

Corporate Carbon Emission Performance and Firm Value: Does Company Size Matter?

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Abstract

As climate change intensifies global pressure on corporate sustainability, this study investigates how the impact of carbon emission performance on firm value and the potential moderating role of company size. This study using a quantitative explanatory research design with analyzed secondary panel data from 63 company sector in transportation and logistics listed on Southeast Asian stock exchanges between 2023 to 2025. Data was processed using Moderating Regression Analysis (MRA) under Random Effect Model with firm value proxied by Tobin's Q and carbon emission performance by normalized carbon intensity divided revenue. The result explain that carbon emission performance has no statistically significant direct effect on firm value. Moreover, company size neither directly influences firm value nor acts as a moderating mechanism in the relationship between carbon emission performance and market valuation. These finding indicate that carbon emission performance has not yet become a value relevant determinant for the transportations and logistic sector in Southeast Asian capital markets. This highlight a critical need for policymaker to implement mandatory disclosure regimes and investor education to ensure that environmental stewardship is systematically priced within the regional economic ecosystem.

Keywords: Carbon Emission Performance, Firm Value, Company Size, Transportation And Logistics, Moderating Regression Analysis (MRA).

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1. Introduction

Climate change has become one of the most urgent global challenges, garnering unmatched focus from governments, investors, civil society, and the business sector (Tian et al., 2024). Intensive industrial operations that produce significant carbon emissions are generally acknowledged as major contributors to global warming and ecological decline (Liu et al., 2023). This changing landscape compels modern companies to consider factors beyond immediate profit and thoroughly assess the ecological impact of their activities. In the modern business environment, incorporating environmental responsibility into corporate strategy has become essential; it is a vital requirement for enduring corporate sustainability.

As global environmental awareness grows, investors are progressively incorporating sustainability measures into their capital allocation choices (Kräussl et al., 2024). Environmental, Social, and Governance (ESG) frameworks have become crucial metrics for assessing a company's fundamental quality and future potential. Firms with strong environmental histories are often viewed as less risky investments, more adept at adapting to changing

regulations and evolving stakeholder demands (Ardia et al., 2022). Binh and Lee (2024) provide empirical evidence that ESG disclosures greatly influence market views and the sustainability of companies. Additionally, Desai (2022) states that carbon disclosure is a fundamental element of thorough sustainability reporting, offering stakeholders essential clarity about a company's environmental impact.

Despite the importance of sustainability, empirical article finding that the relationship between carbon emission performance and firm value remain highly fragmented while some article lie (Orazalin et al., 2023) and (Xie et al., 2023) explain that proactive carbon initiatives yield tangible increase in market value. For instance (Chou et al., 2025) suggest that rising carbon emission can coexist with upward corporate performance trends. And (Matthewset Al., 2024) explain that the market react differently to voluntary versus mandatory disclosure. These ongoing contradictions indicate that the carbon value relationship is influenced by situational elements like the size of the company, which denotes a firm's resource capabilities and vulnerability to public scrutiny. Another article (Gao et al., 2023) and (Hidayat et al., 2025) explain that organizational scale can significantly influence carbon emission transparency.

Moreover, because large enterprises operate under the intense spotlight of public and institutional oversight, they face much higher pressure to model sustainable business practices (Kalbuana et al., 2022). Under these heightened conditions, company size is expected to catalyze and strengthen the positive impact of carbon emission performance on firm value (Bedi & Singh, 2024). This aligns with recent literature for instance, Liu et al. (2025) demonstrated that organizational capabilities like green innovation strongly reinforce the relationship between carbon disclosures and market value, while Sari et al. (2024) noted that carbon disclosure optimizes firm value primarily when channeled through eco-efficiency and eco-innovation.

Driven by the escalating urgency of climate risks, the strategic role of carbon performance in driving corporate wealth, and the theoretical ambiguities left by prior studies, this research addresses a critical gap in the literature. This study aims to: (1) analyze the direct effect of carbon emission performance on firm value, and (2) explicitly investigating how company size serves as a moderating mechanism. Ultimately, this research seeks to offer meaningful theoretical contributions to the environmental accounting literature, while providing practical, actionable insights for corporate managers, institutional investors, and regulatory bodies striving to cultivate a sustainable business ecosystem.

2. Introduction

2.1 Legitimacy Theory

The legitimacy theory is a mechanism that supports organizations in implementing and developing voluntary social and environmental disclosures in order to fulfil their social contract that enables the recognition of their objectives and the survival in a jumpy and turbulent environment (Akhter, Hassain, Elrehail, Ur Rehman, & Almansour, 2023) (Rouf et al., 2022). Good carbon emission performance reflects a company's ability to control the environmental impacts resulting from its operational activities (Aulia et al., 2024). When a company is able to reduce its carbon emission intensity, society and investors tend to perceive the company as having a strong commitment to sustainability (Aulia et al., 2024). This condition can enhance the company's reputation and ultimately increase firm value (Benkraiem et al., 2022). Large companies (company size) generally face greater legitimacy pressure compared to smaller companies because their activities receive more public attention (Akhter et al., 2022). Therefore, large companies tend to be more active in managing carbon emissions in order to maintain their social legitimacy. Accordingly, company size is expected to strengthen the relationship between carbon emission performance and firm value.

2.2 Stakeholder Theory

Stakeholder theory states that companies are not only responsible to shareholders, but also to all stakeholders, including governments, investors, communities, customers, and environmental organizations. Each stakeholder has expectations regarding sustainable and environmentally friendly business practices (Freeman, 1984). In line with stakeholder theory, investors can demand that companies meet their expectations. These expectations may include the management of emissions and strong environmental performance by the company. (Hanifah & Wardhani, 2025). Poor carbon emissions performance results in diminished revenues and a fall in company value. This drop in value subtly indicates that investors impose penalties on firms whose carbon emissions fail to meet their anticipated standards. (Hanifah & Wardhani, 2025).

2.3 Carbon Emission Performance

Carbon emission performance indicates how well a company or area can restrict, manage, and reduce greenhouse

gas (GHG) emissions, particularly carbon dioxide (CO₂), that arise from industrial, economic, or logistical activities. (Zhang & Shen, 2023). They are well-placed to exercise considerable power in minimizing carbon emissions that stem directly from their business activities (scope 1 emissions), in addition to those indirect emissions linked to the energy they buy or obtain (scope 2 emissions), along with indirect emissions related to their supply chain (scope 3 emissions). The extensive nature of their global business operations offers them distinct chances to tackle climate change issues by implementing efficient carbon emissions management strategies. (Oyewo, 2023). The effectiveness of carbon emissions is measured by taking the complete Scope 1 and Scope 2 emissions and dividing that figure by total revenue, showcasing the level of emissions in relation to economic productivity; a smaller number signifies improved carbon efficiency. (Al-Mari & Mardini, 2024). Carbon emission performance reflects the extent to which a company can control and reduce greenhouse gas emissions generated from its operations. Firms can influence Scope 1, Scope 2, and even supply chain related Scope 3 emissions through carbon management strategies. Based on stakeholder theory and signaling theory, we propose that companies exhibiting excellent carbon emission results will achieve elevated market valuations. Investors are progressively including ESG standards in their investment choices, with carbon performance being a fundamental aspect of environmental criteria. Businesses that enhance their carbon footprint minimize operational threats and reputational risks, which are both taken into account in stock valuations. According to (Probohudono et al., 2024) Carbon emission performance has a positive effect to firm value.

H1. Carbon emission performance reflects the extent to which a company can control and reduce greenhouse gas emissions generated from its operations. Firms can influence Scope 1, Scope 2, and even supply chain related Scope 3 emissions through carbon management strategies.

2.4 Firm Value

Firm Value It denotes the cost of a commodity at which a vendor and a purchaser consent to transfer its possession. A mutually accepted market price fulfills the needs of both the seller and the buyer, typically relating to the share price of companies that are publicly traded. (Abdi, Li, & Camara-Turull, 2023). Demonstrate that the worth of a company can be assessed using different financial indicators such as increases in revenue, profit margins, earnings per share, the ratio of market value to book value, and Tobin's Q. (Bui, Nguyen, & Pham, 2023). Firm value in this study is measured using Tobin's Q, a market based ratio that reflects the relationship between a firm's market value and the replacement cost of its assets. Tobin's Q is widely used in empirical research as an indicator of firm value.

2.5 Company Size as Moderating Variable

Company size is an important attribute that reflects enterprise resources. When faced with the external environment, companies behave differently depending on the amount of resources they have. Enterprises of different sizes have different behavioral logics and pursue different value creation goals in low-carbon development (Gao, Wen, Li, & Lyu, 2024). Company size will affect the relationship among "Executive Carbon Cognition (ECC) Corporate Low Carbon Action (CLA) Carbon Performance (CP)". Company size will affect organizational strategic decision making, resulting in different results in the integration and allocation of enterprise resources (Gao, Wen, Li, & Lyu, 2024). From the viewpoint of market competition, big companies hold a beneficial stance within their sector, and leaders can preserve their edge by managing the company wisely. The bigger the company size, the higher the emissions and the more significant the environmental pollution. Thus, as the company size increases, the expenses associated with enhancing its corporate practices also rise. On the other hand, for smaller businesses, their restricted internal and external resources, along with the necessity to constantly grow market presence and enhance operational results, make it challenging to address developmental issues solely by adhering to existing strategies. (Gao, Wen, Li, & Lyu, 2024). Firm size negatively moderates the relationship between Executive Carbon Cognition and Corporate Low Carbon Action, and at the same time, firm size negatively moderates the mediating effect of Corporate Low Carbon Action. (Gao, Wen, Li, & Lyu, 2024). The effect of carbon emission performance on firm value is unlikely to be uniform across all company sizes. Larger company command greater media attention, more diverse investor bases, and higher regulatory exposure all of which amplify the signaling value of carbon improvements. As a result, the positive (or negative) effect of carbon performance on firm value is expected to be stronger for larger firms.

H2. Company size positively moderates the relationship between carbon emission performance and firm value, such that the positive effect of carbon emission performance on firm value is stronger for larger firms.

3. Research Method and Materials

3.1 Research Design

This study employs a quantitative, explanatory research design using secondary panel data. The moderation analysis follows the Moderated Regression Analysis (MRA) framework as outlined. (Indraswari, Subroto, Rosidi, & Subekti, 2025). All hypotheses are tested at a significance level of $\alpha = 0.05$.

3.2 Population and Sample

The population consists of publicly listed companies on the target stock exchange in South East Asia in target sector transportation and logistics for the period 2023-2025. Purposive sampling is applied based on the following criteria:

1. Companies listed continuously throughout the observation period 2023-2025.
2. Companies that disclose carbon/GHG emission data in their annual or sustainability reports throughout the observation period 2023-2025.
3. Companies that are not delisted or under suspension during the study period.

The population of this study consists of 171 transportation and logistics sector companies listed on stock exchanges across ASEAN countries. Due to data availability and the application of purposive sampling criteria and the final sample comprised 63 companies that met all research requirements. The sampling process was conducted by considering several criteria. The criteria including the availability of complete annual reports and sustainability reports and also disclosure of carbon emission-related information between 2023 and 2025, and the completeness of financial data required to measure the research variables. Companies with incomplete or inconsistent data during the observation period were excluded from the sample.

3.3 Variables Measurement

The dependent variable, Firm Value (Y), is operationalized using Tobin's Q, consistent with prior literature in the Indonesian and ASEAN capital market context (Listyadi, 2023). The independent variable, Carbon Emission Performance (X), is proxied through a normalized carbon intensity score derived from Scope 1 and Scope 2 greenhouse gas (GHG) emissions per unit of revenue, inverted so that higher scores represent superior environmental performance. The moderating variable, Company Size (Z), is measured as the natural logarithm of total assets, following established convention in the financial economics literature (Saraswati & Bernawati, 2020). The interaction term (XZ) is constructed as the product of the standardized Carbon Emission Performance score and the natural logarithm of total assets, to operationalize the moderation hypothesis.

Table 1. Variable Measurement

Variables	Type	Measurement	Formula
Carbon Emission Performance	Independent	Carbon Intensity /Revenue	CO ₂ Emissions or CDP disclosure Score
Firm Value	Dependent	Tobin's Q	(Market Cap+Total Debt) / Total Assets
Company Size	Moderation	Ln(Total Assets)	Natural log of total assets (end of fiscal year)

3.4 Panel Model Selection Procedure

Panel model selection followed a hierarchical testing. The Redundant Fixed Effects (Chow) Test was first applied to discriminate between the Common Effects Model (CEM) and the Fixed Effects Model (FEM). The Hausman Test was subsequently administered to adjudicate between FEM and the Random Effects Model (REM). Finally, the Lagrange Multiplier (LM) Test was employed to ascertain whether a REM specification is preferable to pooled OLS. All estimations were performed using EViews 12.

3.5 Model Specification

The following regression models are estimated using panel data (fixed effects / random effects / common effect, subject to Hausman test results):

Model 1 (Baseline):

$$1. \quad \text{Firm Value}_{it} = \alpha + \beta_1(\text{CEP}_{it}) + \beta_2(\text{SIZE}_{it}) + \varepsilon_{it}$$

Model 2 (Moderation / MRA):

$$2. \quad \text{Firm Value}_{it} = \alpha + \beta_1(\text{CEP}_{it}) + \beta_2(\text{SIZE}_{it}) + \beta_3(\text{CEP}_{it} \times \text{SIZE}_{it}) + \varepsilon_{it}$$

Where: CEP = Carbon Emission Performance; SIZE = Company Size (moderator); ε = error term; i = firm; t = year.

Moderation is confirmed if β_3 (the interaction term CEP $\times$ SIZE) is statistically significant. The sign and magnitude of β_3 indicate the direction and strength of the moderating effect.

4. Result and Discussion

4.1 Panel Model Selection

4.1.1 Chow Test

The Redundant Fixed Effects Test (Chow Test) was conducted to evaluate whether individual firm-specific effects are statistically significant, thereby justifying the adoption of FEM over CEM. The test yielded a Cross-section F-statistic of 8.980193 ($p = 0.0000$) and a Cross-section Chi-square statistic of 321.856756 with 62 degrees of freedom ($p = 0.0000$). And the result of Prob (<0.05), providing strong evidence against the null hypothesis of redundant fixed effects. This result confirms that substantial unobserved heterogeneity exists across the 63 sample companies, necessitating the inclusion of firm-specific effects in the model. Accordingly, the Fixed Effects Model is preferred over the Common Effects Model.

Table 2. Result of Chow Test

Effect Test	Statistic	d.f	Prob
Cross-section F	8.980193	(62,124)	0.0000
Cross-section Chi Square	321.856756	62	0.0000

4.1.2 Hausman Test

Having established the presence of firm-specific effects, the Hausman Test was performed to determine whether those effects are correlated with the regressors a condition that would render the Random Effects estimator inconsistent and biased, making FEM the preferred specification. The Hausman test statistic yielded a Chi-square value of 0.395085 with 2 degrees of freedom ($p = 0.8207$). This result from Prob ($P=0.8207$) >0.005 , Random effect are consistent (Random Effect Test is preferred).

Table 3. Result of Chow Test

Correlated Random Effect – Hausman Test

Equation: Untitled

Test cross-section random effect

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob
Cross-section random	0.395.85	2	0.8207

4.1.3 Lagrange Test

To confirm that the Random Effects specification is preferable to a simple pooled OLS regression which assumes no unobserved heterogeneity the Breusch-Pagan Lagrange Multiplier Test was administered. The cross-section component of the Breusch-Pagan statistic is 99.553515 ($p = 0.0000$), providing overwhelming evidence against the null hypothesis that the cross-sectional variance component equals zero. These findings confirm that pooled OLS would produce inefficient estimates due to the presence of firm-level random effects, validating the use of Panel EGLS under the Random Effects specification.

Table 4. Result of Lagrange Test

Lagrange Multiplier Test for Random Effects

Null hypothesis: No effects

Alternative hypothesis: Two-sided (Breusch-Pagan) and one-si

	Cross-section	Test Hypothesis	Both
Breusch Pagan	99.553515 (0.0000)	1.429906 (0.2318)	100.99831 (0.0000)

4.2 Regression Result

4.2.1 Main Effect Model (Model 1: Carbon Emission Performance Only)

The main effects model (Model 1) regresses Firm Value (Y) on Carbon Emission Performance (X) alone under the REM specification. The estimated coefficient for X is -0.003721 ($t = -0.2027$; $p = 0.8396$). This coefficient is statistically indistinguishable from zero at all conventional significance levels (1%, 5%, and 10%), indicating that Carbon Emission Performance does not exert a statistically significant direct effect on Firm Value within this sample. The weighted R-squared is 0.00221, and the Adjusted R-squared is -0.005126 , indicating that the model has essentially no explanatory power over firm value variation. The F-statistic of 0.041291 ($p = 0.8392$) confirms the overall model insignificance.

Table 5. Regression of Carbon Emission Performance Only

Variable	Coefficient	Std, Error	t-Statistic.	Prob.
C	1.149502	0.087557	13.12866	0.0000
Carbon Emission Performance	-0.003721	0.0018351	-0.202681	0.8396
Weighted Statistics				
R-squared	0.00221	Mean dependent var	0.379358	
Adjusted R-square	-0.005126	S.D. dependent var	0.394945	
S.E of regression	0.395955	Sum squared resid	29.31799	
F-statistic	0.041291	Durbin Watson stat	1.679834	
Prob(F-statistic)	0.839199			

4.2.1 Full Model With Moderation (Model 2: $X+Z+XZ$)

The full moderation model incorporates Carbon Emission Performance (X), Company Size (Z), and the interaction term ($XZ = X \times Z$). The results, estimated under Panel EGLS (Cross-section Random Effects).

Table 6. Regression result of Full Model with Regression

Variable	Coefficient	Std, Error	t-Statistic.	Prob.
C	1.152359	0.606037	1.901466	0.0588
Carbon Emission Performance	0.007420	0.356883	0.020790	0.9834
Company Size	-0.000123	0.025735	-0.004769	0.9962
Interaction of Moderation (XZ)	-0.000380	0.012186	-0.031176	0.9752
Weighted Statistics				
R-squared	0.00225	Mean dependent var	0.376303	
Adjusted R-square	-0.015988	S.D. dependent var	0.393904	
S.E of regression	0.397040	Sum squared resid	29.16356	
F-statistic	0.013857	Durbin Watson stat	1.688508	
Prob(F-statistic)	0.997765			

4.3 Hypothesis Testing

4.3.1 F-Test (Overall Model Significance)

The F-statistic for the full moderation model is 0.013857 with a corresponding probability of 0.997765. This result conclusively indicates that the overall regression model comprising Carbon Emission Performance, Company Size, and their interaction does not achieve statistical significance in explaining the variation in Firm Value across the sample.

4.3.2 Carbon Emission Performance on Firm Value

The Carbon Emission Performance variable yields a coefficient of 0.007420, and t-statistic of 0.020790, and a probability value of 0.9834. Since the probability value exceeds the 0.05 significance threshold ($0.9834 > 0.05$), Carbon Emission Performance does not exert a statistically significant effect on Firm Value. Accordingly, the hypothesis positing that Carbon Emission Performance meaningfully influences Firm Value is rejected.

4.3.3 Company Size on Firm Value

The Company Size variable produces a coefficient of -0.000123 , a t-statistic of -0.004769 , and a probability value of 0.9962. Given that this probability value substantially exceeds the 0.05 threshold ($0.9962 > 0.05$), Company Size does not demonstrate a statistically significant influence on Firm Value.

The negative coefficient suggests that larger firms tend toward lower Firm Value in this sample, yet the relationship is both directionally weak and statistically negligible. On these grounds, the hypothesis asserting that Company Size significantly affects Firm Value is likewise rejected.

4.3.4 Moderating Effect of Company Size (XZ)

The interaction term XZ, introduced as the moderating variable, records a coefficient of -0.000380 , a t-statistic of -0.031176 , and a probability value of 0.9752. Because this value exceeds the 0.05 significance level ($0.9752 > 0.05$), Company Size fails to significantly moderate the relationship between Carbon Emission Performance and Firm Value. Consequently, Company Size is not supported as a moderating variable within the scope of this study.

4.4 Discussion

4.4.1 Carbon Emission Performance and Firm Value

The rejection of the first hypothesis that Carbon Emission Performance significantly influences Firm Value is both surprising and intellectually significant. This finding, rather than being a weakness of the study, actually speaks to a deeper reality in how environmental performance is perceived in emerging market contexts (Elshandidy et al., 2025).

This distinction is critical. Investors may respond to the visibility of disclosure rather than to the substance of performance, meaning that a company's genuine de-carbonization efforts can go largely unrecognized in the valuation process if they are not accompanied by compelling narrative disclosures (Jiang et al., 2021). The present study's focus on performance rather than disclosure therefore exposes a gap between what firms do environmentally and what the market actually rewards financially (Liu et al., 2025).

Second, the non-significant result may also reflect the relatively nascent state of carbon pricing and carbon regulatory enforcement in the sampled countries. In markets where carbon-related penalties and incentives remain underdeveloped, investors have fewer structural reasons to systematically differentiate between high- and low-carbon performers when making valuation decisions (Hatane et al., 2025).

Third, from a legitimacy theory standpoint, it is possible that firms in this sample have not yet reached a level of carbon performance that is sufficiently salient to trigger meaningful shifts in stakeholder perception. According to legitimacy theory, companies disclose environmental information to obtain and maintain social legitimacy. Disclosure serves as a consequence of deference to community pressure from investors and other stakeholders (Lindgreen & Swaen, 2010). Organizations must appear consistent with society's expectations to be considered legitimate.

4.4.2 The Non Significant Moderation of Company Size

Perhaps the most nuanced finding of this study is the failure of Company Size to significantly moderate the Carbon Emission Performance. This implies that the anticipated structural advantages of scale, such as access to green technologies, sophisticated ESG reporting systems, and regulatory expertise, do not yet translate into a measurable moderation effect in this particular sample (Ardelia & Paramita, 2026)

This result adds nuance to findings by (W. Gao et al., 2024), who demonstrated that firm size shapes carbon-related outcomes in specific national contexts. It is possible that the moderating role of size is more pronounced in highly regulated, single-country settings, and becomes diluted in cross-country panels where institutional heterogeneity introduces considerable noise (Temiz et al., 2026). Evidence from ASEAN countries shows significant variation across nations and years in environmental performance and firm value, supporting the notion that country-level institutional factors matter (Hatane et al., 2025). Future research would benefit from examining this moderation within country-specific subsamples or by incorporating institutional quality as an additional moderator (Singh & Kumar, 2026). Institutional quality has been shown to significantly influence the relationship between ESG disclosure and firm value in emerging markets (Singh & Kumar, 2026). Country-level characteristics such as rule of law and regulatory quality affect the impact of sustainability disclosure on firm performance (Li & Jia, 2022). Firm-level climate change exposure and carbon transparency effects vary significantly across countries with different institutional environments (M. Xie & Chen, 2025).

4.4.3 The Significance as Studying Carbon Emission Performance over Carbon Emission Disclosure

One of the most important contributions this study makes to the literature is its deliberate focus on carbon emission performance rather than carbon emission disclosure. It bears emphasis that the overwhelming majority of existing studies including those by Hardiyansah and Agustini (2021) found that carbon emission disclosure has a positive and significant effect on firm value when measured using Tobin's Q in Indonesian manufacturing companies. (Houten & Wedari, 2023) examined carbon disclosure, carbon performance, and market value in Indonesian polluting industries, focusing primarily on disclosure metrics. (Nisa, 2023) investigated the effect of carbon emission disclosure on company value with environmental performance as a moderating variable in non-financial companies listed on the Indonesia Stock Exchange. Examine whether and how corporate disclosure of carbon-related information affects firm value. While such studies are valuable, they fundamentally measure the market's reaction to reported information, not to the underlying environmental reality of a firm's operations (Clarkson et al., 2008).

Carbon emission performance, by contrast, captures what a firm actually achieves in reducing its greenhouse gas output relative to its productive activity (Luo, 2019). This distinction matters enormously for both theory and policy. A firm can produce extensive, polished carbon disclosures without meaningfully reducing its emissions a phenomenon widely recognized as greenwashing (Treepongkaruna et al., 2024). Conversely, a firm may achieve genuine and significant emission reductions that go under appreciated in the market simply because they are not effectively communicated. By foregrounding performance over disclosure, this study shifts the lens from optics to substance from what is said to what is done (Ardelia & Paramita, 2026).

The scarcity of studies that directly examine carbon performance as a predictor of firm value, particularly in the ASEAN cross-country context, makes the present re-search not only timely but genuinely necessary (Elshandidy

et al., 2025; Hatane et al., 2025). It lays empirical groundwork for a more performance-oriented strand of the environmental finance literature, and it challenges researchers and practitioners alike to look beyond disclosure scores toward operational metrics that more faithfully reflect a firm's environmental trajectory. Only a few studies, such as (Luo, 2019), have examined the relationship between voluntary carbon disclosure and carbon emission performance, highlighting the need for more research that prioritizes performance over disclosure (Luo, 2019).

5. Conclusion

5.1 Summary of Findings

This study examined the effect of carbon emission performance on firm value among transportation and logistics companies listed in ASEAN markets, with company size as a moderating variable. Drawing on panel data from 63 listed firms and employing a Random Effects Model (Panel EGLS), three hypotheses were systematically tested. The empirical results consistently failed to support all three hypotheses: carbon emission performance does not significantly influence firm value, company size does not significantly affect firm value, and company size does not significantly moderate the relationship between carbon emission performance and firm value.

Specifically, the coefficient for carbon emission performance was 0.007420 ($p = 0.9834$), far exceeding the 0.05 significance threshold. Company size produced a coefficient of -0.000123 ($p = 0.9962$), while the interaction term yielded a coefficient of -0.000380 ($p = 0.9752$). The overall F-statistic of 0.013857 ($p = 0.997765$) confirms that the full moderation model lacks statistical significance in explaining firm value variation across the sample. These results are consistent and robust, pointing not to a methodological limitation but to a substantive empirical reality that deserves careful scholarly attention.

5.2 Theoretical and Empirical Contributions

The findings of this study carry several meaningful theoretical and empirical contributions. First, by focusing on carbon emission performance rather than carbon emission disclosure, this research occupies a distinctive position within the environmental finance literature. The majority of existing studies in ASEAN contexts, including those focused on Indonesia, have examined the market's response to what firms report, rather than what firms actually achieve in terms of emission reduction (Hardiyansah & Agustini, 2021; Houten & Wedari, 2023; Nisa, 2023). The present study shifts this lens decisively, demonstrating that actual emission performance, detached from its disclosure framing, does not yet elicit a discernible valuation response from market participants.

Second, the null results contribute meaningfully to our understanding of investor behavior in emerging markets. The non-significant effect of carbon emission performance on firm value suggests that capital markets in the ASEAN transportation and logistics sector have not yet incorporated environmental fundamentals into their pricing mechanisms. This is consistent with legitimacy theory, which holds that firms seek to manage social perceptions rather than necessarily optimize environmental outcomes, and with signaling theory, where the absence of a pricing signal for genuine carbon performance suggests that market participants may be responding more to disclosure visibility than to operational substance (Elshandidy et al., 2025).

Third, the failure of company size to moderate the carbon-value relationship adds an important nuance to the broader firm size literature. The assumption that larger firms are better positioned to translate carbon performance into market rewards due to their superior resources, ESG infrastructure, and stakeholder visibility is not borne out in this cross-country setting. This finding suggests that the moderating role of size is highly context-dependent and may be diluted when examined across heterogeneous institutional environments (S. Gao et al., 2023; Hatane et al., 2025; Temiz et al., 2026).

5.3 Practical Implications

The findings carry practical implications for multiple stakeholders. For corporate managers and sustainability officers in ASEAN transportation and logistics companies, the results underscore that genuine carbon emission reductions, however commendable from an environmental standpoint, are currently insufficient on their own to drive market valuation. This suggests an urgent need to integrate performance achievements into compelling, high-quality disclosure narratives that can effectively communicate the financial relevance of decarbonization efforts to investors. The gap between what firms do and what the market rewards is, in large part, a communication and transparency gap.

For policymakers and capital market regulators across ASEAN member states, the findings indicate that the region's carbon regulatory architecture remains underdeveloped relative to the demands of market-based

environmental incentives. In the absence of meaningful carbon pricing mechanisms, mandatory disclosure frameworks, and regulatory enforcement of emissions standards, rational investors have limited structural reasons to differentiate between high- and low-carbon performers during the valuation process. Strengthening these regulatory pillars is essential if capital markets are to function as efficient allocators of climate-related risk (Hatane et al., 2025; Li & Jia, 2022).

For institutional investors and asset managers with regional mandates, the results highlight the risk of over-relying on company size as a proxy for environmental credibility. Scale does not guarantee that a firm's carbon performance is reflected in its market price, particularly in cross-country contexts where institutional heterogeneity introduces substantial variation in how environmental information is processed (Singh & Kumar, 2026; M. Xie & Chen, 2025).

5.4 Limitations and Future Research Directions

This study is not without limitations, each of which opens productive directions for future inquiry. First, the cross-country panel structure, while expanding the generalizability of findings, inevitably introduces institutional heterogeneity that may mask within-country relationships. Future research would benefit from country-specific subsampling, or from the explicit inclusion of institutional quality indices, such as rule of law, regulatory enforcement quality, and governance effectiveness, as additional moderating variables (Li & Jia, 2022; Singh & Kumar, 2026).

Second, the study's measurement of carbon emission performance through carbon intensity ratios, while grounded in the extant literature, may not fully capture the multidimensional nature of corporate climate strategy. Future studies might consider supplementing intensity-based metrics with absolute emission trajectories, science-based targets alignment scores, or third-party verified emission certifications to construct more granular performance indicators.

Third, the temporal scope of the panel may not fully capture the lagged effects through which carbon performance influences investor perceptions and firm valuation. Environmental investments and emission reduction programs often carry multi-year gestation periods before they translate into measurable financial outcomes. Future re-search employing longer time horizons or dynamic panel estimations would be well-positioned to address this limitation.

Fourth, the transportation and logistics sector, while strategically significant as one of the highest-emitting industries globally, presents a particular institutional and operational context. Extending the framework to other carbon-intensive sectors within ASEAN, such as energy, manufacturing, or agribusiness, would enrich comparative understanding and allow for cross-sector generalization.

5.5 Concluding Remarks

Taken together, the results of this study serve as an empirical mirror for the current state of environmental finance in ASEAN emerging markets. They reveal a structural disconnect between the environmental substance of corporate behavior and its financial reward structure, a disconnect that is shaped by the region's nascent carbon regulatory ecosystem, the dominance of disclosure over performance in investor assessments, and the limitations of size as an institutional amplifier in heterogeneous cross-country panels.

This study does not conclude that carbon emission performance is irrelevant to firm value in principle. Rather, it concludes that the conditions necessary for the market to recognize and price genuine carbon performance, robust regulation, high-quality disclosure infrastructure, and investor ESG literacy, are not yet sufficiently developed across the ASEAN transportation and logistics landscape. The contribution of this study lies precisely in naming and empirically documenting this gap. In doing so, it lays the groundwork for a more performance-oriented strand of environmental finance research and invites researchers, practitioners, and policymakers alike to look beyond the optics of disclosure and toward the substance of what firms actually achieve in their path to decarbonization.

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