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## The Effect of Ownership Structure, Sustainability Value, and Internationalization on Firm Value Mediated By Technical Efficiency in The Transportation and Logistics Industry In Indonesia

M. Arif Hernawan<sup>1</sup>, Enny Haryanti<sup>2</sup>, Herlina Herlina<sup>3</sup>, Ika Utami Yulihapsari<sup>4</sup>, Siti Nurhayati<sup>5</sup>

<sup>1</sup>Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia, [arifhernawan1112@gmail.com](mailto:arifhernawan1112@gmail.com)

<sup>2</sup>STIE Indonesia Banking School, Jakarta, Indonesia, [enny.haryanti@ibs.ac.id](mailto:enny.haryanti@ibs.ac.id)

<sup>3</sup>Universitas Bunda Mulia, Jakarta, Indonesia, [Herlina@bundamulia.ac.id](mailto:Herlina@bundamulia.ac.id)

<sup>4</sup>Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia, [ikautamiyulihapsari@gmail.com](mailto:ikautamiyulihapsari@gmail.com)

<sup>5</sup>Institut Transportasi dan Logistik Trisakti, Jakarta, Indonesia, [snkalibata66@gmail.com](mailto:snkalibata66@gmail.com)

Corresponding Author: [arifhernawan1112@gmail.com](mailto:arifhernawan1112@gmail.com)<sup>1</sup>

**Abstract:** The transportation and logistics sector plays a strategic role in the Indonesian economy; however, firm value within this sector remains heterogeneous due to differences in technical efficiency and corporate strategies. Such variations indicate that ownership structure, degree of internationalization, and sustainability value may shape technical efficiency and, ultimately, firm value. This study aims to examine the effects of corporate ownership, internationalization, and sustainability value on firm value, with technical efficiency serving as a mediating variable. The study employs panel data regression and Sobel tests. Technical efficiency is measured using operational efficiency scores derived from a production-based approach, firm value is proxied by Tobin's Q, internationalization is measured using the foreign assets to total assets ratio (FATA), sustainability value is measured by the ratio of corporate social responsibility expenditures to net income, and corporate ownership is measured by the proportion of institutional ownership. The sample consists of transportation and logistics companies listed on the Indonesia Stock Exchange during the period 2014–2023. The empirical results indicate that corporate ownership and sustainability value positively affect technical efficiency, while internationalization has a negative effect on technical efficiency. Technical efficiency, in turn, positively influences firm value. Regarding direct effects on firm value, corporate ownership shows a positive but insignificant effect, internationalization has a positive and significant effect, and sustainability value has a negative effect. In terms of indirect effects through technical efficiency, corporate ownership and sustainability value positively influence firm value, whereas internationalization exerts a negative indirect effect. These findings contribute to the literature by highlighting the role of technical efficiency as a key mechanism linking ownership structure, internationalization, and sustainability value to firm value. From a

managerial perspective, the study emphasizes the importance of optimizing technical efficiency in strategic decision-making within the transportation and logistics industry.

**Keyword:** Technical Efficiency, Internationalization, Sustainability, Firm Value, Tobin's Q.

## INTRODUCTION

The transportation and logistics industry plays a strategic role in supporting national economic infrastructure by ensuring the smooth flow of goods and distribution activities (Maji et al., 2023). This role directly influences price stability, industrial competitiveness, and the efficiency of national supply chains. In the context of Indonesia as an archipelagic country, the need for an integrated and efficient transportation and logistics system becomes increasingly critical to sustain long-term economic growth (World Bank, 2023a). Geographical complexity requires strong multimodal connectivity supported by reliable infrastructure and coordination. Therefore, this sector functions not only as a supporting system but also as a key driver of economic activity. Its performance reflects the broader health and resilience of the national economy.

Over the past decade, the transportation and logistics sector has experienced significant transformation driven by digitalization and the rapid growth of e-commerce (Atieh et al., 2025). The adoption of technologies such as the Internet of Things (IoT), big data analytics, and automation has enhanced operational efficiency and improved supply chain transparency (Ezekiel Onyekachukwu Udeh et al., 2024). These technological advancements have reshaped traditional logistics business models into more agile, data-driven systems. Consequently, companies are required to develop adaptive capabilities to remain competitive in an increasingly dynamic market environment. Digital transformation also enables real-time monitoring and better decision-making processes. As a result, technology integration has become a fundamental determinant of logistics service quality.

Despite these advancements, the performance of the transportation and logistics sector remains volatile, reflecting fluctuations in both growth rates and the performance of industry players (Ferrari et al., 2023). During the COVID-19 pandemic, operators experienced a decline in transportation volume and asset utilization, while regulators were challenged to implement emergency policies that affected distribution costs (World Bank, 2023b). Facilitators, on the other hand, accelerated digital transformation but faced delays in physical infrastructure investments. These conditions highlight the uneven impact of external shocks across different actors within the industry. The variation in performance suggests that resilience and adaptability differ significantly among firms. Therefore, understanding these disparities is essential for improving sector-wide efficiency.

From a technical efficiency perspective, differences between state-owned enterprises and private firms have become increasingly evident (Iskandar & Arifin, 2023). Private companies tend to adopt technology-based transportation management systems more rapidly, resulting in higher service reliability (Santoso et al., 2021). Technical efficiency refers to a firm's ability to optimally convert input into outputs, which is reflected in productivity and resource management effectiveness rather than merely production frontier metrics. In this context, inefficiencies often arise from suboptimal asset utilization and operational constraints. These inefficiencies can weaken a company's competitiveness and financial performance. Therefore, improving internal efficiency is critical to sustaining long-term value creation.

The contribution of the transportation and logistics sector to Gross Domestic Product (GDP) also demonstrates significant fluctuations. The sector grew by 6.39% in 2019 but contracted sharply by -13.09% in 2020 due to the COVID-19 pandemic, which disrupted

mobility and reduced shipment volumes (BPS, 2021). A rapid recovery occurred in early 2022, with growth reaching 15.79% in the first quarter (OECD, 2021a). This rebound reflects the sector’s ability to respond to increased demand for logistics services, particularly driven by changes in consumption patterns. However, empirical studies indicate that macroeconomic recovery does not uniformly translate into improved firm value (Huo et al., 2024; Maji et al., 2023). This phenomenon highlights a dual effect where some firms benefit from recovery while others struggle due to internal limitations.

The figure above illustrates the fluctuation in the contribution of the transportation and logistics sector to GDP, particularly before, during, and after the COVID-19 pandemic. The sharp contraction in 2020 and strong rebound in 2022 demonstrate the sector’s sensitivity to external shocks and recovery dynamics. This volatility indicates that macroeconomic improvements alone are insufficient to guarantee stable firm performance. Internal capabilities such as efficiency and adaptability play a crucial role in determining outcomes. Therefore, firms must strengthen internal strategies to sustain growth during uncertain conditions. The visualization reinforces the argument that sectoral growth does not always align with firm-level value creation.

National logistics performance indicators reveal structural challenges that continue to hinder competitiveness. Indonesia’s ranking in the Logistics Performance Index (LPI) declined from 46th to 63rd position in 2023, indicating weaknesses in customs efficiency, infrastructure quality, shipment reliability, and logistics competence (World Bank, 2025). Additionally, logistics costs in Indonesia remain high, ranging between 23% and 26% of GDP, significantly higher than in neighboring ASEAN countries such as Malaysia and Vietnam (ADB, 2024; Syifa & Tohir, 2025). High logistics costs reflect substantial operational burdens on domestic firms, including fluctuating fuel prices, infrastructure limitations, and administrative inefficiencies (Ferrari et al., 2023). These factors reduce technical efficiency and negatively affect long-term firm value. Consequently, cost pressures originate not only from external conditions but also from internal inefficiencies in resource management.

At the firm level, variations in company value further illustrate the gap between sector growth and market performance. Tobin’s Q ratio of several transportation firms does not show stable improvement despite increasing logistics demand (Ohakwe & Wu, 2025). Firm value reflects market perceptions of long-term performance prospects, making it a crucial indicator of corporate health (Warsiki & Dewi, 2023). Studies show that improvements in demand do not automatically enhance firm value unless supported by efficient operational management (Peng et al., 2021). Some companies benefit from expansion strategies, while others face declining value due to operational constraints. This divergence reinforces the importance of internal strategic factors in shaping firm performance.

**Table 1. Comparison of Phenomena Among Logistics Companies in Indonesia**

Company	Key Phenomenon	Impact on Firm Value	Source
Samudera Indonesia	Fleet efficiency and international expansion	Increasing and stable	(Jelita, 2025)
Temas Line	High asset utilization	Increasing	(Oktaviana, 2022)
Blue Bird	Digital transformation and efficiency	Stable	(Img-content & Michelle, 2024)
Express Transindo	High asset burden	Decreasing	(Adfanin et al., 2023)
Steady Safe	High operational costs	Decreasing	(Adilah & Wiliyanti, 2025)

The table above compares operational phenomena across major logistics companies in Indonesia, highlighting differences in efficiency, cost structures, and digital transformation.

Companies with strong efficiency and strategic expansion tend to exhibit stable or increasing firm value. In contrast, firms facing high operational costs and low asset utilization experience declining market performance. These findings support the argument that internal management quality significantly influences firm value. The variation also reflects the dual effect nature of operational strategies in the logistics sector. Therefore, firm-specific factors must be carefully analyzed to understand performance differences.

Internal factors such as ownership structure, internationalization, sustainability, and technical efficiency play a crucial role in determining firm value. Institutional ownership can enhance governance and operational discipline, thereby improving firm performance (Purnama & Muchtar, 2023; F. Purnama & Muchtar, 2024). However, concentrated ownership may also lead to entrenchment effects that negatively impact firm value (Ibrahim & Falkenbach, 2023). Similarly, internationalization can create value through market expansion but may also increase risks and costs if not managed properly (Marchet et al., 2016; Peng et al., 2021; Liang, 2024). Sustainability initiatives contribute to long-term efficiency but may impose short-term financial burdens (Khan et al., 2017; Dianti & Puspitasari, 2024). These dynamics highlight the dual effect nature of internal variables in shaping firm outcomes.

Based on these phenomena, this study focuses on examining the influence of ownership structure, internationalization, and sustainability value on firm value, with technical efficiency acting as a mediating variable. The research is limited to transportation and logistics companies listed on the Indonesia Stock Exchange to ensure relevance and data consistency. The study aims to address the gap between macro-level sector growth and micro-level firm performance. Empirical investigation is necessary to identify whether internal variables produce positive or negative effects under different conditions. This approach aligns with recent literature emphasizing non-linear and dual-effect relationships (Peng et al., 2021; Ibrahim & Falkenbach, 2023). Ultimately, the findings are expected to provide strategic insights for stakeholders in improving firm value within the logistics industry.

## **METHOD**

This study employs a quantitative research design to examine the relationship between independent and dependent variables in the transportation and logistics sector (Huyler & McGill, 2019). The data used are secondary data obtained from the Indonesia Stock Exchange (IDX), covering financial statements of firms from 2014 to 2023. Technical efficiency is proxied using productivity-based indicators derived from financial data, reflecting the firm's ability to optimally convert inputs into outputs. The analysis applies panel data multiple regression and is complemented by the Sobel test to examine the mediating role of intervening variables.

Firm ownership (FO) is measured using institutional ownership as a proxy for control rights and governance effectiveness, calculated as the proportion of shares held by institutional investors (Cheng & Feng, 2023). The degree of internationalization (DOI) is proxied by the Foreign Assets to Total Assets (FATA) ratio, reflecting the firm's long-term commitment to global operations (Nguyen & Kim, 2020). Sustainability value (SV) is measured using the ratio of Corporate Social Responsibility (CSR) expenditure to earnings after tax (EAT), representing the firm's actual commitment to environmental and social responsibility (Yeboah et al., 2022). Technical efficiency (TE) is estimated using Total Factor Productivity (TFP) based on the Cobb–Douglas production function, while firm value (FV) is measured using Tobin's Q to capture market perception of firm performance and future prospects (Irawan & Apriwenni, 2021).

Data collection is conducted using secondary sources, including annual reports, financial statements, and sustainability reports published by firms listed on the IDX during the 2014–2023 period. The sampling method uses purposive sampling, resulting in 22 companies from an initial population of 37 firms, with a total of 206 firm-year observations in an unbalanced panel structure (Hsiao et al., 2011). Data analysis employs panel regression models, including Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM), with model selection based on Chow, Hausman, and Lagrange Multiplier tests. Hypothesis testing is conducted using R<sup>2</sup>, F-test, and t-test, while the Sobel test is applied to evaluate the mediating role of technical efficiency in the relationship between independent variables and firm value (Bell et al., 2017).

## RESULT AND DISCUSSION

### Result

#### 1. Panel Data Regression Analysis

This study employs two panel regression models to examine the effects of firm ownership, internationalization, and sustainability value on technical efficiency and firm value in the transportation and logistics sector. Model 1 evaluates the determinants of technical efficiency, capturing how firms optimize resource utilization, while Model 2 assesses firm value using Tobin’s Q and incorporates technical efficiency as a mediating variable. The use of panel data regression is appropriate as it captures both cross-sectional and time-series variations, allowing for more robust and efficient estimation (Gujarati & Porter, 2010). The estimation results confirm that the Common Effect Model (CEM) is most suitable for technical efficiency, whereas the Fixed Effect Model (FEM) is selected for firm value, indicating the presence of firm-specific heterogeneity.

Empirical findings indicate that firm ownership and sustainability value positively and significantly influence technical efficiency, while internationalization exhibits a negative effect due to increased operational complexity and expansion costs. In contrast, Model 2 shows that internationalization significantly enhances firm value, whereas sustainability value negatively affects firm value, reflecting short-term cost burdens associated with sustainability investments. Technical efficiency demonstrates a positive effect on firm value, supporting its role as a mediating mechanism, although its significance is marginal at the 5% level. These findings highlight the dual effect of internal strategies, where efficiency serves as a critical pathway in transforming firm resources into long-term market value. Overall, the results align with the Resource-Based View (RBV), emphasizing that internal capabilities such as efficiency are key drivers of sustainable competitive advantage.

**Table 2. Model 1 – Technical Efficiency (Common Effect Model)**

Variable	Coefficient	t-Statistic	Prob.	Description
Constant	59.141	6.380	0.000	Positive
FO	0.989	5.280	0.000	Positive significant
FATA	-8.048	-4.113	0.000	Negative significant
SV	0.151	3.822	0.003	Positive significant

**Table 3. Model 2 – Firm Value (Fixed Effect Model)**

Variable	Coefficient	t-Statistic	Prob.	Description
Constant	0.846	9.247	0.000	Positive
TE	0.000754	1.978	0.0529	Positive (marginal)
FO	0.001646	0.929	0.357	Not significant
FATA	0.063508	3.724	0.0005	Positive significant
SV	-0.002593	-34.778	0.000	Negative significant

## 2. Sobel Test Analysis

The Sobel test is applied to evaluate the significance of indirect effects and to determine whether technical efficiency functions as a mediating variable between independent variables and firm value. The test results indicate that technical efficiency significantly mediates the relationship between firm ownership, internationalization, sustainability value, and firm value. Specifically, firm ownership has a positive indirect effect on firm value through technical efficiency, suggesting that stronger governance enhances operational efficiency and ultimately improves market valuation. Similarly, sustainability value exhibits a positive indirect effect, indicating that effective sustainability practices enhance efficiency, which then translates into higher firm value.

However, internationalization demonstrates a negative indirect effect through technical efficiency, reflecting the increased operational complexity and coordination costs associated with global expansion. Despite this negative pathway, firms with strong efficiency management can mitigate these adverse effects and maintain long-term value creation. These findings support the Resource-Based View and Transaction Cost Economics, emphasizing that the benefits of internationalization and sustainability depend on the firm’s ability to maintain operational efficiency. Overall, technical efficiency acts as a strategic transmission mechanism that determines whether internal and external factors generate positive or negative outcomes for firm value.

**Table 4. Sobel Test Results**

Mediation Path	a (Sa)	b (Sb)	a×b	Z	p-value
FO → TE → FV	0.9892 (0.1873)	0.000754 (0.00031)	0.000746	2.209	0.027
FATA → TE → FV	-8.0483 (1.9569)	0.000754 (0.00031)	-0.006068	-2.094	0.036
SV → TE → FV	0.15066 (0.03941)	0.000754 (0.00031)	0.000114	2.052	0.040

## 3. Hypothesis Testing Analysis

The hypothesis testing results reveal that firm ownership and sustainability value have a positive and significant effect on technical efficiency, while internationalization has a significant negative effect. Technical efficiency significantly enhances firm value, confirming its role as a key determinant of performance in the transportation and logistics sector. However, firm ownership does not significantly affect firm value directly, indicating that its influence is primarily indirect through efficiency mechanisms. Internationalization positively affects firm value, while sustainability value shows a negative direct effect, reflecting the short-term financial burden of sustainability investments.

Furthermore, mediation analysis confirms that technical efficiency significantly mediates the relationship between all independent variables and firm value. The mediation effect is positive for firm ownership and sustainability value, but negative for internationalization, reinforcing the notion of dual effects in strategic decision-making. These findings highlight that efficiency acts as a critical pathway that transforms internal capabilities and strategic initiatives into economic value. Overall, the results support agency theory, RBV, and stakeholder theory, emphasizing that effective resource management and governance are essential for sustainable firm value creation.

**Table 5. Hypothesis Testing Results**

Hypothesis	Coefficient	p-value	Conclusion
H1: FO → TE (+)	0.989197	0.0000	Supported
H2: DOI → TE (+)	-8.04825	0.00005	Not supported
H3: SV → TE (+)	0.150660	0.00015	Supported
H4: TE → FV (+)	0.000754	0.0264	Supported
H5: FO → FV (+)	0.001646	0.1784	Not supported
H6: DOI → FV (+)	0.063508	0.0002	Supported

Hypothesis	Coefficient	p-value	Conclusion
H7: SV → FV (+)	-0.00259	0.0000	Not supported
H8: FO → TE → FV	0.000741	0.0322	Supported
H9: DOI → TE → FV	-0.00603	0.0375	Not supported
H10: SV → TE → FV	0.00011	0.0397	Supported

## Discussion

### 1. Firm Ownership and Technical Efficiency

Firm ownership is found to have a positive and significant effect on technical efficiency, indicating that higher ownership concentration enhances operational control and resource utilization efficiency. This finding supports agency theory, which posits that ownership alignment reduces agency costs and improves managerial performance (Jensen & Meckling, 1976; Eisenhardt, 1989). Empirical evidence also confirms that institutional and managerial ownership strengthens monitoring mechanisms and cost discipline, thereby improving efficiency outcomes (Wan et al., 2023b; Wedajo et al., 2024; Ahmadi et al., 2025). In the context of Indonesian logistics firms, this relationship highlights the importance of governance structures in driving operational excellence.

From a Resource-Based View (RBV) perspective, ownership structure functions as a strategic capability that enables optimal allocation of both tangible and intangible resources (Barney, 1991; D. Kim et al., 2024). Firms with balanced ownership structures can enhance efficiency through better decision-making, technological adoption, and managerial discipline. However, excessive concentration may create entrenchment effects, reducing flexibility and innovation potential. Therefore, an optimal mix of institutional and managerial ownership is essential to sustain efficiency improvements and competitive advantage.

### 2. Internationalization and Technical Efficiency

Internationalization is found to negatively affect technical efficiency, suggesting that increased global expansion leads to higher operational complexity and coordination costs. This result contrasts with RBV expectations but aligns with Transaction Cost Economics, which emphasizes the cost burden of managing cross-border operations (Nguyen & Kim, 2020; Puthusserry et al., 2020). Empirical studies indicate that beyond an optimal level, internationalization creates diseconomies of scale due to regulatory differences and infrastructure disparities (Ibrahim & Falkenbach, 2023; Ruiz-Fernández et al., 2024). Thus, the relationship follows an inverted U-shaped pattern rather than a linear one.

This finding also reflects limitations in absorptive capacity, where firms are unable to fully leverage international learning and technological spillovers (Zahra & George, 2002). In emerging markets such as Indonesia, weak infrastructure and limited managerial capability exacerbate inefficiencies during global expansion. However, firms that adopt digital logistics systems and integrated supply chain technologies can mitigate these negative effects. Therefore, internationalization contributes to efficiency only when supported by strong technological and organizational capabilities.

### 3. Sustainability Value and Technical Efficiency

Sustainability has a positive and significant impact on technical efficiency, indicating that firms adopting sustainable practices achieve better resource optimization. This finding is consistent with prior studies demonstrating that green innovation, energy efficiency, and waste reduction improve operational performance (Huo et al., 2024; Wu & Dong, 2021; Ilyas & Osiyevskyy, 2022). Sustainability initiatives encourage firms to adopt advanced technologies and streamline processes, thereby enhancing productivity. In capital-intensive industries such as logistics, these improvements are particularly critical.

From an RBV and Triple Bottom Line perspective, sustainability acts as a strategic resource with VRIN characteristics (Barney, 1991; Elkington, 2020). Sustainable practices generate long-term efficiency gains through cost reduction and innovation. Empirical

evidence shows that green logistics and digital energy management significantly improve technical efficiency (Sundarakani & Khan, 2025; García-Sánchez et al., 2024). Thus, sustainability should be viewed not as a cost burden but as a driver of operational excellence and long-term competitiveness.

#### **4. Technical Efficiency and Firm Value**

Technical efficiency positively and significantly influences firm value, indicating that efficient resource utilization enhances market valuation. This finding supports RBV, which identifies efficiency as a key intangible capability driving competitive advantage (Barney, 1991; Chambers & Ray, 2021). Empirical studies confirm that higher efficiency improves profitability and investor confidence, leading to increased Tobin's Q (Rahman et al., 2024; Zhou & Li, 2022). Efficient firms are perceived as more resilient and capable of sustaining long-term growth.

In the digital transformation era, efficiency is closely linked to technological integration and operational innovation. Firms adopting AI, IoT, and data-driven logistics systems achieve superior performance and valuation (Wang et al., 2023; Skhvediani & Rekhviashvili, 2024). Efficiency reduces operational risk and enhances service quality, which strengthens investor perception. Therefore, technical efficiency acts as a strategic bridge between operational performance and market value creation.

#### **5. Firm Ownership and Firm Value**

Firm ownership does not have a significant direct effect on firm value, suggesting that ownership alone is insufficient to create market value. This finding aligns with agency theory, where ownership improves control but does not guarantee performance outcomes (Jensen & Meckling, 1976). Empirical evidence indicates that ownership contributes to firm value only when combined with effective governance and transparency (Rahman et al., 2024; Zhang & Liu, 2023). In many cases, institutional or state ownership prioritizes non-economic objectives, reducing its direct impact on value.

The results imply that ownership affects firm value indirectly through efficiency and governance mechanisms. Studies show that ownership becomes valuable when it enhances operational efficiency and reduces information asymmetry (Omar et al., 2022; Alrawashedh et al., 2021). Therefore, firms must integrate ownership structures with performance-based management and digital governance systems. Without these supporting mechanisms, ownership may become a coordination burden rather than a value driver.

#### **6. Internationalization and Firm Value**

Internationalization positively and significantly affects firm value, indicating that global expansion enhances market perception and growth potential. This finding supports the multinationality–performance framework, where access to international markets increases revenue diversification and reduces domestic risk (Nguyen & Kim, 2020; Bayraktar et al., 2024). Firms operating globally benefit from economies of scale, knowledge transfer, and technological integration. These advantages contribute to higher market valuation and investor confidence.

From RBV and Transaction Cost Economics perspectives, internationalization strengthens firm-specific advantages and reduces dependency on domestic markets (Narula & Verbeke, 2021; Wang et al., 2023). Digital logistics systems further enhance these benefits by improving coordination and efficiency across borders. Empirical evidence shows that firms with higher foreign asset ratios tend to have higher Tobin's Q. Thus, internationalization becomes a key driver of long-term firm value when supported by operational efficiency.

#### **7. Sustainability Value and Firm Value**

Sustainability value has a negative short-term effect on firm value, reflecting the high initial costs associated with ESG investments. This finding aligns with trade-off theory, where sustainability expenditures reduce short-term profitability (Pu, 2023a; Prabawati &

Rahmawati, 2022). Investors often perceive sustainability initiatives as cost burdens when immediate financial benefits are not visible. As a result, market valuation may decline in the early stages of implementation.

However, this relationship is dynamic and evolves over time into a positive effect. Longitudinal studies show that sustainability improves firm value after efficiency gains and reputational benefits materialize (Gerged et al., 2023; M et al., 2021). From a signaling theory perspective, sustainability creates value only when supported by strong financial performance (Wolf, 2017). Therefore, firms must align sustainability strategies with measurable economic outcomes to gain investor trust.

#### **8. Mediation of Technical Efficiency in Ownership–Firm Value Relationship**

Technical efficiency significantly mediates the relationship between firm ownership and firm value, indicating that ownership improves value through efficiency enhancement. This finding supports agency theory, where ownership alignment leads to better resource management and performance (Jensen & Meckling, 1976). Empirical studies confirm that governance structures enhance efficiency, which subsequently increases firm value (Mohd Fahmy-Abdullah et al., 2017). Thus, efficiency serves as a transmission mechanism linking ownership to market outcomes.

From an RBV perspective, efficiency transforms governance advantages into economic value. Firms with strong ownership structures leverage efficiency improvements to enhance competitiveness and investor perception. This mediation effect highlights that ownership alone is insufficient without operational excellence. Therefore, firms must focus on efficiency-driven governance to maximize value creation.

#### **9. Mediation of Technical Efficiency in Internationalization–Firm Value Relationship**

Technical efficiency negatively mediates the relationship between internationalization and firm value, indicating that global expansion can reduce efficiency and weaken value. This finding supports the inverted U-curve hypothesis, where excessive internationalization leads to inefficiencies (Bahl et al., 2021; Ibrahim & Falkenbach, 2023). High coordination costs and operational complexity reduce efficiency, which negatively impacts firm value. Thus, efficiency becomes a critical constraint in global expansion strategies.

However, this mediation effect can be mitigated through digital transformation and organizational learning. Firms that adopt integrated logistics systems and enhance absorptive capacity can maintain efficiency despite global expansion (Ciocirlan, 2018). RBV suggests that efficiency capability determines whether internationalization creates or destroys value. Therefore, firms must balance expansion with operational readiness to sustain value creation.

#### **10. Mediation of Technical Efficiency in Sustainability–Firm Value Relationship**

Technical efficiency positively mediates the relationship between sustainability value and firm value, indicating that sustainability creates value through efficiency improvements. This finding aligns with RBV and stakeholder theory, where sustainable practices enhance operational performance and legitimacy (Dmytriiev & Freeman, 2023; Nothnagel & Mellewigt, 2008). Green logistics and energy efficiency reduce costs and improve productivity, translating into higher firm value. Thus, efficiency acts as the main pathway linking sustainability to economic outcomes.

Empirical evidence shows that firms integrating sustainability with digital efficiency achieve significant performance gains (Hasanuddin & Dharsana, 2025; Febrina, 2024). Sustainability investments become strategic assets when they improve efficiency and reduce operational risks. This mediation confirms that sustainability is not merely a social obligation but a source of competitive advantage. Therefore, firms should integrate sustainability with efficiency strategies to maximize long-term value creation.

## CONCLUSION

This study provides robust empirical evidence on the determinants of technical efficiency and firm value in the transportation and logistics sector. The findings reveal that firm ownership and sustainability value significantly enhance technical efficiency, while internationalization exerts a negative effect due to increased operational complexity and coordination costs. Furthermore, technical efficiency plays a crucial role in improving firm value, confirming its position as a key operational capability that translates resource utilization into market performance. However, firm ownership does not directly influence firm value, indicating that governance structures alone are insufficient without efficient operational execution.

The results also highlight the dual nature of internationalization and sustainability in shaping firm value. Internationalization positively affects firm value by expanding market opportunities and diversification benefits, despite its negative impact on efficiency. In contrast, sustainability value negatively affects firm value in the short term, reflecting high initial investment costs and limited immediate market appreciation. These findings suggest that both strategies require careful managerial alignment to balance short-term performance with long-term value creation.

Importantly, technical efficiency emerges as a central mediating variable that connects internal and external strategic factors to firm value. It positively mediates the relationship between firm ownership and sustainability with firm value, while negatively mediating the impact of internationalization. This confirms that efficiency is the primary transmission mechanism through which governance, global expansion, and sustainability initiatives influence market valuation. Overall, this study contributes to the literature by reinforcing the strategic role of technical efficiency as a foundational driver of sustainable firm value in capital-intensive industries.

The managerial implication of this study emphasizes the importance of aligning ownership structure, internationalization strategy, and sustainability practices with operational efficiency to enhance firm value. Companies should strengthen governance mechanisms, adopt measured international expansion strategies, and integrate sustainability initiatives with efficiency-driven operations. From a policy perspective, regulators should support domestic ownership structures, provide incentives for measurable sustainability practices, and facilitate internationalization through infrastructure and regulatory improvements. Theoretically, this study extends the Resource-Based View and Agency Theory by confirming that technical efficiency acts as a critical mediating mechanism linking strategic variables to firm value, particularly in emerging market logistics sectors.

This study is subject to several limitations, including the relatively small sample size of 22 firms and reliance on secondary financial data, which may limit generalizability and accuracy. The observation period (2014–2023) may not fully capture long-term dynamic effects, particularly for sustainability investments and international expansion. Additionally, the study focuses on a limited set of variables, excluding important external factors such as geopolitical risk, digital transformation, and global market volatility. These limitations suggest that the findings should be interpreted within the specific context of the Indonesian transportation and logistics industry.

Future research is encouraged to expand the sample size across sectors and incorporate primary data sources such as managerial interviews and operational metrics to improve validity. Extending the observation period and applying dynamic panel methods, such as GMM or VAR, would allow for deeper analysis of long-term relationships and structural changes. Researchers should also include additional variables such as digital readiness, green innovation, and geopolitical risk to better capture the complexity of the business environment. Finally, adopting mixed method approaches and case studies would provide

richer insight into the causal mechanisms underlying efficiency, sustainability, and firm value relationships.

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