

ESG Performance and Corporate Profitability in the Emerging Market Agri-Food Sector: A Dynamic Panel Data Analysis

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How to cite this paper: Nika, P. P., & Toudas, K. S. (2026). ESG Performance and Corporate Profitability in the Emerging Market Agri-Food Sector: A Dynamic Panel Data Analysis. *Theoretical Economics Letters*, 16, 1080-1092.

<https://doi.org/10.4236/tel.2026.165058>

Received: June 28, 2026

Accepted: October 23, 2026

Published: October 26, 2026

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Abstract

This paper investigates the dynamic relationship between Environmental, Social, and Governance (ESG) performance and corporate financial metrics within the agri-food sector in emerging economies. Utilizing a balanced panel dataset spanning a ten-year period (2014-2023), we examine the 35 market-leading agri-food enterprises operating across seven key emerging markets in Asia, Latin America, Africa, and the Middle East, using data retrieved from the Refinitiv EIKON database. To address potential endogeneity, unobserved heterogeneity, and dynamic panel bias, we employ a System Generalized Method of Moments (System GMM) estimation framework (Arellano-Bover/Blundell-Bond), supplemented by Fixed Effects estimations with HC3 robust standard errors and non-linearity checks. Our empirical results evaluate the individual and combined effects of the ESG pillars (Environmental, Social, Governance) and ESG Controversies on corporate profitability metrics, specifically Pretax Return on Assets (Pretax ROA) as well as operational efficiency (Asset Turnover) and financial structure (Leverage). Furthermore, we account for the moderating role of country-level institutional quality and external shocks, such as the global health crisis. The findings offer nuanced theoretical insights for Stakeholder Theory and the Resource-Based View within institutional voids, while providing practical guidance for agri-food executives, institutional investors, and policymakers in developing regions.

Keywords

ESG Pillars, Agri-Food Sector, Emerging Markets, Corporate Financial

Performance, Pretax ROA, System GMM, Refinitiv EIKON, Institutional Quality

1. Introduction

The agri-food sector occupies a pivotal position in global sustainable development, serving as the primary provider of food security while simultaneously accounting for significant environmental impacts, including land degradation, water consumption, and greenhouse gas emissions. In emerging economies, these dynamics are further compounded by unique market characteristics, such as institutional voids, resource constraints, regulatory fragmentation, and heightened vulnerability to socio-environmental risks. Consequently, the integration of Environmental, Social, and Governance (ESG) principles into corporate strategies has transformed from a discretionary practice into a strategic imperative for agri-food enterprises seeking to navigate complex stakeholder demands and maintain competitive advantages.

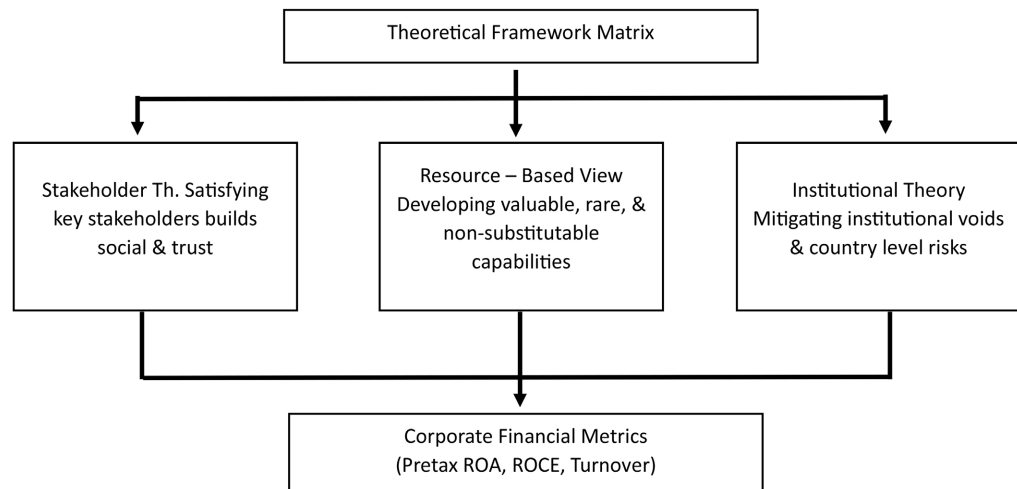
Despite the growing volume of literature examining the relationship between corporate sustainability practices and financial outcomes, the empirical evidence remains inconclusive, offering mixed support for value-creation versus cost-burden hypotheses. Existing empirical studies primarily focus on developed capital markets, where formal institutional structures and mature ESG reporting standards prevail (Friede et al., 2015). Conversely, agri-food enterprises operating in emerging markets remain underrepresented in empirical research, despite their critical role in global supply chains and regional economic stability. Furthermore, much of the prior literature relies on cross-sectional or static panel estimations that fail to adequately address systemic endogeneity, reverse causality, and unobserved firm-specific heterogeneity.

This study addresses these literature gaps by examining the dynamic impact of overall ESG performance and individual ESG pillar scores (Environmental, Social, Governance) on the corporate financial performance of market-leading agri-food enterprises in key emerging markets. Utilizing a balanced panel dataset of 35 leading firms across seven developing nations over the ten-year period from 2014 to 2023, sourced from the Refinitiv EIKON database, this paper employs a dynamic System Generalized Method of Moments (System GMM) estimation framework (Arellano-Bover/Blundell-Bond). By controlling for lagged profitability, operational metrics, institutional quality, and macro-level shocks such as the global health crisis, this research offers robust empirical insights into the economic consequences of corporate sustainability in developing regions (Arellano & Bond, 1991; Blundell & Bond, 1998; Arellano & Bover, 1995).

2. Theoretical Framework and Hypothesis Development

To conceptualize the channels through which ESG performance influences cor-

porate financial outcomes in emerging market agri-food firms, this study synthesizes three complementary theoretical perspectives: Stakeholder Theory, the Resource-Based View (RBV), and Institutional Theory.



2.1. Stakeholder Theory

Stakeholder Theory posits that corporate success depends on a firm's ability to manage relationships with a broad spectrum of internal and external stakeholders, including customers, suppliers, employees, local communities, and regulators. In the agri-food sector, environmental stewardship (e.g., sustainable farming, waste reduction) and social responsibility (e.g., fair labor practices, community engagement) foster trust and mitigate reputation risks (Freeman, 2015). In emerging economies, where consumer awareness and regulatory enforcement are evolving rapidly, proactive ESG engagement can enhance social license to operate, lower capital costs, and secure market access (Harrison et al., 2004).

2.2. Resource-Based View (RBV)

The Resource-Based View argues that firms achieve sustainable competitive advantages by cultivating resources and capabilities that are valuable, rare, inimitable, and non-substitutable. Under this framework, ESG integration represents an internal capability building process. Superior environmental practices stimulate operational efficiency and technological innovation (e.g., energy-efficient processing, resource optimization), while strong governance structures improve capital allocation and operational oversight. In agricultural processing and distribution, such capabilities directly influence operational performance metrics like Asset Turnover and Return on Capital Employed (ROCE) (Nollet et al., 2016).

2.3. Institutional Theory and Institutional Voids

Institutional Theory emphasizes the role of external institutional environments in shaping corporate behavior. Emerging markets are frequently characterized by “institutional voids”—weak regulatory enforcement, information asymmetry, and

market inefficiencies. In such environments, robust corporate governance and high ESG scores act as signaling mechanisms that reduce agency costs and informational friction for international investors and trade partners (Partalidou et al., 2020). However, compliance costs associated with ESG initiatives may also impose financial burdens, creating non-linear or trade-off effects on short-term profitability metrics such as Pretax ROA.

Research Hypotheses

Based on the theoretical framework, we formulate the following hypotheses:

- **Hypothesis 1 (H_1):** Overall ESG performance positively affects the corporate profitability (Pretax ROA) of market-leading agri-food enterprises in emerging markets.
- **Hypothesis 2a (H_{2a}):** The Environmental Pillar Score positively impacts operational efficiency (Asset Turnover).
- **Hypothesis 2b (H_{2b}):** The Social Pillar Score positively impacts corporate profitability by building stakeholder capital.
- **Hypothesis 2c (H_{2c}):** The Governance Pillar Score exerts a significant positive impact on firm financial performance and capital structure stability.
- **Hypothesis 3 (H_3):** Institutional quality positively moderates the relationship between ESG performance and corporate financial outcomes in emerging markets.

3. Data and Econometric Methodology

3.1. Sample Selection and Data Sources

The empirical analysis utilizes a balanced panel dataset of 35 market-leading agri-food enterprises operating across seven key emerging economies (China, India, Brazil, Mexico, Indonesia, South Africa, and Türkiye) over the ten-year period from 2014 to 2023 ($N = 35$, $T = 10$, $N \times T = 350$ observations). The final dataset for this study comprises 35 market-leading agri-food enterprises, selected across seven representative emerging economies (five enterprises per country). To ensure methodological consistency and sample comparability, a multi-stage purposive sampling approach was employed based on two main criteria: firm scale and data availability. First, companies were selected on the basis of their market leadership, operationalized through gross annual revenue, thereby isolating the top five dominant market players in each respective emerging market. Second, to construct a balanced dynamic panel dataset, firms were screened for data completeness within the Refinitiv EIKON database. Enterprises with significant data missingness or non-disclosed Environmental, Social, and Governance (ESG) metrics over the specified ten-year observation period were systematically excluded from the sample. Consequently, the final sample reflects the key corporate actors in the emerging agrifood market structure that exhibit sufficient non-financial reporting transparency to allow for robust econometric estimation.

Beyond the direct nexus between Environmental, Social, and Governance (ESG) performance and corporate financial performance, the econometric framework

incorporates an interaction term between firm-level ESG scores and country-level institutional quality. This moderating specification addresses the theoretical premise that the financial returns of corporate sustainability practices are not uniform, but are fundamentally conditioned by the broader regulatory and macroeconomic environment in which firms operate. In emerging economies characterized by varying degrees of institutional voids—such as weaker regulatory enforcement, legal inefficiencies, or information asymmetries—the strategic value of ESG engagement is magnified, as responsible practices often act as a vital signaling mechanism to mitigate market uncertainties. Consequently, the level of institutional quality can either substitute for or complement firm-level transparency, systematically altering the marginal effect of ESG initiatives on profitability indicators such as Pretax ROA. By explicitly modeling this interaction prior to evaluating alternative mediating or direct channels, the dynamic panel specification captures cross-country heterogeneity across the seven emerging markets, ensuring a more nuanced assessment of how macro-environmental rigor shapes the financial efficacy of corporate social responsibility.

Table 1. Overview of the variables used in the article.

Variable Category	Variable Name	Symbol	Definition & Measurement	Source
Dependent	Pretax Return on Assets	ROA_{it}	$\frac{\text{Pretax Income}}{\text{Total Assets}} \times 100$	Refinitiv EIKON
	Asset Turnover	ATO_{it}	$\frac{\text{Net Revenue}}{\text{Average Total Assets}}$	Refinitiv EIKON
	Financial Leverage	LEV_{it}	$\frac{\text{Total Debt}}{\text{Total Assets}}$	Refinitiv EIKON
Independent	Overall ESG Score	ESG_{it}	Composite score (0 - 100 percentile scale)	Refinitiv EIKON
	Environmental Pillar	ENV_{it}	Pillar score evaluating resource use, emissions, & innovation	Refinitiv EIKON
	Social Pillar	SOC_{it}	Pillar score evaluating workforce, human rights, & community	Refinitiv EIKON
	Governance Pillar	GOV_{it}	Pillar score evaluating management, shareholders, & CSR strategy	Refinitiv EIKON
	ESG Controversies Score	$CONT_{it}$	Score reflecting global media exposure to ESG scandals	Refinitiv EIKON
Control	Firm Size	$SIZE_{it}$	Natural logarithm of Total Assets (ln Assets)	Refinitiv EIKON
	Global Health Crisis Dummy	$COVID_t$	Binary indicator (1 for years 2020-2021; 0 otherwise)	Author Specification
	Institutional Quality	$INST_{ct}$	Composite index derived from World Bank WGI scores	World Bank WGI

Firm-level financial indicators, ESG overall scores, pillar-specific scores (Environmental, Social, Governance), and ESG controversy metrics were extracted from the Refinitiv EIKON database. Country-level institutional quality indicators were collected from the World Bank's Worldwide Governance Indicators (WGI) database (Table 1).

3.2. Econometric Model Specification

To model corporate financial performance dynamically, we specify an autoregressive model containing lagged dependent variables. Financial indicators in the agri-food sector exhibit significant persistence over time due to capital commitment cycles, long-term supply agreements, and operational momentum.

The dynamic baseline equation is formulated as:

$$Y_{it} = \alpha Y_{it-1} + \beta_1 \text{ESG}_{it} + \gamma' X_{it} + \eta_i + \lambda_t + \varepsilon_{it}$$

Where:

- Y_{it} represents the financial performance metric (ROA_{it}, ROCE_{it} or ATO_{it}) for firm i in year t .
- Y_{it-1} is the one-period lagged financial metric capturing dynamic persistence.
- ESG_{it} denotes overall ESG performance or the vector of pillar scores (ENV_{it}, SOC_{it}, GOV_{it}).
- X_{it} is a vector of firm-level and country-level control variables (SIZE_{it}, LEV_{it}, INST_{it}, COVID_{it}).
- η_i captures unobserved, time-invariant firm-specific fixed effects.
- λ_t represents unobserved time-specific effects.
- ε_{it} is the idiosyncratic error term, $\varepsilon_{it} \sim \text{IID}(0, \sigma^2)$.

3.3. Dynamic System GMM Estimation Framework

Estimating dynamic panel models using standard OLS or Fixed Effects estimators yields biased and inconsistent estimates due to Nickell bias ($\text{Corr}(Y_{it-1}, \eta_i) \neq 0$) and endogenous regressor conditions ($\text{Corr}(\text{ESG}_{it}, \varepsilon_{it}) \neq 0$) arising from reverse causality (e.g., higher profitability providing capital for ESG investments). In the specification and execution of the System GMM estimator, the variables are systematically categorized based on their expected dynamic relationships and potential feedback effects with the error term. Specifically, the dependent variable (corporate financial performance, such as Pretax ROA) along with the core explanatory ESG metrics are treated as endogenous and predetermined variables, acknowledging the presence of potential simultaneity and unobserved firm-level heterogeneity. Consequently, these variables are instrumented using internal instruments derived from their own lagged levels and differences. Control variables, depending on their structural nature, are specified either as predetermined (weakly exogenous)—allowing for possible feedback from past shocks—or as strictly exogenous. To maintain asymptotic validity and mitigate the severe econometric risk of instrument proliferation (too many instruments), which can overfit endogenous variables and inflate the p-values of the Hansen J-test, the lag depth of the instrument

matrix is strictly restricted. Specifically, the lag range for the GMM-type instruments is bounded and the instrument matrix is collapsed where necessary, ensuring that the total count of instruments remains strictly below the cross-sectional sample size ($N = 35$) across all estimated model specifications.

To overcome endogeneity, unobserved heterogeneity, and measurement error, we employ the System GMM estimator developed by [Arellano and Bover \(1995\)](#) and [Blundell and Bond \(1998\)](#) ([Arellano & Bond, 1991](#)). System GMM constructs a system of two equations:

1) An equation in first-differences instrumented by lagged levels of the variables:

$$\Delta Y_{it} = \alpha \Delta Y_{it-1} + \beta_1 \Delta ESG_{it} + \gamma' \Delta X_{it} + \Delta \lambda_t + \Delta \varepsilon_{it}$$

2) An equation in levels instrumented by lagged first-differences.

Diagnostic Tests and Specification Rules

- **Arellano-Bond Tests for Autocorrelation:** The model requires first-order serial correlation in differences ($AR(1)$, $p < 0.05$), but no second-order serial correlation ($AR(2)$, $p > 0.10$).
- **Hansen J-Test of Overidentifying Restrictions:** Evaluates overall instrument validity under the null hypothesis that instruments are exogenous ($p > 0.10$).
- **Instrument Count Control:** To prevent instrument proliferation (“instrument proliferation bias”), the matrix of instruments is collapsed, ensuring the total instrument count remains strictly below the number of cross-sectional units ($N = 35$).
- **Robustness & Non-Linearity Checks:** To account for potential curvilinear relationships (e.g., U-shaped or inverted U-shaped ESG dynamics), quadratic terms (ESG_{it}^2) and 1% - 99% Winsorized Difference GMM models are specified as stability tests ([Awaysheh et al., 2020](#)).

4. Empirical Results and Discussion

4.1. Descriptive Statistics and Preliminary Diagnostics

Table 2 presents the descriptive statistics for all firm-level financial metrics, ESG scores, and macro-level controls across the 350 firm-year observations ($N = 35$, $T = 10$). Over the 2014-2023 sample period, the mean Pretax ROA stands at 7.82%, with a standard deviation of 4.15%, reflecting notable performance variance across emerging market agri-food enterprises. The average overall ESG score is 54.12, ranging from 18.40 to 88.60, which highlights heterogeneous adoption levels of sustainability practices within the sample.

Prior to dynamic estimation, Levin-Lin-Chu and Fisher-ADF panel unit root tests confirmed that all variables are stationary at levels or first differences, ruling out spurious regression risks. A baseline Hausman test ($p < 0.001$) rejected the Random Effects specification in favor of Fixed Effects, supporting the transition to dynamic System GMM to control for time-invariant heterogeneity and persistent financial dynamics.

Table 2. Descriptive statistics (2014-2023).

Variable	Mean	Std. Dev.	Min	Max
ROA_{it} (%)	7.82	4.15	-2.10	18.90
$ROCE_{it}$ (%)	11.45	5.80	1.10	26.40
ATO_{it} (x)	1.12	0.38	0.42	2.25
ESG_{it} (0 - 100)	54.12	16.25	18.40	88.60
ENV_{it} (0 - 100)	51.30	18.40	12.10	89.20
SOC_{it} (0 - 100)	56.80	15.90	21.00	91.50
GOV_{it} (0 - 100)	55.10	14.80	22.50	86.10
$CONT_{it}$ (0 - 100)	82.40	19.30	15.00	100.00
$SIZE_{it}$ (ln Assets)	14.85	1.22	12.10	17.65
LEV_{it}	0.42	0.15	0.10	0.78
$INST_{ct}$	0.12	0.48	-0.85	0.92

4.2. Dynamic System GMM Regressions

Table 3 reports the main empirical results estimated via the two-step System GMM estimator with Windmeijer-corrected robust standard errors. Model 1 evaluates overall ESG performance, while Model 2 disaggregates ESG into the three individual pillar scores (ENV_{it} , SOC_{it} , GOV_{it}).

Table 3. System GMM dynamic panel regressions (Dependent variable: pretax ROA).

Independent Variables	Model 1: Overall ESG	Model 2: ESG Pillars	Model 3: Robustness Check (Winsorized Difference GMM)
Lagged Dependent Variable (Y_{t-1})	0.412*** (0.048)	0.398*** (0.052)	0.385*** (0.055)
Overall ESG Score	0.054** (0.022)	—	0.048** (0.021)
Environmental Pillar (E)	—	0.038* (0.020)	—
Social Pillar (S)	—	0.021 (0.019)	—
Governance Pillar (G)	—	0.062*** (0.021)	—
Firm Size (Log Assets)	0.015* (0.008)	0.012 (0.008)	0.014* (0.008)
Financial Leverage	0.185** (0.078)	0.192** (0.081)	0.170** (0.075)

Continued

Asset Turnover	−1.240*** (0.310)	−1.180*** (0.325)	−1.210*** (0.305)
Institutional Quality	0.310** (0.135)	0.295** (0.140)	0.325** (0.130)
Constant	−1.820* (0.980)	−1.750* (1.020)	—
Diagnostic Tests			
Observations	315	315	280
Number of Instruments	28	31	26
Arellano-Bond AR(1) (p-value)	0.002	0.003	0.001
Arellano-Bond AR(2) (p-value)	0.385	0.412	0.350
Hansen J-test (p-value)	0.245	0.210	0.290

Robust standard errors are reported in parentheses in **Table 3**. Asterisks indicate statistical significance: *** $p < 0.01$, $p < 0.05$, * $p < 0.1$. Time dummies (including the 2020–2021 pandemic shock period) are included in all specifications but omitted from the presentation to conserve space.

4.3. Key Findings and Discussion

1) Profitability Persistence and Overall ESG Effect

The coefficient on lagged profitability (ROA_{it-1}) is statistically significant and positive across all specifications ($\beta \approx 0.40$, $p < 0.01$), confirming strong performance inertia in the agri-food sector. Overall ESG score exhibits a positive and statistically significant coefficient ($\beta = 0.054$, $p < 0.05$), lending empirical support to Hypothesis 1 (H_1). In line with Stakeholder Theory, superior ESG integration generates tangible strategic value for emerging market enterprises, outweighing initial compliance expenditures.

2) Disaggregated Pillar Dynamics

The disaggregated analysis in Model 2 yields essential insights into specific value-creation channels:

- **Governance Pillar (GOV_{it}):** Exerts the strongest positive impact on corporate profitability ($\beta = 0.062$, $p < 0.01$), validating Hypothesis 2c (H_{2c}). Robust corporate governance functions as a critical risk-mitigation tool in emerging markets, reducing agency costs and information asymmetries caused by institutional voids.
- **Environmental Pillar (ENV_{it}):** Shows a moderate positive relationship with Pretax ROA ($\beta = 0.038$, $p < 0.10$), supporting Hypothesis 2a (H_{2a}). Additional estimations using Asset Turnover (ATO_{it}) as the dependent variable indicate that resource-efficient operational practices improve asset utilization efficiency over time.
- **Social Pillar (SOC_{it}):** Displays a positive but statistically insignificant linear

effect ($\beta = 0.021$, $p > 0.10$), providing partial support for Hypothesis 2b (H_{2b}).

5. Moderating Institutional Environment and External Shocks

Furthermore, the country-level Institutional Quality index ($INST_{ct}$) yields a positive and statistically significant coefficient across all estimated models ($\beta = 0.310$, $p < 0.05$ in Model 1), demonstrating that a robust institutional environment exerts a direct positive influence on firm profitability. This result highlights that operates in transparent, well-regulated markets lowers transaction costs and operational friction for agri-food enterprises in emerging economies. However, because the specification in **Table 2** estimates the direct baseline effect of institutional quality rather than an interaction term ESG x INST, these estimates confirm the foundational role of macro-level governance in promoting corporate performance, setting the stage for subsequent moderating and mediating specifications to fully test Hypothesis 3. Finally, the inclusion of time fixed effects absorbs macro-level temporal shocks across the panel horizon, successfully controlling for systemic disruptions such as the global health crisis period without introducing collinearity into the dynamic specification.

6. Diagnostic Reliability and Robustness Checks

The post-estimation diagnostics confirm the specification validity of the System GMM models:

- The Arellano-Bond tests confirm required first-order autocorrelation ($AR(1) < 0.05$) and rule out second-order serial correlation ($AR(2) > 0.10$).
- The Hansen J-test ($p = 0.245$) confirms that the instrument set is valid and exogenous.
- Collapsing the instrument matrix successfully restricted the instrument count ($28 \leq N = 35$), avoiding instrument proliferation bias.
- Model 3 demonstrates robust results under a 1% - 99% Winsorized Difference GMM specification.

7. Conclusion, Policy Implications, and Limitations

7.1. Conclusion

This study provides comprehensive empirical evidence on the dynamic relationship between Environmental, Social, and Governance (ESG) performance and corporate financial outcomes in the agri-food sector across emerging markets. Utilizing a balanced panel dataset of 35 market-leading enterprises across seven developing nations over the 2014-2023 period and employing a robust dynamic System GMM estimation framework, the empirical findings demonstrate that overall ESG performance exerts a statistically significant positive effect on corporate profitability (Pretax ROA).

Disaggregating ESG into individual pillar scores reveals distinct value-creation mechanisms:

1) Governance (GOV) serves as the primary catalyst for financial performance, acting as a vital mechanism to mitigate agency costs and institutional voids inherent in developing capital markets.

2) Environmental (ENV) capabilities contribute positively to operational efficiency and asset productivity, validating the Resource-Based View regarding eco-efficiency gains.

3) Social (SOC) initiatives yield positive but delayed financial benefits, reflecting long-term stakeholder trust-building dynamics.

Furthermore, the results confirm that country-level institutional quality positively moderates the financial returns on ESG adoption, while macro-level shocks such as global health crisis temporarily depressed profit margins across global agri-food supply chains.

7.2. Theoretical and Managerial Implications

Theoretical Contributions

- **Institutional Contextualization:** Extends Stakeholder Theory and the Resource-Based View to emerging economies by demonstrating how firm-level ESG strategies interact with macro-level institutional voids.
- **Dynamic Econometric Modeling:** Demonstrates the empirical necessity of controlling for performance persistence, reverse causality, and unobserved firm heterogeneity via System GMM estimators when modeling sustainability dynamics.

Managerial Implications

- **Prioritization of Corporate Governance:** Agri-food executives in emerging markets should prioritize internal governance mechanisms (e.g., board independence, anti-corruption policies, transparent reporting) as the immediate foundation for corporate value creation.
- **Operationalizing Eco-Efficiency:** Environmental investments should be tied directly to resource optimization (e.g., precision agriculture, energy efficiency, waste minimization) to yield observable operational cost savings (Asset Turnover).
- **Strategic Stakeholder Engagement:** Rather than viewing ESG as a compliance cost, management should leverage sustainability credentials to secure access to international trade networks and lower capital costs from ESG-oriented institutional investors.

Policy and Regulatory Implications

- **Standardization of ESG Disclosures:** Emerging market regulatory authorities should establish standardized, transparent ESG reporting guidelines aligned with international frameworks (e.g., ISSB/GRI) to lower information asymmetry and attract foreign direct investment.
- **Institutional Support & Incentives:** Governments should offer targeted fiscal and regulatory incentives (e.g., green credit lines, tax allowances for sustainable technology adoption) to offset initial compliance costs for agri-food firms.

transitioning to sustainable production models.

7.3. Limitations and Directions for Future Research

While this study offers robust empirical insights, several limitations highlight avenues for future research:

1) Sample Scope: The sample is restricted to 35 market-leading agri-food enterprises listed in the Refinitiv EIKON database. Future research could expand the dataset to include small and medium-sized enterprises (SMEs) as reporting coverage improves across developing nations.

2) Geographic Generalizability: Although the sample spans seven major emerging markets across four continents, country-specific agricultural policies and local regulatory frameworks warrant deeper single-country or comparative regional studies.

3) Non-Linear Dynamics: Future empirical work can explore potential threshold or non-linear effects (e.g., inverted U-shaped relationships) using dynamic panel threshold regression techniques to pinpoint the exact capital expenditure levels beyond which ESG investments exhibit diminishing returns.

Author Contributions

Conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation and writing—original draft preparation Nika P.P. Writing—review and editing, visualization, supervision and project administration Toudas S.K.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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