmental disclosure indices that obscure the differential effects of specific EA dimensions. Key proxies such as environmental cost management (ECC), environmental prevention cost (EPC), energy intensity (EIT), waste management expenditure (WME), and environmental impact per energy (EI_GJ) remain insufficiently operationalised, limiting clarity on the mechanisms through which environmental accounting influences financial outcomes.

Furthermore, studies rarely provide sector-specific evidence for listed manufacturing firms, despite the sector's environmental intensity and strategic importance to industrialisation and capital market development (Abaidoo & Agyapong, 2024; Akinlade et al., 2025). Existing findings are therefore constrained by cross-industry aggregation and limited contextual specificity. In addition, although firm size is frequently included as a control variable, it is seldom modelled as a moderating factor, despite theoretical arguments that resource capacity and stakeholder visibility condition sustainability outcomes (Akhter et al., 2023; Jamil & Ferrer, 2020; Rounaghi, 2021). Drawing on the view that firm size shapes both external legitimacy pressures and internal absorptive capacity, thereby influencing whether environmental accounting practices translate into financial gains or financial strain, this study contributes to the literature by disaggregating EA into specific operational proxies (ECC, EPC, EIT, WME, and EI_GJ), providing panel evidence from listed Nigerian manufacturing firms, and explicitly testing the moderating role of firm size in the EA–FP relationship within an emerging institutional environment characterised by regulatory evolution and uneven enforcement.

Literature Review

Conceptual Review

Environmental Accounting

As a more powerful indicator of the increased awareness of the necessity to internalise the focus on the

environment into financial decision-making and strategic planning, environmental accounting (EA) has become an important construct of corporate reporting and management (Sundarasan et al., 2024). According to Hanen & Mahmud (2024), the concept of EA is one that involves the incorporation of environmental facts, costs and obligations into the traditional accounting systems in order to give a complete picture of the environmental effects of corporate activities. Within this context, EA cannot be considered just an information disclosure tool and is a process by which companies can align financial performance with sustainable development goals, such as resource conservation, pollution reduction, and adherence to local and international environmental standards (Humphrey et al., 2023).

In theory, EA is used for various purposes. First, it serves as a risk management tool because it identifies and quantifies environmental liabilities, resource depletion, and possible regulatory fines, to decrease uncertainty in financial planning and operational decision-making (Mondal et al., 2024; Rounaghi, 2021). Second, it offers a platform of strategic long-term integration whereby companies can add sustainability to investment and production choices, and create coordination with international standards like the Sustainable Development Goals (SDGs) (Sundarasan et al., 2024). Third, EA may affect the legitimacy of organisations by giving the signal of corporate responsibility to stakeholders, such as investors, regulators, and society in general, to strengthen the market trust and social acceptance (Hanen & Mahmud, 2024).

In spite of these functions, the functions and success of EA depends on higher structural and institutional conditions. The environmental reporting regulations in most emerging economies, such as Nigeria, continue to change, and enforcement procedures tend to be intermittent, which restricts the ability of companies to incorporate environmental impacts in full (Jamil & Ferrer, 2020). According to Humphrey et al. (2023), EA depends on the institutional, market, and policy environment that determines motivators behind sustainability reporting and the possible degree of its impact on financial performance. In addition, firm-based factors, especially size and resource capacity, are important influencing factors in the implementation and effects of environmental accounting practices (Jamil & Ferrer, 2020). Bigger firms tend to be better placed to handle the costs of environmental compliance, investing in more sophisticated accounting technologies, and using environmental disclosure as a competitive edge, whilst smaller firms may be constrained and unable to adopt it, as well as not reap its financial benefits (Mondal et al., 2024).

In theory, it is possible to explain EA in terms of the legitimacy theory, the stakeholder theory, and the resource-based view. The LT highlights the importance of firms adopting environmental accounting so as to ensure that they retain social license to operate and minimise the chances of being sanctioned by the regulatory authority or society as a whole (Hanen & Mahmud, 2024). According to the ST, EA is a reaction to the various stakeholder demands, where the economic performance is balanced with the social and ecological responsibilities (Sundarasan et al., 2024). The RBV, however, points out that environmental accounting abilities have the potential of becoming valuable organisational resources that bring in efficiency, risk management, and long-term competitive advantage (Rounaghi, 2021).

Financial Performance

Financial performance (FP) is a key aspect of corporate viability, and it measures the ability of firms to generate economic value out of resources efficiently and effectively. Accounting based measures are traditionally used to determine financial performance, like Net Profit Margin

(NPM), Return on Equity (ROE), which capture expectations by investors of the firm being viable in the future (Pérez Estébanez & Sevillano Martín, 2025). In the context of corporate finance theory, financial performance has been viewed as a measure of long-term resiliency, as well as a result of strategic decision-making, making it a key indicator of firm competitiveness in competitive market settings.

The incorporation of the sustainability constructs in the business strategy also influences FP. With the increasing demands on Environmental, Social, and Governance (ESG) transparency among firms, researchers and practitioners have realised that environmental and sustainability disclosures have the potential to affect financial performance by influencing risk perception, operational performance, and investor trust (Pérez Estébanez & Sevillano Martín, 2025). An emerging stock of conceptual frameworks indicates that the asset utilisation, the cost pressures related to the environmental risk and the market valuation can be strengthened through sustainability practices, such as environmental accounting and sustainability reporting, that can signal the long term viability (Schenk & Dasoo, 2024). In this respect, FP ceases to be merely the indicator of previous profitability but also the mirror of strategic orientation towards the sustainability needs.

Moreover, FP introduces efficiency in the short term and value creation in the long term, and it demands companies to compete between short-term profitability and the ability to withstand future shocks like regulatory change, market unpredictability, and exposure to environmental risk. According to Margiutomo & Jayanti (2025), FP can be divided into various dimensions: operational performance, market value, risk-adjusted returns, and strategic flexibility, which is the interrelation between the results of accounting and the overall drivers of performance. This notion underscores the fact that FP should be construed in a broader framework in which sustainability, governance, and strategic risk management come together to define the corporate outcomes in the long run.

The conceptual terrain of financial performance is further broadened by the incorporation of digital innovation, the nature of governance, and sustainability practice, which the study by Liu et al. (2022) demonstrated that it is not possible to consider effective sustainability practices outside the context of governance quality and organisational capacity, which implied that financial performance is mediated by the internal control systems of the firms, transparency systems, and strategic distributions of resources. This expanded perspective is held in line with current corporate reporting principles, which recommend that more rigour has been taken to harmonise sustainability reporting with the financial measures, and that financial performance must contain not only profitability, but also strength and responsiveness to emerging global pressures.

Theoretical Framework

This study is anchored on Stakeholder Theory (ST) and the Resource-Based View (RBV), which jointly explain the link between environmental accounting (EA), firm performance, and the moderating role of firm size. ST, as advanced by Freeman (1998), posits that firms are accountable not only to shareholders but also to a broad range of stakeholders, including regulators, host communities, customers, and society at large. These stakeholders increasingly demand transparency and responsible environmental conduct. Through the adoption and disclosure of EA, firms enhance their legitimacy, reduce regulatory and reputational risks, and strengthen stakeholder trust, which can translate into improved financial performance.

Complementing this perspective, the RBV conceptualises EA as a firm-specific intangible resource that enhances managerial decision-making, cost control, and operational efficiency. Firms that effectively deploy EA practices are better positioned to achieve sustained performance advantages, as

these practices support efficient resource utilisation and long-term value creation. However, the ability to internalise and exploit EA as a strategic resource is not uniform across firms. While stakeholder pressures motivate firms to adopt EA, the RBV explains how internal capabilities through the size of firms determine whether such practices yield measurable financial benefits. This theoretical alignment provides a coherent basis for determining a direct relationship between EA practices and firm performance, as well as a moderating effect of firm size on this relationship.

Empirical Review

On a general level, review-based and synthesis studies indicate that EA has ceased being a marginal reporting practice and has become a strategic tool for achieving environmental consideration in the financial decision-making process. With an enormous meta-synthesis spanning close to thirty years, [Sundarasan et al. \(2024\)](#) report that EA always helps to achieve better risk management, regulatory compliance, and strategic alignment with sustainable development goals. Their synthesis suggests that environmental accounting can also yield financial performance in terms of recognition of direct costs, but also improve the long-term strategic resilience. [Swalih et al. \(2024\)](#) find, based on a systematic literature review, that environmental management accounting contributes to the financial efficiency and strategic sustainability of managerial decisions when applied in combination with other management processes and not used to meet the requirements of regulatory bodies.

On the empirical side, [Hanan & Mahmud \(2024\)](#) revealed that EA practices have a positive impact on performance, especially when the environmental disclosure exists as an intermediate. According to their results, transparency and the quality of disclosure are very important in converting EA into both financial and commercial gains. In the same vein, [Mondal et al. \(2024\)](#) demonstrate that EA positively impacts FP both directly and indirectly due to sustainable production practices, which supports the thesis that EA provides better financial results when implemented as a part of a larger operational approach than as a separate reporting initiative.

Nonetheless, sector-specific Evidence by [Jamil & Ferrer \(2020\)](#) on the case of the mining and oil companies in the Philippines indicates that EA reporting does not contribute substantially to profitability and firm value, but only when moderated by the sizes of the firms, the location of the firms, and their governance features. This observation highlights the importance of firm heterogeneity in determining the performance outcomes, but indicates that environmental accounting can only lead to financial gains when firms have enough structures to internalise the environmental costs.

[Humphrey et al. \(2023\)](#) state that the bulk of EA literature has been drifting toward appreciating the importance of environmental performance and incorporating sustainability indicators into the financial markets. Their overview brings out consistent controversies on whether EA serves the interests of capital market players or the wider social goals. It is implied by this tension that the results of FP can vary depending on the conceptualisation of environmental accounting, its measurement, and its use by companies. In a similar opinion, [Rounaghi, 2021](#) concludes that EA disclosures are related to lower financial risk and better future performance, which supports the theory that EA leads to FP by increasing risk assessment and control over actual profitability benefits.

In a research study conducted by [Liu et al. \(2022\)](#), they employ the GMM to demonstrate that sustainability-related disclosures, quality of governance and technological adoption have a positive and significant impact on the performance of the firm. They have also found that non-financial performance measurements and governance systems mediate the sustainability-financial performance linkage and suggested

that more rigid application of fairness and governance criteria disclosure should be implemented to improve information symmetry and investor trust. On the same note, [Farza et al. \(2021\)](#) use a two-step system GMM model to demonstrate the positive impact of environmental innovation on FP and attribute these benefits to the enhanced resource efficiency and reputational capital. They lay stress on encouraging green innovation by the use of favourable regulatory and financing systems.

Moderation effects were also reported among the evidence in a study by [Li et al. \(2023\)](#), who conducted a study of a large panel of Chinese listed firms. They found that in highly information asymmetrical environments, greenwashing can initially increase FP. Yet, this influence diminishes when the environmental regulation is strict and becomes opposing when the media pressure is increased. The paper has emphasised the importance of institutional enforcement and media transparency in punishing opportunistic environmental disclosure. In a similar institutional environment, [Abubakr et al. \(2024\)](#) demonstrate that inadequate environmental accounting disclosure models among GCC industrial companies impede the quality of the supply chain and sustainability development. In their findings, they propose that the problem of disclosure does not only lie in technical but in institutional form that requires harmonised standards and regulatory transparency.

Research by [Seun et al. \(2023\)](#) reported a mixed effect of EA components on FP. Although the policies in terms of pollution control have a positive impact on ROA, environmental research and development, and waste management have a negative impact on ROA when they are not managed properly. This study advises that more emphasis should be placed on effective environmental management systems in order to prevent cost overruns. Conversely, [Wobo & Odoemelam \(2024\)](#) observe a positive correlation between the cost of environmental accounting and the performance of oil and gas companies in Nigeria in terms of the results of panel regression with robustness checking, indicating that the cost of actively adhering to the environment improves the legitimacy and profitability of the high-risk sector.

The significance of the indirect transmission channels is supported by evidence obtained using structural and mediation-based methodologies. Through the application of structural equation modelling, [Al-Mawali \(2021\)](#) proves that environmental cost accounting has a positive direct and indirect influence on financial performance through environmental performance. This result confirms contingency-based argument that monetary benefits of environmental accounting become realised when companies translate the accounting practices into physical environmental benefits. Similarly, [Mayndarto & Murwaningsari \(2021\)](#) show that the environmental management accounting and environmental strategy have great positive effects on environmental performance and economic performance, and that the managerial commitment enhances a number of these connections. Their findings highlight the environmental accounting implementation on a strategic and behavioural level.

Methods

Research Design

The research design adopted in the study is an *ex post facto* research design because it is suitable for studying historical financial and EA data without any manipulation by the researcher. It is a design that fits causal-comparative analysis in which the independent variables, EA, are not directly manipulable but rather, they are observed retrospectively

because they have naturally occurred throughout the time (Kerlinger and Lee, 2000). *Ex post facto* approach enables the research to establish the association between variations in EA practices and changes in firms in FP in a systematic manner, with the help of secondary data that will be collected from published financial reports.

Population, Sampling Design and Size

The study population comprise forty-four (44) Nigerian Exchange Group (NGX)-quoted manufacturing companies. To choose twenty (20) listed manufacturing firms, a purposive sampling method is utilised to cover the timeframe of 2010–2024. The criteria applied to select are continuous listing on the NGX during the study period and the availability of full and consistent financial reports and environmental disclosure reports needed to perform empirical analysis (Central Bank of Nigeria, 2022). The sample is sufficiently large to represent the heterogeneity of firms in the green accounting practices and financial performance, and also provides a balanced structure of the panel, which assures the econometric estimation is robust and reliable.

Model Specification

This paper is based on the RBV, which is the model of firm-level financial performance that is explicable by internally generated environmental accounting resources which have potential value-creating characteristics. Consistent with the RBV assumption that sustainable performance differentials arise from heterogeneous internal resource deployment, environmental accounting practices, environmental cost management (ECC), environmental prevention cost (EPC), energy intensity (EIT), and waste management expenditure (WME), environmental impact per energy (EI_GJ) is treated as a strategic firm-specific resource. Firm size (FS) is incorporated as a moderating variable to capture scale-related effects on financial outcomes within the EA–FP nexus. Following this, the framework is consistent with prior empirical studies (Uwuigbe et al., 2020).

The general functional relationship, which is the baseline model, is implicitly below:

$$FP_{it} = (ECC_{it}, EPC_{it}, EIT_{it}, WME_{it}, EI_GJ_{it}, FS_{it},)$$

1

To capture alternative dimensions of financial performance, Equation (1) is decomposed into two estimable models:

$$ROE_{it} = (ECC_{it}, EPC_{it}, EIT_{it}, WME_{it}, EI_GJ_{it}, FS_{it},)$$

2

$$NPM_{it} = (ECC_{it}, EPC_{it}, EIT_{it}, WME_{it}, EI_GJ_{it}, FS_{it},)$$

3

$$NPM_{it} = (ECC_{it}, EPC_{it}, EIT_{it}, WME_{it}, EI_GJ_{it}, FS_{it}, FS * ECC_{it}, FS * EPC_{it},)$$

4

$$ROE_{it} = (ECC_{it}, EPC_{it}, EIT_{it}, WME_{it}, EI_GJ_{it}, FS_{it}, FS * ECC_{it}, FS * EPC_{it},)$$

5

Given the scale differences among firms, a linear–log specification is adopted. The baseline econometric models are specified as follows:

$$ROE_{it} = \alpha_0 + \beta_1 \log ECC_{it} + \beta_2 \log EPC_{it} + \beta_3 EIT_{it} + \beta_4 \log WME_{it} + \beta_5 \log FS_{it} + \beta_6 EI_GJ_{it} + \mu_{it}$$

6

$$NPM_{it} = \alpha_0 + \beta_1 \log ECC_{it} + \beta_2 \log EPC_{it} + \beta_3 EIT_{it} + \beta_4 \log WME_{it} + \beta_5 \log FS_{it} + \beta_6 EI_GJ_{it} + \mu_{it}$$

7

$$ROE_{it} = \alpha_0 + \beta_1 \log ECC_{it} + \beta_2 \log EPC_{it} + \beta_3 EIT_{it} + \beta_4 \log WME_{it} + \beta_5 \log FS_{it} + \beta_6 EI_GJ_{it} + \beta_7 \log FS * \log EPC_{it} + \beta_8 \log FS * \log ECC_{it} + \mu_{it}$$

8

$$NPM_{it} = \alpha_0 + \beta_1 \log ECC_{it} + \beta_2 \log EPC_{it} + \beta_3 EIT_{it} + \beta_4 \log WME_{it} + \beta_5 \log FS_{it} + \beta_6 EI_GJ_{it} + \beta_7 \log FS * \log EPC_{it} + \beta_8 \log FS * \log ECC_{it} + \mu_{it}$$

9

Natural logarithmic transformation is applied to ECC, EPC, WME, and FS to reduce scale effects, address potential heteroskedasticity, and linearise the relationship between EA and FP. As shown in Table 1 EIT and EI_GJ are retained in their original form because they are ratio-based intensity measures and already scale-neutral. The interaction terms are constructed using the logged values of firm size and the respective environmental accounting variables to ensure consistency and interpretability.

Where: α_0 is the intercept; β_{1-8} is the coefficient of the explanatory variables μ is the error term; i is the 20 listed manufacturing firms, t-2010-2024

Method of Data Analysis

In this research, descriptive and inferential statistics are used. The descriptive statistics are initially used to summarise the obtained data and analyse the patterns of distributions,

Table 1. Variable Description and Measurement

Variable	Description	Measurement	Source
NPM	Net Profit Margin	Profit after tax divided by total revenue, expressed as a percentage	Annual financial statements
ROE	Return on Equity	Profit after tax divided by shareholders' equity	Annual financial statements
ECC	Environmental Compliance Cost	Annual expenditure incurred to meet environmental laws and regulatory standards	Annual reports and sustainability reports
EPC	Environmental Prevention Cost	Expenditure on pollution prevention, environmental protection, and control activities	Annual reports and sustainability reports
WME	Waste Management Expenditure	Costs related to waste reduction, recycling, treatment, and disposal	Annual reports and sustainability reports
EI_GJ	Environmental Impact per Energy	Total environmental impact per energy output	Annual reports and sustainability reports
EIT	Energy Intensity	Total energy consumed by the firm	Annual reports and sustainability reports
FS	Firm Size	Log of Total Assets	Annual financial statements

Source: Author's compilation (2025)

such as skewness and possible outliers. In order to identify the

right panel regression strategy, the Hausman test is carried out to decide whether to adopt a fixed-effects or random-effects model. The strength and consistency of the findings are also determined with some diagnostic tests, including the Variance Inflation Factor (VIF) to evaluate the presence of multicollinearity, the Wooldridge test to assess the autocorrelation, and the tests of heteroscedasticity and cross-sectional dependence.

Result and Discussion

Descriptive Statistics

The descriptive statistics presented in [Table 2](#) showed that on average, firms allocate 422.54 million naira to ECC, reflecting a moderate level of compliance expenditure, with substantial variation across firms (SD = 217.39). EIT exhibits a mean of 427,489.1 GJ, with a high SD of 320,638.1, indicating wide disparities in energy efficiency practices among firms. EPC averages 262.17 million naira, suggesting moderate investments in proactive environmental measures, while WME has a mean of 78.81, showing relatively consistent efforts in waste reduction. FS displays a mean of 418,570.5, highlighting notable variation in operational scale within the sample.

FP indicators reveal that ROE averages 33.51% (SD = 38.99), while NPM averages 12.86% (SD = 4.42). ROE exhibits substantial positive skewness (2.85) and high kurtosis (12.68), reflecting the presence of firms with exceptionally high returns relative to the sample, whereas NPM shows mild negative skewness (-0.11) and moderate kurtosis (1.73), suggesting relatively symmetric performance around the mean. Environmental impact per energy (EI_GJ) averages 0.847 with low dispersion (SD = 0.37), indicating general consistency in energy consumption efficiency when scaled by firm size. The Jarque-Bera tests for all variables are significant at the 1% level ($p < 0.01$), confirming deviations from normality, which is common in financial and environmental cost data due to firm-specific heterogeneity.

Pre-Analysis Test

All VIF values in [Table 3](#) are below 5, indicating that multicollinearity is not a concern among the independent variables and their interaction terms. This confirms that the estimated coefficients for environmental accounting variables, firm size, and energy intensity are reliable and not inflated due to intercorrelations among regressors, thereby supporting the robustness of the regression results.

Pre-Analysis Test

The Hausman test results for the panel regressions are presented in [Table 4](#) to evaluate whether the fixed-effects (FEM) or random-effects (REM) model is more appropriate for each equation. For Equations 4 ($\chi^2 = 6.88$, $p = 0.3321$), 6 ($\chi^2 = 4.80$, $p = 0.5697$), and 7 ($\chi^2 = 4.14$, $p = 0.8439$), the p-values exceed the 5% significance level, indicating that the null hypothesis of no correlation cannot be rejected, and the random-effects specification is preferred. Conversely,

Equation 5 ($\chi^2 = 16.20$, $p = 0.0396$) has a p-value below 0.05, suggesting that the fixed-effects model is more suitable for this regression. The Hausman test confirms that the choice between fixed and random effects varies across models, depending on the underlying correlation structure of the regressors with the error term.

Table 2. Variance Inflation Factor (VIF) Results

Variable	VIF	1/VIF
LogECC	1.21	0.826
LogEPC	1.28	0.781
EIT	1.12	0.893
LogWME	1.25	0.800
LogFS	1.15	0.870
EI_GJ	1.10	0.909
LogFS * LogEPC	1.32	0.758
LogFS * LogECC	1.30	0.769
Mean VIF	1.21	

Source: Author's Computation Using EViews 13 (2026)

Table 3. Hausman Test Result

Equation	χ^2	d.f.	Prob.
4	6.880225	6	0.3321
5	16.199744	8	0.0396
6	4.799872	6	0.5697
7	4.143544	8	0.8439

Source: Author's Computation Using Eviews 13 (2026)

Table 4. Result of Panel Regression Between EA and ROE

Dependent Variable: ROE				
Variable	Without Moderation (REM)		With Moderation (FM)	
	Coefficient	Prob	Coefficient	Prob
EI_GJ_	-40.04825	0.0000	39.09559	0.0000
EIT	7.01E-05	0.0000	6.86E-05	0.0000
LOGECC	2.687937	0.3569	73.07240	0.6224
LOGEPC	-2.906846	0.2938	114.6317	0.3991
LOGFS	15.93536	0.6597	405.2931	0.3166
LOGWME	1.934287	0.8908	3.859166	0.7902
C	-11.65567	0.9179	44.30996	0.4066
LOGEPC*LOGFS	--	--	29.52687	0.6121
LOGFS*LOGECC	--	--	1049.857	0.3119
R-squared	0.223289		0.290109	
Adjusted R-squared	0.207383		0.219641	
Durbin-Watson	1.957330		2.112426	
F-statistic	14.03858		4.116934	
Prob(F-statistic)	0.000000		0.000000	

Source: Author's Computation Using Eviews 13 (2026)

Table 5. Summary of the Variables Statistics

Variables	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	J.B	Prob.
ECC	422.5378	790.1652	54.14159	217.3947	-0.043821	1.761978	19.25474	0.000066
EIT	427489.1	1390345.	14619.14	320638.1	0.949777	3.133559	45.32678	0.000000
EPC	262.1724	497.8556	32.37894	140.2971	0.036506	1.719360	20.56712	0.000034
WME	78.81330	97.86070	60.18772	11.15867	0.014607	1.764512	19.09104	0.000072

Variables	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	J.B	Prob.
FS	12.74918	13.5896	10.8669	0.6926	-0.8095	-0.2642	11.5316	0.00031
ROE	33.51242	251.6314	0.983974	38.98769	2.849542	12.67614	1576.340	0.000000
EI_GJ	0.847057	1.497314	0.206022	0.373715	-	1.881660	15.74355	0.000381
					0.046901			
NPM	12.86154	19.97521	5.086380	4.423233	-0.10644	1.725302	20.87711	0.000029

Source: Author's Computation Using Eviews 13 (2026)

Table 6. Result of Panel Regression Between EA and NPM

Dependent Variable: NPM				
Variable	Without Moderation (REM)		With Moderation (REM)	
	Coefficient	Prob	Coefficient	Prob
EI_GJ	0.498171	0.0610	0.595300	0.0911
EIT	-1.60E-06	0.1066	-1.72E-06	0.0859
LOGECC	0.975289	0.0083	-10.37422	0.5712
LOGEPC	-0.612566	0.0799	16.57151	0.0230
LOGFS	1.142108	0.8022	11.53396	0.8176
LOGWME	-1.407263	0.4283	-1.398880	0.4347
C	13.91928	0.3289	-6.743784	0.3057
LOGEPC*LOGFS	--	--	4.447039	0.5361
LOGFS*LOGECC			-12.51926	0.9222
R-squared	0.344874		0.348729	
Adjusted R-squared	0.225315		0.222577	
Durbin-Watson	1.978929		1.994671	
F-statistic	2.294318		1.863321	
Prob(F-statistic)	0.035172		0.065543	

Source: Author's Computation Using Eviews 13 (2026)

The results of the panel regression in [Table 5](#), examining the connection between EA and ROE for Equations 6 (without moderation) and 8 (with moderation), are presented in [Table 4](#). In the REM without moderation, the results show that EI_GJ has a negative and significant effect on ROE ($\beta = -40.05$, $p < 0.01$), indicating that firms with higher environmental impact per unit of energy consumption experience reduced profitability. EIT has a positive and significant coefficient ($\beta \approx 7.01E-05$, $p < 0.01$), suggesting that more energy-efficient firms tend to generate higher returns. LOGECC exhibits a positive but non-significant coefficient ($\beta = 2.69$, $p = 0.36$), implying that compliance expenditures alone do not meaningfully affect profitability. LOGEPC has a negative, non-significant coefficient ($\beta = -2.91$, $p = 0.29$), implying that preventive environmental expenditures have no detectable impact on ROE in the absence of moderation. LOGFS (firm size) shows a positive, non-significant effect ($\beta = 15.94$, $p = 0.66$), indicating that larger firms do not automatically achieve higher ROE. LOGWME (waste management expenditures) is positive but non-significant ($\beta = 1.93$, $p = 0.89$), implying that waste management costs alone do not affect profitability. The model explains approximately 22.33% of the variation in ROE ($R^2 = 0.2233$), with a Durbin-Watson statistic of 1.957, indicating no serious autocorrelation issues.

In the FEM with moderation, EI_GJ remains negative and significant ($\beta = -39.10$, $p < 0.01$), reaffirming that higher environmental burdens reduce ROE. EIT continues to positively influence ROE ($\beta \approx 6.86E-05$, $p < 0.01$), confirming that energy efficiency enhances profitability. LOGECC now shows a negative but non-significant coefficient ($\beta = -73.07$, $p = 0.62$), while LOGEPC also remains negative and non-significant ($\beta = -114.63$, $p = 0.40$), suggesting that their direct effects on ROE are not statistically meaningful even when moderation is considered. LOGFS exhibits a large negative, non-significant effect ($\beta = -405.29$, $p = 0.32$), indicating that firm size alone does not significantly affect ROE. LOGWME remains positive and non-significant ($\beta = 3.86$, $p = 0.79$). The interaction terms, LOGEPC*LOGFS ($\beta = 29.53$, $p = 0.61$) and

LOGFS*LOGECC ($\beta = 1049.86$, $p = 0.31$), are positive but statistically insignificant, showing that firm size does not significantly moderate the relationship between environmental expenditures and ROE. The adjusted R^2 improves slightly to 21.96%, and the Durbin-Watson value of 2.112 suggests minimal autocorrelation.

In [Table 6](#) above, the REM without moderation shows that EI_GJ exhibits a positive and significant relationship with NPM ($\beta = 0.50$, $p \approx 0.06$), meaning that firms with higher environmental impact improve profit margins significantly at 10%. EIT carries a negative and insignificant coefficient ($\beta \approx -1.60E-06$, $p = 0.11$), indicating that variations in energy intensity do not meaningfully influence net profit margins. LOGECC shows a positive and statistically significant effect on NPM ($\beta = 0.98$, $p < 0.01$), implying that higher environmental compliance expenditure is associated with improved profitability, possibly due to efficiency gains or reputational benefits.

LOGEPC has a negative and weakly significant coefficient ($\beta = -0.61$, $p \approx 0.08$), suggesting that preventive environmental expenditures may slightly compress profit margins in the short run. LOGFS records a positive but clearly insignificant coefficient ($\beta = 1.14$, $p = 0.80$), indicating that firm size does not significantly affect NPM. LOGWME is negative and insignificant ($\beta = -1.41$, $p = 0.43$), implying that waste management costs do not translate into measurable changes in profit margins. The model explains a moderate proportion of variation in NPM ($R^2 = 0.34$), with the joint significance of regressors confirmed at the 5% level.

With Moderation (Random Effects Model with Interaction Terms)

In the moderated model, EI_GJ remains positive but

Table 7. Result of Residual Cross-Section Dependence Test

Equation	Statistic	d.f.	Prob.
6	-2.1241	190	0.2145

Equation	Statistic	d.f.	Prob.
7	-1.563957	190	0.1178
8	-0.772920	190	0.4396
9	-0.853600	190	0.3933

Source: Author's Computation Using EViews 13 (2026)

Table 8. Results of Residual Serial Correlation and Heteroskedasticity Tests

Equations	Wooldridge Correlation)	(Serial	Breusch–Pagan (Heteroskedasticity)	
	χ^2	prob	χ^2	prob
6	0.785422	0.8531	0.52564	0.4214
7	0.812936	0.8127	0.60318	0.4379
8	0.694217	0.8945	0.47806	0.4896
9	0.731884	0.8723	0.55641	0.4558

Source: Author's Computation Using EViews 13 (2026)

significant at 10% ($\beta = 0.60$, $p \approx 0.09$), indicating that environmental intensity exerts a significant influence on NPM when firm size interactions are considered. EIT continues to show a negative and significant ($\beta \approx -1.72E-06$, $p \approx 0.09$), meaning that energy efficiency variations have limited implications for profit margins. LOGECC becomes negative insignificant ($\beta = -10.37$, $p = 0.57$), indicating that its earlier positive effect on NPM does not persist once moderation is introduced. In contrast, LOGEPC turns positive and significant ($\beta = 16.57$, $p < 0.05$), suggesting that preventive environmental expenditures enhance profit margins when firm-specific effects are controlled. LOGFS remains positive but insignificant ($\beta = 11.53$, $p = 0.82$), reaffirming that firm size alone does not directly influence NPM. LOGWME retains a negative and insignificant coefficient ($\beta = -1.40$, $p = 0.43$).

The interaction terms, LOGEPC*LOGFS ($\beta = 4.45$, $p = 0.54$) and LOGFS*LOGECC ($\beta = -12.52$, $p = 0.92$), are both statistically insignificant, indicating that firm size does not significantly moderate the effects of environmental prevention or compliance costs on NPM. Explanatory power of $R^2 = 0.35$, showed that approximately 35% variation is explained in NPM.

Table 7 presents the results of the residual cross-section dependence test for Equations 4 to 7. The test statistics for all equations are statistically insignificant, with probability values exceeding the 5%. Specifically, Equation 4 reports a probability of 0.2145, Equation 5 shows 0.1178, Equation 6 records 0.4396, and Equation 7 indicates 0.3933. These results suggest that the null hypothesis of no cross-sectional dependence cannot be rejected across all estimated models. Hence, the residuals are cross-sectionally independent, implying that unobserved shocks affecting one firm do not systematically spill over to other firms in the panel.

The Wooldridge test in Table 8 for the four equations indicate that the null hypothesis of no first-order serial correlation cannot be rejected, as all probability values exceed the 5%. Similarly, the Breusch–Pagan test results show no evidence of heteroskedasticity across the models. These findings confirm that the panel regression estimates are free from serial correlation and heteroskedasticity problems, thereby supporting the efficiency and reliability of the reported regression results.

The study examines the relationship between EA practices and firm financial performance, as measured by ROE and NPM, and how this relationship changes with and without firm size moderation. The findings reinforce the growing consensus that the financial implications of environmental accounting are neither uniform nor automatic but depend on the nature of environmental activities, efficiency outcomes, and firm-specific conditions.

For ROE, the outcome of Equation 6 (no moderation)

shows that the environmental impact per energy (EI_GJ) has a significant and negative impact on profitability. It indicates that the shareholder returns of firms are lower the higher the environmental burden in comparison to the use of energy, probably because of inefficiencies, regulatory expenditures, or reputational losses due to the greater environmental impact, which reflects stakeholder sanctions and legitimacy costs arising from poor environmental outcomes. This is consistent with the research conducted in developing economies that highlights the pressure of environmental exposure on the cost side of mitigation, which is weak in the context of weak mitigation mechanisms (Seun et al., 2023).

However, in contrast, energy intensity (EIT) is positively and significantly correlated with ROE, which means that the companies which manage energy use more efficiently enjoy lower operating costs and better returns, demonstrating the RBV mechanism through which internal efficiency capabilities translate environmental practices into financial gains. This corroborates the efficiency-based argument by Farza et al. (2021) and Mondal et al. (2024), who specify resource efficiency as one of the avenues through which environmental practices are converted into financial returns.

Other EA factors, LOGECC, LOGEPC and LOGWME do not provide significant impacts on ROE in the non-moderated model. This does not mean that these expenditures are irrelevant; rather, as opposed to being direct shareholder return drivers. The same neutral impact is obtained by Jamil & Ferrer (2020), who state that disclosures of EA seldom enhance firm profitability unless companies can internalise and strategically leverage such expenditures. The scale of the firm (LOGFS) is also not significant, implying that among Nigerian manufacturing firms.

When moderation is introduced in Equation 8, the core findings remain largely unchanged. EI_GJ continues to exert a significant negative effect on ROE, while EIT remains positive and significant, reinforcing the robustness of these relationships. However, neither the direct EA cost variables nor their interaction terms with firm size are statistically significant. This indicates that firm size does not meaningfully moderate the EA–ROE relationship. This outcome contrasts with evidence from China and other emerging markets, where size and institutional strength enhance the payoff from environmental strategies (Li et al., 2023). In the Nigerian manufacturing context, the finding points to what constrains the strategic exploitation of environmental investments, consistent with Abubakr et al. (2024).

For NPM, the non-moderated model (Equation 7) indicates that EI_GJ has a positive and significant impact at the 10% level on profit margins, suggesting that firms with higher environmental exposure may be able to transfer environmental costs to consumers through pricing and product differentiation, which aligns with Stakeholder Theory's emphasis on reputational capital and stakeholder acceptance as margin-protecting mechanisms. This is in line with the risk-management and reputational arguments developed by Sundarasan et al. (2024) and Rounaghi (2021), which argue that long-term margin protection may outweigh short-term efficiency losses.

The relationship between LOGECC and NPM is also positive and significant, meaning that compliance-related environmental expenditures can translate into better margins through operating discipline and enhanced stakeholder trust, reflecting a legitimacy-driven pathway rather than a pure efficiency channel, as also reported by Hanen & Mahmud (2024). However, LOGEPC is negative and significant at the 10% level, implying that preventive environmental investments may initially compress margins due to high upfront costs. This mirrors the mixed evidence reported by Seun et al. (2023), where certain environmental investments reduce profitability when not efficiently managed.

Other variables, EIT, LOGFS, and LOGWME, do not

significantly influence NPM, reinforcing the view that profit margins are less sensitive to scale and waste-related expenditures in the short run. The positive effect of EI_GJ on NPM remains significant at the 10% level, while EIT is marginally negative, indicating that efficiency-induced energy adjustments may not immediately improve margins due to rebalancing costs or capital expenditure requirements. It is noteworthy that LOGEPC becomes positive and significant in the moderated specification, suggesting that preventive environmental investments yield margin benefits, lending support to the RBV-based contingency argument advanced by Al-Mawali (2021) and Maydarto & Murwaningsari (2021).

The interaction between firm size and environmental expenditures remains insignificant, indicating that firm size does not moderate the EA–NPM relationship, consistent with the institutional perspective advanced by Humphrey et al. (2023).

Conclusion

This study examined the moderating role of FS in the relationship between EA practices and the FP of listed manufacturing companies in Nigeria, using panel regression techniques on data drawn from 20 firms over the period 2010–2024. The findings indicate that EA practices exert meaningful effects on FP. The results also show that EIT has a positive and significant effect on ROE, highlighting the importance of efficient energy utilisation in enhancing shareholder returns through cost containment, productivity gains, and improved operational resilience. EI_GJ has a negative and significant effect on ROE, indicating that higher environmental impact per unit of energy consumed erodes shareholders' returns by increasing operational inefficiencies, environmental compliance costs, and exposure to regulatory and reputational risks.

With respect to NPM, environmental compliance cost demonstrates a positive and significant direct effect in the non-moderated models, suggesting that compliance-oriented investments can improve profit margins by strengthening corporate legitimacy, reducing regulatory risk, and enhancing stakeholder confidence. Environmental protection cost displays a positive and significant effect on NPM.

References

- Abaidoo, R., & Agyapong, E. K. (2024). Institutional Framework, Macroeconomic Instability and Financial Markets: Perspective from Emerging Economies. *Journal of Economic and Administrative Sciences*, 2(4), 20–45. <https://doi.org/10.1108/JEAS-08-2023-0214>
- Abubakr, A. A. M., Sahal, M. S., Mohammed, A. A. A., Yousif, N. A. I., Mohammed, F. M. A., & Roustom, Z. M. (2024). Challenges of Disclosing Environmental Accounting Performance and its Impact on Quality Supply Chains to Promote Sustainable Development in Companies. *Sustainability*, 16(24), 11243. <https://doi.org/10.3390/su162411243>
- Akhter, F., Hossain, M. R., Elrehail, H., Rehman, S. U., & Almansour, B. (2023). Environmental Disclosures and Corporate Attributes from the Lens of Legitimacy Theory. *European Journal of Management and Business Economics*, 32(3), 342–369. <https://doi.org/10.1108/EJMBE-01-2021-0008>
- Akinlade, O. O., Adedokun, L. B., Taiwo, L. A., & Osisanya, F. P. (2025). Corporate Environmental Responsibility and Financial Performance: A Study of Nigerian Manufacturing Firms. *ISAR Journal of Multidisciplinary Research and Studies*, 3(4), 24–34.
- Al-Mawali, H. (2021). Environmental Cost Accounting and Financial Performance. *Accounting*, 7(3), 535–544. <https://doi.org/10.5267/j.ac.2020.12.003>
- Amoako, G. K., Adam, A. M., Arthur, C. L., & Tackie, G. (2021). Institutional Isomorphism, Environmental Management Accounting and Environmental Accountability. *Environment, Development and Sustainability*, 23(8), 11201–11216. <https://doi.org/10.1007/s10668-020-01140-y>
- Central Bank of Nigeria. (2022). *Annual Report and Statement of Accounts*.
- Farza, K., Ftiti, Z., Hlioui, Z., Louhichi, W., & Omri, A. (2021). Does it Pay to Go Green? Environmental Innovation Effect on Corporate Financial Performance. *Journal of Environmental Management*, 300, 113695. <https://doi.org/10.1016/j.jenvman.2021.113695>
- Financial Reporting Council of Nigeria. (2025). *Sustainability Reporting Guideline (SRG 01) in Nigeria*.
- Frances, C. C., & Nworie, G. O. (2025). Firm Size: A Strategic Booster of Shareholder Wealth Maximisation. *International Journal of Academic Accounting, Finance and Management Research*, 9(4), 7–57.
- Hanen, B., & Mahmod, A. (2024). Environmental Accounting

Environmental impact per unit of energy consumption (EI_GJ) exhibits a positive and significant relationship with ROE, implying that higher environmental burdens tend to erode profitability when not adequately managed or offset by efficiency-enhancing strategies. However, waste management expenditure and the interaction terms involving firm size remain insignificant across the models, implying that institutional constraints, scale inefficiencies, or suboptimal integration of environmental initiatives may limit the extent to which firm size enhances the financial returns from environmental accounting practices. The study concludes that while environmental accounting practices significantly influence financial performance, firm size does not play a meaningful moderating role in shaping this relationship among listed manufacturing firms in Nigeria.

The study recommends that firms should adopt advanced energy management systems, such as renewable energy integration and process optimisation technologies, which can reduce operational costs and mitigate environmental risks, thereby enhancing asset utilisation and shareholder value. They should also strategically allocate resources to ECC, viewing them not merely as regulatory obligations but as opportunities to build reputational capital and stakeholder trust, which can lead to better market positioning and pricing power.

Author contributions

Author's Contribution Statement: Awe-Mathias Chris Sunday conceptualised the study, developed the research objectives, designed the methodology, and led the data analysis and interpretation of results. He also drafted the initial version of the manuscript and coordinated revisions in line with reviewers' comments.

Abiola Mikail Tonade contributed to the literature review, theoretical framework development, and refinement of the research hypotheses. Sunday Olugboyega Kajola provided overall academic supervision and intellectual guidance throughout the study. Amos Adejare Aderibigbe contributed to the study design and econometric analysis, reviewed the empirical models and particularly the discussion and conclusion sections.

- Practices and Corporate Global Performance. *International Journal of Sustainable Economies Management*, 13(1), 1–18.
- Humphrey, C., O'Dwyer, B., & Unerman, J. (2023). Environmental Accounting in the European Accounting Review. *European Accounting Review*, 33(4), 1–26.
- Jamil, C. C., & Ferrer, R. C. (2020). Effect of Environmental Accounting on Financial Performance. *Asia-Pacific Social Science Review*, 20(1), 149–163. <https://doi.org/10.59588/2350-8329.1287>
- Khan, M., Serafeim, G., & Yoon, A. (2021). Corporate Sustainability: First Evidence on Materiality. *The Accounting Review*, 96(1), 169–202. <https://doi.org/10.2308/accr-52680>
- Li, W., Li, W., Seppänen, V., & Koivumäki, T. (2023). Effects of Greenwashing on Financial Performance. *Business Strategy and the Environment*, 32(1), 820–841. <https://doi.org/10.1002/bse.3132>
- Liu, Y., Kim, C. Y., Lee, E. H., & Yoo, J. W. (2022). Relationship between Sustainable Management Activities and Financial Performance. *Sustainability*, 14(3), 1168. <https://doi.org/10.3390/su14031168>
- Margiutomo, S. A. S., & Jayanti, F. D. J. (2025). Integrating Financial Planning with Business Strategy to Achieve Long-Term Competitive Advantage. *The Journal of Academic Science*, 2(5), 1411–1420.
- Maydarto, E. C., & Murwaningsari, E. (2021). Environmental Management Accounting and Environmental Strategy. *Journal of Industrial Engineering and Management Research*, 2(2), 35–38.
- Mondal, M. S. A., Akter, N., & Ibrahim, A. M. (2024). Nexus of Environmental Accounting and Financial Performance. *Environmental Challenges*, 15, 100878. <https://doi.org/10.1016/j.envc.2024.100878>
- Obasan, O. T. (2025). Corporate Social Responsibilities and Sustainability of Listed Manufacturing Firms in Nigeria. *Fane-Fane International Multidisciplinary Journal*, 9(1), 53–58.
- Osemene, O. F., Adinnu, P., Fagbemi, T. O., & Olowookere, J. K. (2024). Corporate Governance and Environmental Accounting Reporting. *Global Business Review*, 25(4), 1096–1119. <https://doi.org/10.1177/09721509211010989>
- Pérez Estébanez, R., & Sevillano Martín, F. J. (2025). Business Sustainability and its Effect on Performance Measures. *Sustainability*, 17(1), 297. <https://doi.org/10.3390/su17010297>
- Rounaghi, M. M. (2021). A Systematic Review on Environmental Accounting. *International Journal of Ethics and Systems*, 37(3).
- Schenk, S. F., & Dasoo, M. (2024). Financial Performance as a Driver of Sustainable Investment. *Journal on Innovation and Sustainability RISUS*, 15(2), 96–112. <https://doi.org/10.23925/2179-3565.2024v15i2p96-112>
- Seun, K. J., Esther, I. O., Isaiah, O. O., & Emmanuel, D. M. (2023). Environmental Accounting Practice and Financial Performance of Listed Aviation Firms. *Asian Journal of Economics, Business and Accounting*, 23(13), 70–80. <https://doi.org/10.9734/ajeba/2023/v23i13720>
- Sundarasan, S., Rajagopalan, U., & Alsmady, A. A. (2024). Environmental Accounting and Sustainability: A Meta-Synthesis. *Sustainability*, 16(21), 9341. <https://doi.org/10.3390/su16219341>
- Swalih, M. M., Adapa, S., & Türkmendağ, Z. (2024). Environmental Management Accounting for Strategic Decision-Making. *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.3828>
- Uwuigbe, U., Egbide, B., Eluyela, D. F., Oladipo, O. A., & Obarakpo, T. (2020). Corporate Environmental Disclosure and Financial Performance. *International Journal of Business Performance Management*, 21(3), 321–337. <https://doi.org/10.1504/IJBPM.2020.107862>
- Wobo, H. O., & Odoemelam, N. (2024). Environmental Accounting Costs and Financial Performance of Oil and Gas Companies in Nigeria. *Universal Journal of Accounting and Finance*, 12(5), 124–137. <https://doi.org/10.13189/ujm.2024.120401>
- World Bank. (2020). *World Development Report: Trading for Development in the Age of Global Value Chains*. World Bank.