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Environmental and Financial firm Performance Nexus: Moderating Role of Internal and External Governance Mechanism

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ABSTRACT

In an era marked with growing environmental concerns, this study delves into the nexus between environmental performance and firm performance with the moderating role of governance mechanisms in the non-financial sectors of Brazil, Russia, India, China, and South Africa (BRICS). The research employs a Generalized Method of Moments (GMM) by taking data from 176 companies for 11 years (2012-2022). The findings reveal a significant positive influence of environmental performance on business performance, indicating the importance of sustainable practices in enhancing business outcomes. Furthermore, internal governance has an advantageous influence on the environment and firm performance nexus. External governance mechanisms, encompassing government efficiency, political stability, regulation, rule of law, voice and accountability, and control of corruption, also play a crucial role. While these mechanisms partially increase the association between environmental and company performance, some elements show an unfavourable affinity, highlighting challenges in regulatory frameworks and institutional environments. Such results have ramifications for regulators, firms, and financiers, giving perspectives on the significance of adopting ecological sustainability to business management procedures. By understanding the moderating effects of governance mechanisms, organizations can navigate their challenges and capitalize on opportunities presented by environmental initiatives.

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1. Introduction

Despite continuous discussion on environmental sustainability and company performance nexus, this research probes the modification of this link because of internal and external governance frameworks. Since society and businesses prioritise sustainability and ethical and environmental behaviour, the question of how the environment influences company performance has become more relevant. In compliance with ISO 140001, environmental performance means how an organization interacts with the environment. As part of its environmental control apparatus, a company addresses the effects of its use of resources, organisational processes, goods and services, and compliance with the law and environmental regulations. Performance in the environmental field consists of two key components: (1) quantifiable consequences of the environmental oversight process in a company that is connected to its ecological strategy, objectives, and aims, and (2) results about how to handle a corporation's environmental consequences (Arafat et al., 2012).

Horváthová (2012) found that a higher level of profitability, as calculated by yield on assets, is a consequence of improved sustainability (environmental assessments conducted by companies consist of acquiescence records, waste reduction spending, and others). To enhance organizational and environmental performance, professionals and decision-makers should institutionalize green innovation approaches within their businesses. Ahmed et al.'s (2023) study showed that environmental performance is highly impacted by both internal (employees) and external (surroundings and the public) CSR-related techniques. The observations indicate that environmental responsibility has an advantageous impact on organizational and environmental performance, improving organizational performance (Huynh, 2020).

Luo and Qu (2023) concluded that environmental corporate societal task enhances the sustainability of a business. According to the findings, CSR components (monetary, regulatory, socially conscious, and ecological) have an advantageous effect on system collaboration, sustainable development, and enterprise effectiveness; system cooperation, consecutively, has a good impact on environmentally conscious innovation and company efficiency (Nguyen & Vien, 2023). Uyar et al. (2023) ascertained that corporate ecological effectiveness can increase firm value, meaning that shareholders respond positively to involvement in the surroundings. Maji and Lohia (2023) proposed that ESG performance and its components are favorably related to business performance.

Although a company's profitability fluctuates, it must nevertheless contribute to society in a certain way. Numerous societal factors influence how well a company performs, and one of those elements—environmental performance—helps the company function better. Shareholders hesitate to make eco-friendly investments due to short-term financial worries, uncertainty about long-term returns, and the belief that green practices may not immediately translate into profits, leading to inevitable agency problems. Fisher-Vanden and Thorburn (2011) indicated a decrease in shareholder value when companies declare their participation in climate leaders and ceres and when a specific greenhouse gas reduction objective is published. Seckin-Halac et al. (2021) demonstrated that organizations with limited ownership are often more unwilling to engage in corporate environmental and social responsibility as controlling shareholders give less attention to societal and stakeholder problems.

Therefore, a mechanism is required to address the agency issue, i.e., both external and internal Governance. Alabdullah et al. (2022) recommended attaining great corporate supremacy; inside control mechanisms and board, features are essential. Many modern organizations have agency issues since ownership and control are frequently divided. The committee of directors is liable for reducing such agencies' concerns, supporting the enterprise's mission, and providing transparency to shareholders (Yu, 2023). Internal governance can mitigate agency problems (Acharya et al., 2011). As stated by John and Senbet (1998), internal (committee functions and CEO remuneration contracts) and external governance systems (marketplaces for corporation oversight and immediate action/shareholder agitation) may mitigate agency concerns. According to a diverse group of economists and financial professionals, the number of directors is essential for influencing business growth and achievement. It may assist in decreasing the overall expenses associated with accomplishing enterprise (Almashhadani & Almashhadani, 2022).

When specifically addressing the significance of the study, it initially expands to review the moderating effects of both inside and outside governance methods in the relationship between corporate environmental performance and financial performance. This study focused on non-financial

sectors of emerging economies, such as Brazil, Russia, India, China, and South Africa (BRICS). The results of the study are helpful for policymakers in updating and creating new environmental regulations. Policymakers can be advised by the practical consequences of the research findings. This study shows how internal and external governance mechanisms may address challenges brought on by implementing environmental performance in the firm, which is useful for businesses.

2. Literature Review

2-1. Environmental Performance and Firm Performance

Companies have argued for a long time about how environmental performance impacts performance. Elsayed and Paton (2005) analyze the financial outcomes of ecological efficiency using both passive and active panel data analysis. Results point to an impartial connection between sustainable development and business performance. Tan et al. (2017) research first examines how personal and collective EP traits affect business outcomes. Aggregation sustainability improves revenue in the tourist industry. Yang (2012) aims to scientifically examine how handling environmental issues affects both business and sustainability. The implications of environmental oversight on sustainability and company revenue have been explored using the structural equation modeling method. Following the findings, handling environmental matters significantly improves the ecology and corporate success. Still, their investigation revealed no causal connection between the sustainability of the environment and business outcomes. Using a rating system based on the environmental hazards of various pollutants, Horváthová (2012) suggests a way to assess environmental performance more comprehensively. An outcome elaborates that sustainability has a detrimental impact on financial outcomes for a one-year lag; however, it has a favorable effect for a two-year lag based on environmental compliance records, waste reduction expenditures, and return on assets. Russo and Fouts (1997) concluded that enhanced environmental efficiency is related to superior financial success. The existence of the link between ecological performance and company earnings is a long and contentious debate. Ramanathan (2018) findings suggest a quadratic relationship: when enterprises increase their EP, they appear to obtain substantially superior business outcomes. These findings are reliable with a firm's resource-based perspective. As enterprises engage in EP activities, they collect unique knowledge that aids in further learning and firm performance improvement. According to the above discussion, the study has developed the first hypothesis.

H1. Environmental performance has a positive significant impact on firm performance.

2-2. Moderating Role of Internal and External Governance between Environmental and Firm Performance

Wahidahwati and Ardini (2023) address how environmental sustainability and good corporate supremacy affect firm worth as controlled through corporate social obligation. The inquiry suggests that the enhanced supremacy of corporations will raise the firm's worth and vice versa. According to Abdullah and Tursoy (2023) study, the behavior of audit committee and board of directors adversely impact a company's financial success. However, CEO duality has no statistically noteworthy influence on firm efficiency. Greater corporate governance generally serves to enhance profitability by limiting the potential hazards that owners experience, thereby aiding in attracting new shareholders (Manigandan et al., 2023). Mohan and Chandramohan (2018) panel assessment outcomes reveal each CG component, particularly the dual position of the chief executive officer and the size of the board of directors, had a substantial detrimental influence on the operation of the company; however, the board's makeup had no bearing on how efficiently the business operated. Based on Fuzi et al. (2016), aboard independence and business achievement had diverse results—either beneficial, detrimental or a negligible association with business achievement.

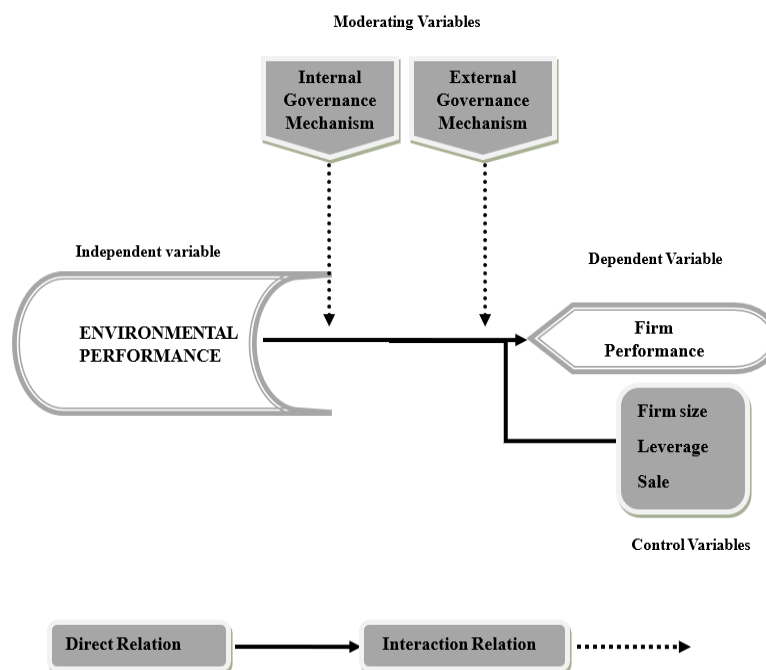
The Saha and Kabra (2019) reveal that executive integrity has a significant adverse effect on the accounting-based gauge of FP, while board composition, shareholding concentration, and the impartiality of the audit had an enormous advantageous influence on the market-driven measurement of FP. Furthermore, gender diversity and role dualism are not connected to FP. As stated by Albitar et al. (2020), the study appears to evaluate how ethical, social, and governance transparency influences firm profitability prior to and after integration reporting, whether corporate governance mechanisms may moderate this relationship. ESGD scores and company performance are positively associated and

statistically significant. In addition, there is evidence that corporate supremacy mechanisms (e.g., focus on ownership, gender diversity, and the number of directors) moderate this relationship. Regulatory regimes, market characteristics, and competitive situations all affect small firms' environmental behavior, but little is known about how these factors can impact environmental performance (Aykol & Leonidou, 2015). An environmentally friendly business practice can only be adopted and benefited when corruption is controlled, the authority of law is efficient, and voices and responsibilities are enacted. Corporate sustainability investment is more likely to be encouraged with a robust legal environment and effective governance. The ability to communicate corporate sustainability initiatives to stakeholders is also enhanced by a transparent and accountable government. Developing the company's vision, supporting its strategy, and meeting stakeholder demands are the tasks of the board of directors (Yu, 2023). By reducing agency conflicts and information asymmetry, these governance mechanisms will strengthen the association connecting sustainability and total business success via ensuring that ecologically acceptable methods are implemented effectively and fostering stakeholder confidence, which frequently improves financial performance and long-term sustainability. Nguyen (2022) deployed a collection of retail firms to explore the implications of managerial parameters, such as fraud, leadership effectiveness, peace in politics, legislation, rule of law as well as voice accountability on the profitability of the company. Researchers concluded that fraud has an unfavorable effect on overall firm performance. Still, governmental effectiveness, stability in power, legislation, rule of statute, and voice accountability have an uplifting effect on business achievement. External governance tools, such as takeover markets or legal systems, have a disciplinary function in monitoring managerial behavior to reduce agency difficulties and thereby increase profitability (Gillan, 2006). Min (2023) discovered that the absence of corruption inside public organizations is optimistically related to outstanding performance. The finding suggests that combating corruption may help improve public organizations' effectiveness. Therefore, the above discussion elaborates that internal and external governance are moderating in the relationship between environmental and firm performance.

H2. Internal governance mechanism strengthens the relationship between environmental performance and firm performance

H3. External mechanism of governance strengthens the relationship between environmental performance and firm performance

2-3. Conceptual Framework



3. Methods and Materials

3-1. Sampling Method

BRICS non-financial sectors were specifically targeted. The study used the purposive sampling technique as the main variable for environmental performance. The time frame spans from 2012 until 2022. The study's sample size is one hundred seventy-six companies. Since panel data is used, companies are adopted from various non-financial sectors at different times. Data from one hundred seventy-six companies has been collected over eleven years. DataStream and the World Bank database were used to obtain information for a statistical test.

3-2. Measurements of Variables

Table1 is demonstrating the proxies for each variable used in the study.

Table 1. Summary of Variables Used in Study Regression Models

Variable	Measurement	Sources
Firm performance (FP)	Tobin Q = Market value of total assets / the book value of total asset ROA = net income / total assets	(Hejazi et al., 2016; Maury, 2022; Pham & Tran, 2020; Shahbaz et al., 2020; Stoel & Muhanna, 2011).
Environmental performance (EP)	Environment pillar score data extracted from Refinitiv data stream ESG score database	(Elsayed & Paton, 2005; Guérin & Suntheim, 2021; Mao et al., 2023; Cheng et al., 2014; Garcia et al., 2017)
Internal governance mechanism CEO duality, Board size (BS), Board independence (BIND), Gender diversity (Gnd), Audit independence (AI)	CEO duality = Chairman serves as Managing Director, if yes then 1, else 0 Bs = entire number of directors Bind = % of Non-Executive Independent Directors to the total number of directors. GD = % of female directors out of total board members AI = % of audit committee members who are independent	(Saha & Kabra, 2019; Mohan & Chandramohan 2018; Babatunde & Olaniran 2009)
External governance mechanism Government effectiveness (GE), Political stability (PS), REGULATION (RQ), Rule of law (RL), Voice & accountability (VA), Control of Corruption (CC)	WGI calculates aggregate indicators across six dimensions of country governance	(Athari & Bahreini, 2023; Modugu & Dempere, 2020; Indicators-WGI, 2017; Ojeka et al., 2019)
Sales growth (GWT)	(previous period net sales - current period)/Prior period net sales	(Mohan & Chandramohan, 2018; Afinindy et al., 2021; Eka, 2018; Mohan & Chandramohan, 2018; Cevheroglu-Acar, 2018; Chen & Chen, 2011; Mota & Moreira, 2017; Nguyen et al., 2017; Savitri et al., 2012).
Leverage (LEV)	Total debt to total assets ratio	(Alipour, 2012; Bharadwaj et al., 1999; Hejazi et al., 2016; Lev & Sougiannis, 1996)
Firm size (FS)	Ln (total assets)	(Fiegenbaum & Karnani, 1991; Hall & Weiss, 1967; Hejazi et al., 2016; Jónsson, 2007; Karadeniz & İskenderoğlu, 2011; Lee, 2009; Majumdar, 1997; Ozgulbas et al., 2006; Saliha & Abdessatar, 2011; Serrasqueiro & Maças Nunes, 2008; Stierwald, 2009).

3-3. Research Models

- A moderating role for Board Structure Index (BIX) in relationships between Environmental Performance (ENFP) and Firm Performance (FP).

$$ROA_{i,t} = \beta_0 + \alpha ROA_{i,t-1} + \beta_1 ENFP_{i,t} + \beta_2 BIX_{i,t} + \beta_3 (ENFP * BIX)_{i,t} + \sum_{i=1}^n a_i FCN_{i,t} + \mu_{i,t}$$

- The Audit Quality Index (AX) modifies relationships between Environmental Performance (ENFP) and Firm Performance (FP)

$$ROA_{i,t} = \beta_{01} + \alpha ROA_{i,t-1} + \beta_4 ENFP_{i,t} + \beta_5 AX_{i,t} + \beta_6 (ENFP * AX)_{i,t} + \sum_{i=1}^n a_i FCN_{i,t} + \mu_{i,t}$$

- The moderating role of Governance Index at the Country Level (GI) in the affiliation between Environmental Performance (ENFP) and Firm Performance (FP)

$$ROA_{i,t} = \beta_{02} + \alpha ROA_{i,t-1} + \beta_7 ENFP_{i,t} + \beta_8 GI_{i,t} + \beta_9 (ENFP * GI)_{i,t} + \sum_{i=1}^n a_i FCN_{i,t} + \mu_{i,t}$$

FP represents firm performance, and interaction terms ENFP*BIX, ENFP*AX, and ENFP*GI are used to confirm the moderating effect of board structure, audit quality, and external oversight mechanisms index in the interaction between firm environmental sustainability and financial results. An index is developed using principal component analysis (PCA). Control variables include the firm size, leverage, and sales growth represented by the FCN.

ROA = Firm Performance

ENFP = Environmental Performance

BIX = Board structure Index

AX = Audit quality Index

GI = Governance Index at country level

$\alpha ROA_{i,t-1}$ = lag of dependent variable (used as an independent variable in the equation).

Ferreira (2010) emphasized that potential endogeneity problems could weaken the interpretation of evidence. Endogeneity was reduced when employing the two-step dynamic Generalized Method of Moments (GMM), where it emerged. Robustness checks involve using alternative measures of firm performance, specifically market-based metrics, such as Tobin Q, which provide crucial information for decision-making.

4. Result and Discussion

4-1. Summary Statistics and Correlation Analysis

Table 2. Summary Statistics and Correlation Matrix

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7
ROA	0.0410	0.0716	1.000**						
EP	46.1228	23.554	0.019**	1.000**					
CGI	-0.0002	1.2284	0.109**	0.026**	1.000**				
GI	-0.0001	2.1843	-0.0747	-0.1916	-0.0190	1.000**			
GWT	-0.006	0.6539	0.006**	0.125**	-0.0064	-0.1546	1.000**		
LEV	0.207	0.1809	-0.2445	0.184**	-0.1396	0.026**	0.020**	1.000**	
FS	18.201	1.9548	0.060**	0.274**	-0.1205	-0.3832	0.134**	0.024**	1.000**

Note: *Sample size (n) = 176 firm. The table indicates Pearson's correlation coefficients.

** denote correlation is significant at the 1%

The correlation analysis and summary statistics show numerous significant insights into the connection between financial performance (ROA), governance processes, and environmental performance (EP). While environmental performance varies greatly throughout organizations, the mean ROA of 4.1% indicates small financial returns. ROA and EP have a weak but significant positive connection ($r = 0.019$, $p < 0.01$). Additionally, there is a slight positive correlation between corporate Governance (CGI) and ROA ($r = 0.109$, $p < 0.01$). Conversely, LEV shows a substantial negative correlation with ROA ($r = -0.2445$, $p < 0.01$), indicating that larger debt levels may impair business profitability. The results are evidenced by the weak correlation between ROA and Governance at the national level (GI). It's interesting to note that while better governance systems (GWT) are marginally associated with better environmental performance, larger enterprises (FS) exhibit marginally better financial performance ($r = 0.060$, $p < 0.01$).

4-2. Test of Endogeneity

Environmental performance (EP) exhibit statistical significance ($p < 0.05$), indicating a substantial association between the variables according to the results of the endogeneity test. These findings support the existence of endogeneity and emphasize the necessity of using sophisticated econometric methods, such as GMM, to account for potential biases.

Table 3. Test of Endogeneity

Variable	Coefficient	Std. Error	Prob.
C	0.0121	0.0013	0.0000
EP	-0.0003	0.0000	0.0000
R-squared	0.7942	Adjusted R-squared	0.7736

Note: EP = Environmental performance, p value < 0.05 (shows significance)

4-3. Regression Analysis

4-3-1. Moderating Role of Board Structure Index (BSI) in the Relationship between Environmental Performance (ENFP) and Firm Performance (FP)

First regression model results are shown in Table 4 in the context of BRICS combined and individual emerging nations

Table 4. Moderating Role of Board Structure Index (BSI) in Relationships between Environmental Performance (ENFP) and Firm Performance (FP)

Dependent Variable ROA	Brazil	Russia	India	China	South AFRICA	Combine (BRICS)
ROA (-1)	0.1039*** (0.000)	0.4855*** (0.000)	0.2265*** (0.000)	0.5351*** (0.000)	0.3416*** (0.000)	0.2486*** (0.000)
EP	0.0001** (0.022)	0.0020*** (0.000)	0.0010*** (0.000)	-0.0001* (0.093)	-0.00068** (0.020)	0.0002*** (0.000)
BSI	-0.005** (0.002)	-0.2396 (0.287)	0.0548*** (0.000)	0.0134*** (0.000)	-0.172304 (0.123)	0.0017*** (0.029)
EP*BSI	0.0001*** (0.000)	0.0006 (0.100)	0.00059*** (0.000)	0.0001*** (0.000)	0.0003** (0.020)	0.00005*** (0.000)
FS	-0.0076*** (0.000)	- 0.3241*** (0.000)	-0.0608*** (0.000)	-0.0005 (0.820)	0.0273*** (0.000)	-0.0008*** (0.003)
LEV	0.01395** * (0.000)	- 0.1743*** (0.000)	0.2618*** (0.000)	-0.329079 (0.118)	-0.2035*** (0.000)	-0.0521*** (0.000)
GWT	-0.0033*** (0.000)	0.1817*** (0.000)	0.0328*** (0.000)	0.0075*** (0.000)	0.0113 (0.326)	0.0648*** (0.000)
cons.	0.1347*** (0.000)	0.6391*** (0.000)	1.1158*** (0.000)	0.4133 (0.312)	-0.3845*** (0.000)	0.03718*** (0.000)
AR(1) p-value	(0.005)	(0.013)	(0.090)	(0.037)	(0.000)	(0.000)
AR(2) p-value	(0.174)	(0.096)	(0.153)	(0.788)	(0.223)	(0.093)
Number of instruments	181	25	52	275	25	181
Sargan Test p-value	(1.000)	(0.675)	(0.992)	(1.000)	(0.242)	(0.545)

Note: ROA (firm performance), EP (environmental performance), BSI (board structure index), EP*BSI (interaction term includes environmental performance and board structure index), FS (firm size), LEV (leverage), GWT (growth). *** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$. Parenthesis = (P-value, Significance).

The findings presented in Table 4 shed light on how the Board Structure Index (BSI) influences the correlation between Environmental Performance (EP) and Firm Performance (ROA) in the BRICS nations. In every country, the lagged ROA is favorably significant ($p < 0.01$), suggesting that past company performance considerably impacts present performance. This demonstrates how consistent a company's performance is over time. The results are consistent with the theory's predictions and prior research, as Cho (2022) experimentally demonstrated that organizations' ecologically conscious efforts favorably impact their financial viability. Except for China and South Africa, most countries have positive and significant EP coefficients ($p < 0.05$). As Brazil, Russia, India, and the BRICS model demonstrated, higher environmental performance leads to improved business performance. However, the coefficients for South Africa and China are either negligible or

negative, indicating that contextual factors may impact this relationship. Each country has a different moderating effect of BSI. For China and India, it is strongly positive ($p < 0.01$), suggesting that effective board arrangements improve company performance. It is detrimental to South Africa and Brazil, though, implying that inflexible or badly designed boards could impair performance. The combined BRICS analysis shows a slight beneficial effect ($p < 0.05$). The interaction term EP*BSI is mostly significant ($p < 0.01$), suggesting that board structure moderates the association between firm performance and environmental performance. While the negative coefficient in China and India indicates that excessively strict or complicated board structures may lessen the benefits of environmental initiatives, the positive coefficient in Brazil and South Africa indicates that improved board structures enhance the positive impact of EP.

Except in South Africa, where the effect is positive, firm size negatively influences ROA in most nations ($p < 0.01$). This suggests that smaller businesses typically have superior financial results in this situation. Leverage has a mixed effect; it has a major and favourable impact in India, while it has a detrimental effect on performance in other nations, indicating different capital structure dynamics. In Brazil, Russia, India, and China, growth positively and significantly impacts ROA ($p < 0.01$), indicating that growth prospects influence financial performance. The instruments' validity is confirmed by the Sargan test p-values, which show no issues with over-identification. Andries and Stephan (2019) revealed that participating in innovative environmental practices favourably relates to corporate financial achievement. Kalash (2021) demonstrated that ecological sustainability considerably increases the return on assets. Moreover, a strong, significant correlation exists between the development of green products and improved financial and sustainability results (Ha et al., 2023). However, for Russia, we lack adequate data to demonstrate the strengthening effect of the internal governance mechanism. This is similar to the findings of Judge et al. (2003), who discovered an adverse correlation between CEO dualism and business performance. This discovery is especially important considering the 1996 Russian Federal statute that prevents the CEO from concurrently serving as board chair. According to Merendino and Melville (2019), board composition improves company success. Another inquiry also found a favourable relationship between board size, ROA, as well as board autonomy and Tobin's Q (Alqatan et al., 2019).

4-3-2. Moderating Role of Audit Quality Index in Relationship between Environmental Performance (ENFP) and Firm Performance (FP)

The additional model's estimation outputs expand on the association of audit quality index with environmental and corporate performance. The results of this model are reported in Table 5 in the context of combining the BRICS group and five emerging economies independently.

The coefficient estimates for the EP variable across individual countries and the combined BRICS group are optimistic. The coefficient estimates are statistically significant for Brazil ($p < 0.001$), Russia ($p < 0.001$), India ($p < 0.05$), China ($p < 0.1$), and the BRICS group ($p < 0.001$), except South Africa. Therefore, hypothesis H1, that environmental performance has a major beneficial effect on business performance, is agreed upon in the case of Brazil, Russia, India, China, and the combined BRICS countries. In South Africa, results correspond to Ball (2021) investigation, discovering insufficient statistical support for a link between corporate sustainability performance and financial achievement in South African firms.

To test the second hypothesis, the study examines the coefficient estimates for the Audit Quality Index (AIND) variable and the interaction term (EP*AIND), including both environmental performance and the audit quality index. The coefficient estimates for the AIND variable across individual countries and the combined BRICS group are all positive. The estimated coefficients show significance for Brazil ($p < 0.001$), Russia ($p < 0.05$), India ($p < 0.01$), China ($p < 0.05$), South Africa ($p < 0.05$), and the BRICS group ($p < 0.001$). These findings indicate a favourable correlation between the audit quality index and firm performance. Regarding the interaction term EPAIND, the coefficient estimates vary across countries. The coefficient estimations of Brazil ($p < 0.01$), Russia ($p < 0.01$), India ($p < 0.01$), and the combined BRICS group ($p < 0.001$) are all negative and statistically significant, except South Africa and China. Findings within the context of China correspond with earlier studies of Zahid et al. (2023) using the Bloomberg ESG rating to indicate a company's sustainability to investigate its impact on funding decisions among Chinese firms. Audit quality influences the structure of ESG financing.

However, the results suggest that audit quality has no meaningful effect on this connection. The insignificance of EPAIND in the context of South Africa is similar to Kilincarslan et al. (2020). The regression coefficient of auditing quality is insignificant, suggesting that the number of auditors does not affect Middle Eastern and African enterprises' ecological disclosures. Nonetheless, this variable is statistically significant in certain sub-samples: It is statistically significant and beneficial for non-South Africa and Africa but insignificant for all South African firms. Overall Combine BRICS result suggests that the EP*AIND interaction term has a considerable negative impact on company performance. Zahid et al. (2022) indicates that audit validity of financial statements, reviewed and verified by the Top Four auditors, has a beneficial influence on Return on Assets (ROA). However, when coupled with ESG policies, particularly in environmental, social, and governance domains, the ESG-ROA relationship is significantly weakened. This shows that higher audit quality improves financial information dependability and decreases previous financial performance, suggestive over the research period. Based on these findings, hypothesis H2 is somewhat supported. The audit quality index enhances the link between environmental and corporate performance. However, the interplay of environmental performance and the audit quality index has a negative but considerable impact on company performance, particularly in Brazil, Russia, India, and the BRICS group. AR (2) insignificant values show that the autocorrelation problem is addressed at lag 2. Lastly, the Sargan test yields p-values higher than 0.05 in all nations. This suggests that the over-identification limits are valid, indicating that the instrumental variable estimation used in the model is appropriate.

Table 5. A Moderating Role of Audit Quality Index (AIND) in Relationships between Environmental Performance (ENFP) and Firm Performance (FP)

Dependent Variable (ROA)	Brazil	Russia	India	China	South AFRICA	combine (BRICS)
ROA (-1)	0.0452** (0.006)	0.4897*** (0.000)	0.1536*** (0.001)	0.3872*** (0.000)	0.3336*** (0.000)	0.1468*** (0.000)
EP	0.0002*** (0.000)	0.0034*** (0.000)	- (0.008)	0.0003* (0.099)	-0.0003 (0.500)	0.0014*** (0.000)
AIND	0.2092*** (0.000)	0.1408* (0.060)	-0.1920** (0.021)	0.0685* (0.060)	-0.0873* (0.057)	0.1874*** (0.000)
EP*AIND	- (0.000)	-0.0030** (0.040)	0.0048*** (0.001)	-0.0006 (0.246)	0.0002 (0.849)	-0.0034*** (0.000)
FS	- (0.000)	-0.3935*** (0.000)	-0.0076 (0.208)	0.0098*** (0.000)	0.0323*** (0.000)	0.0012* (0.088)
LEV	0.0056*** (0.006)	-0.1908*** (0.000)	-0.0629* (0.099)	-0.1453 (0.363)	-0.1885*** (0.000)	0.0014 (0.586)
GWT	0.0000 (0.941)	0.15667** (0.000)	0.0514*** (0.000)	0.0040* (0.079)	0.0084 (0.494)	0.06858*** (0.000)
cons.	0.0829*** (0.000)	0.7244*** (0.000)	0.2829** (0.014)	0.1774*** (0.000)	-0.0431*** (0.000)	-0.0739*** (0.000)
AR (1) p-value	(0.005)	(0.013)	(0.203)	(0.038)	(0.003)	(0.000)
AR(2) p-value	(0.090)	(0.100)	(0.751)	(0.732)	(0.193)	(0.054)
Number of observation	479	200	300	400	380	1760
Number of instruments	91	25	223	275	25	226
Sargan test (p-value)	(1.000)	(0.731)	(1.000)	(1.000)	(0.494)	(0.990)

Note: ROA (firm performance), EP (environmental performance), AIND (audit quality index), EP*AIND (interaction term include environmental performance and audit quality index), FS (firm size), LEV (leverage), GWT (growth). *** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$. Parenthesis = (P-value, Significance).

4-3-3. Moderating Role of Governance Index in Relationship between Environmental Performance (ENFP) and Firm Performance (FP)

The study's third and last regression model helps to determine the moderating role of external governance mechanisms in affiliation among environmental and firm performance by six governance indicators at the country level in the context of five separate developing economies and groups of these five countries, as presented in Table 6.

Table 6. The Moderating Role of Governance Index at the Country Level (GI) in the Affiliation between Environmental Performance (ENFP) and Firm Performance (FP)

Dependent variable (ROA)	Brazil	Russia	India	China	South Africa	combined BRICS
ROA (-1)	0.0824*** (0.000)	0.4883*** (0.000)	0.4041*** (0.000)	0.5268*** (0.000)	0.1724*** (0.000)	2.8641*** (0.000)
EP	0.0020*** (0.000)	0.0010** (0.030)	0.0002** (0.007)	0.00004 (0.561)	-0.0002** (0.059)	0.0002*** (0.000)
GI	0.0051** (0.020)	-0.0078 (0.252)	-0.0078*** (0.000)	0.0014** (0.010)	0.0128*** (0.000)	0.0057*** (0.000)
EP*GI	0.0000*** (0.000)	0.00004 (0.709)	0.0001*** (0.000)	-0.00004*** (0.000)	-0.0003*** (0.000)	-0.0001*** (0.000)
FS	-0.0089*** (0.000)	-0.4988*** (0.000)	-0.2760*** (0.000)	-0.0050*** (0.000)	-0.0057 (0.241)	0.0006 (0.206)
LEV	0.0093** (0.003)	0.1469*** (0.000)	0.1188*** (0.000)	-0.0126 (0.522)	-0.0628*** (0.000)	-0.1186*** (0.000)
GWT	-0.0021 (0.075)	0.1721*** (0.000)	0.0335*** (0.000)	0.0067* (0.074)	0.0501** (0.002)	0.0686*** (0.000)
cons.	0.1536*** (0.000)	1.0287*** (0.000)	0.5355*** (0.000)	0.1123*** (0.000)	-0.0376 (0.632)	-0.0739** (0.001)
AR (1) p-value	(0.006)	(0.011)	(0.106)	(0.040)	(0.010)	(0.000)
AR (2) p-value	(0.140)	(0.066)	(0.683)	(0.790)	(0.217)	(0.108)
Number of observation	479	200	300	400	380	1760
Number of instrument	204	25	61	240	238	149
Sargan test p-value	(1.000)	(0.708)	(1.000)	(1.000)	(1.000)	(0.386)

Note: ROA (firm performance), EP (environmental performance), GI (Governance index), EP*GI (interaction term includes environmental performance and external Governance index at country level), FS (firm size), LEV (leverage), GWT (growth). *** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$. Parenthesis = (P-value, Significance).

Table 6 illustrates the result of a study on the interaction amongst environmental performance (EP), company performance (ROA), and the moderating function of a governance index (GI) at the national level. The study is focused on five countries: Brazil, Russia, India, China, and South Africa, as well as the unified BRICS group. The findings demonstrate that environmental performance (EP) has a significant positive impact on firm performance (ROA) in three BRICS nations (Brazil, Russia, and India). In contrast, environmental sustainability significantly and negatively impacts business profitability in South Africa, except in China, which has minimal impact on business performance. However, the combined BRICS groupings reveal a favourable and considerable influence of environmental performance on business performance. This finding supports Hypothesis 1 in the context of the BRICS group (Brazil, Russia, and India). The coefficients for EP in Brazil, Russia, and India are all statistically significant, with p-values less than 0.001, indicating a robust association between environmental and business performance. In the context of China, the preceding literature supports our findings. Some studies have discovered that environmental, social, and governance or a particular component of the environment has no association with business financial success (Shakil et al., 2019).

Furthermore, research findings show that the external mechanism of governance, determined through the Governance Index (GI), improves the link between environmental performance and company performance. More specifically, the interaction term EP*GI is beneficial and statistically significant in Brazil and India, demonstrating that external governance enhances the favourable connection between EP and FP. These data lend credence to Hypothesis 3, which proposes that the external governance mechanism strengthens the link between environmental and corporate performance. The coefficients for China, South Africa, and the combined BRICS are negative and significant. This suggests that an external governance mechanism lessens the beneficial interaction between EP and FP in these nations. Hypothesis 3 is partially supported, demonstrating that the external mechanism of governance improves the link between environmental performance and company performance. Prior research has also found that organizational ESG initiatives considerably impacted company productivity by analyzing a selection of China A-share-listed businesses with ESG ranking data. This was mostly because China is in the early stages of ESG growth, where applicable legislative and data disclosure laws are not flawless. Therefore, ESG has not drawn the attention of most listed firms (Ruan & Liu, 2021). Sun et al. (2023), investigating a Chinese firm, indicate that an environmentally conscious financing strategy has minimal effect on social and governance pillars. The negative coefficient EP*GI in South African companies results are congruent to the findings of Chetty et al. (2015), who discovered a substantial adverse association between ecological, societal, and Governance (ESG) results and ROA. However, it is noteworthy to highlight that the collaboration term

EP*GI is not significant in Russia, demonstrating that the external governance mechanism does not have any moderating effect on the link between EP and FP in this nation. The Coronavirus pandemic Covid-19, which occurred from 2019 to 2021, and the current armed war between Russia and Ukraine in 2022 posed such financial and economic changes that rendered conducting business more challenging and created uncertainties about prospective government initiatives (Al-Shboul et al., 2020). The Sargan test's p-values remain greater than 0.1 for all nations, indicating that the model is valid, the over-identification limitations are not violated, and the issue of autocorrelation is resolved at AR(2).

4-4. Robustness Result (Tobin Q)

Return on assets, a common measure of corporate success, was used in this study to evaluate the premise and test the hypothesis. ROA is an accounting-based indicator of corporate success. For robust results, Tobin's Q (TQ), a market-based measure of corporate performance, was employed. All three model findings are combined in Table 7. Model 1: The moderating influence of a board structure index upon the interaction between environmental performance and firm performance using Tobin's Q proxy results is the same as those using ROA. The interaction term EP*BSI has been discovered as statistically significant at the 1% level. Model 2: The audit quality index moderates the relationship between environmental performance and firm performance outcomes. Therefore, both proxies revealed that the interaction EP*AIND remained highly significant at the 1% level. Model 3: The moderating influence of the governance index in the relationship between environmental performance; both proxies also match results; EP*GI identified significant outcomes at the 1% significance level. The influence of environmental performance on firm performance is significant at the 5% significance level for the first and three models, but negative at the 1% significance level for model 2. Environmental performance considerably decreases Tobin's Q value at the 1% significance level (Chang, 2015).

Table 7. Robustness Result for All Models in the Context of Polling of Companies from BRICS Countries by Tobin's Q

Dependent variable: TQ	Model 1	Model 2	Model 3
Lagged (TQ)	1.016318*** (0.000)	1.011585*** (0.000)	1.015393*** (0.000)
EP	0.0346** (0.020)	-0.0407*** (0.000)	0.0298** (0.040)
BSI	-0.1030* (0.050)		
EP*BSI	0.047*** (0.000)		
AIND		-0.0328** (0.019)	
EP*AIND		0.0866*** (0.001)	
GI			0.042 (0.202)
EP*GI			-0.0178*** (0.005)
FS	0.0113 (0.486)	0.0218 (0.162)	-0.0167 (0.330)
LEV	-0.0401** (0.023)	0.04 (0.936)	-0.0517*** (0.003)
GWT	0.0962 (0.343)	0.0157 (0.919)	0.0782 (0.442)
Cons	-0.0173 (0.547)	-0.0231 (0.402)	0.0364 (0.230)
Number of observation	1760	1760	1760
Number of instruments	277	187	279
Sargan test	166.794 (1.000)	127.901 (0.998)	230.750 (0.963)

Note: TQ = Tobin's Q, EP = Environmental performance, FP = firm performance, BSI = Board Structure index, EP*BSI (interaction term includes environmental performance and board structure index), AIND (audit quality index), EP*AIND (interaction term includes environmental performance and audit quality index), GI (Governance index), EP*GI (interaction term include environmental performance and external Governance index at country level), FS (firm size), LEV (leverage), GWT (growth). *** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$. Parenthesis = (P-value, Significance)

5. Conclusion

The study's primary goal is to determine how environmental performance affects company performance. The research also attempts to assess the moderating influence of internal and external governance mechanisms on the affiliation between environmental and corporate performance. Internal and external oversight can both play a role in mitigating agency problems that have lately arisen due to putting effort into ecological performance.

The hypotheses examined the influence of sustainability performance upon firm accomplishments across BRICS nations, focusing on the moderating effects of internal and external governance structures. The data indicate a subtle connection between environmental performance and company performance. Hypothesis 1 claims that environmental performance has an important and beneficial impact on company performance, confirmed by multiple models (EQ1, EQ2, and EQ3) for both ROA and Tobin's Q. However, some recognize a negative connection in Tobin's Q for EQ3, reflecting a more intricate link. Hypothesis 2 suggests that internal governance systems strengthen the relationship across environmental and company performance, which board structure models support. While this concept is frequently accepted, a strong board structure with diversified skills and independence encourages strategic decision-making that incorporates environmental concerns into overall business strategy. Boards with a higher rating are more likely to prioritize long-term sustainability goals, resulting in more investment in environmentally friendly practices and technology. This proactive strategy improves the company's environmental performance and increases its competitiveness and reputation, resulting in better financial performance. Evidence of a negative link to the audit quality index suggests that the interaction may be complex. Hypothesis 3 investigates how external governance systems influence the bond between environmental performance and business efficiency. The findings support a partially recognized negative link, implying that external governance systems may not always reinforce the favourable impact of environmental performance on company success. However, the negative moderating influence of audit quality structure and governance at the country level in the relationship between environmental performance and business performance can be interpreted through legislative restrictions and institutional frameworks. Accurate reporting and disclosure of environmental performance through corporations could prove difficult in nations with lenient governance and audit quality standards. Weak oversight mechanisms and insufficient enforcement of environmental legislation may encourage businesses to prioritize short-term financial rewards above long-term sustainability goals. Furthermore, a lack of transparency and accountability in such circumstances may erode investor confidence and raise the risks connected with environmental liabilities. Overall, the findings emphasize the necessity of addressing internal and external governance structures while analyzing the relationship between environmental performance and business profitability in BRICS.

5-1. Implications of the Study

The insights of this research, primarily focused on the influence of environmental outcomes on company performance in BRICS nations, hold multiple significant consequences regarding scholastic research and real-world applications in corporate governance and ecological sustainability. First, the connection between environmental and corporate performance highlights the importance of incorporating environmental considerations into business operations. This suggests that companies operating within BRICS nations may enhance their fiscal health by prioritizing environmentally responsible practices, aligning with global sustainability trends, and perhaps obtaining competitive advantages. Moreover, the identified moderating effects of internal governance mechanisms offer light on the function of corporate supremacy structures in enhancing the association between environmental performance and company performance. While internal governance mechanisms were found to strengthen this relationship in the context of the board structure index and partially strengthen it in the audit quality index, the observed negative association suggests potential complexities in governance dynamics. This highlights the need for BRICS firms to develop robust internal governance frameworks that prioritise environmental objectives and effectively align them with broader organizational goals, thereby fostering synergistic relationships amid environmental and financial performance indicators. Similarly, their inquiry into external governance mechanisms reveals nuanced dynamics underlying environmental performance and corporate performance within a group of BRICS

nations. Partially accepted negative affiliation suggests that external governance factors may present challenges or limitations in leveraging environmental performance for improved financial outcomes. Consequently, BRICS firms may need to navigate regulatory landscapes and stakeholder pressures to ensure that external governance mechanisms complement rather than hinder efforts towards sustainable practices. These consequences highlight their understanding of taking an all-encompassing strategy for corporate governance and sustainability within the BRICS nations. Firms working in these situations will benefit from incorporating environmental factors into their tactical assessments while simultaneously addressing internal and external governance dynamics to maximize the synergies between environmental and financial performance objectives. By accomplishing this, BRICS companies may not solely improve their competitiveness but also favourably contribute to broader socio-ecological goals, aligning with the global urge for sustainable development.

5-2. Limitations and Future Direction

The study addresses countries that belong to the BRICS (Brazil, Russia, India, China, and South Africa) group, which may have distinct economic, social, and environmental circumstances. Precisely an outcome, the research's results might not remain immediately applicable to companies operating in other nations or areas with varying legal regimes or degrees of environmental awareness. Another issue may be connected to measuring environmental efficacy. Environmental performance is a multidimensional term that may be measured with various indicators, including carbon emissions, trash generation, and energy efficiency. The study may have utilized a specific set of indicators or metrics to assess environmental performance, which may not cover the entire range of environmental impacts or be generally relevant across businesses or sectors. Future research objectives should include doing similar studies in various geographical regions to compare and contrast findings across diverse contexts. The effect of COVID-19 has not been tested.

Furthermore, researchers could investigate different environmental performance metrics and include a greater range of governance mechanisms or organizational elements in their analysis. Longitudinal studies may also glimpse the long-term influence of sustainability performance on business success and the changing function of governance structures over time. Overall, resolving these constraints and broadening the scope of study could lead to a deeper awareness of the complicated interaction of environmental performance, corporate performance, and governance structures.

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