Jurnal Akuntansi, Keuangan, dan Manajemen (JAKMAN)
ISSN: 2716-0807, Vol 7, No 4, 2026, 335-356 https://doi.org/10.35912/jakman.v7.n4.p335-356.2026

Asset Turnover Mediates the Effects of ERM and Sales Growth on the Profitability

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Article History
Received on 12 August 2026
1st Revision on 18 August 2026
2nd Revision on 21 August 2026
3rd Revision on 28 August 2026
Accepted on 01 September 2026

Abstract

Purpose: This study examines whether asset turnover mediates the effects of *Enterprise Risk Management* (ERM) and sales growth on profitability, while assessing the role of firm size in influencing this relationship.

Research Methodology: The study analyzes 143 non-financial listed firms on the Indonesia Stock Exchange during 2018–2025, producing a balanced panel of 1,144 observations. The analysis employs a *Fixed Effects Model*, with mediation tested through causal path analysis and moderation examined using the interaction term between TATO and firm size.

Results: The findings show that ERM and sales growth positively affect *Total Asset Turnover* (TATO). TATO is the strongest predictor of *Return on Assets* (ROA) and partially mediates the relationship between ERM, sales growth, and profitability. However, the interaction between TATO and firm size has a negative and significant effect, indicating that larger firms experience reduced efficiency in converting asset utilization into profitability.

Conclusion: Operational efficiency serves as a key channel through which risk management and sales growth enhance profitability. However, increasing firm size may weaken this conversion process due to greater organizational complexity.

Limitations: The study is limited to 143 non-financial firms and uses an aggregate ERM disclosure index, which may not fully capture implementation maturity.

Contribution: This study contributes to the Resource-Based View and Contingency Theory by identifying asset efficiency as an overlooked mechanism in the ERM–performance relationship and demonstrating firm size as a boundary condition that influences efficiency-based value creation.

Keywords: *Enterprise Risk Management, Firm Size, Return on Assets, Sales Growth, Total Asset Turnover*

How to Cite: Wibowo, S., Leon, F. M., Lestari, H. S., Syam, E., Wahyudi, A. S., & Pusvikasari, N. (2026). Asset Turnover Mediates the Effects of ERM and Sales Growth on the Profitability. *Jurnal Akuntansi, Keuangan, dan Manajemen*, 7(4), 335-356.

1. Introduction

During the period 2018-2025, non-financial listed companies in Indonesia were hit by a series of shocks, including the COVID-19 pandemic, a sharp rise in global interest rates, and reciprocal U.S. tariffs that impacted labor-intensive industries; all three directly reduced profit margins (Dewi, & Priyadi, 2023; Khalifaturofi, & Setiawan, 2024). Traces of this pressure were evident in the manufacturing purchasing managers' index, which briefly plunged into contraction territory before gradually recovering a dynamic that spilled over into asset turnover rates and sales growth in the real sector (Syifa & Maiyaliza, 2026). Amid this situation, the Enterprise Risk Management (ERM) framework along with its four dimensions: strategy, operations, reporting, and compliance is increasingly being adopted by non-financial companies as a benchmark for best practices, even though the formal obligation to implement it remains confined to the financial services industry (Anugerah, Ariyanto, & Sari, 2023; Ananda, Madyoningrum, Sari, & Shafitranata, 2024).

As risk management systems improve and sales continue to rise, the next challenge for companies is to translate both into increased profits. Among Indonesian non-financial listed companies, the pandemic reduced Return on Assets (ROA), while the ERM adoption rate rose only slightly from 37.95% to 38.66%, indicating that its adoption is still in its early stages (Napitupulu, Situngkir, Basuki, & Nugroho, 2023; Ananda et al., 2024). According to Nurullah, Gozali, Hamzah, Bakti, Khasman, and Maharani (2024), an increase in assets does not necessarily lead to an improvement in ROA for Indonesian listed companies, while corporate profits in developing countries are easily affected by external shocks, industry characteristics, or the current stage of growth (Mansikkamäki, 2023; Suteja, Gunardi, Alghifari, Susiadi, Yulianti, & Lestari, 2023). For capital-intensive companies, ROA is more appropriate than equity-based ratios because it reflects how productively assets are managed while signaling the quality of corporate governance to investors and creditors (Napitupulu et al., 2023; Suyanto, & Bilang, 2023).

There are two distinct gaps that this study aims to address, and both need to be clearly distinguished. The empirical gap relates to conflicting findings: the effect of ERM on ROA has been reported as significantly positive by some researchers (Horvey, & Odei-Mensah, 2024; Olaoye, & Olaoye, 2022), negative by others (Soladoye, Dominic, Gambo, & Abubakar, 2024), and negligible in subsequent studies (Otero, & Tamayo, 2020; Pagach, & Warr, 2008), depending on the sector studied, the ERM proxy used, and the observation period. Similar inconsistencies are evident in the relationship between sales growth and profitability, which, at the international level, even follows an inverted U-shaped curve rather than a straight line (Anokhin, Spitsin, Vukovic, & Maiti, 2026; Dakić, Nuševa, Vučenović, Hladika, Petreska, & Jovanović, 2025). Theoretical gaps vary in nature: the literature has not yet explained through what mechanisms and under what conditions risk management capabilities translate into profits. Most studies only highlight the direct relationship between ERM and performance without simultaneously modeling mediating variables and contingent conditions, so the process by which capabilities translate into profitability remains a black box (Resende, Monje-Amor, & Calvo, 2024; Vinh, Ngoc-Long, & Xuan, 2024).

These two gaps are bridged by using Total Asset Turnover (TATO) as an intermediary mechanism and Firm Size as a contingent condition. The selection of TATO is based on empirical evidence that this ratio drives ROA while also serving as a conceptual link connecting ERM, sales growth, and profitability (Dincă, & Akomeah, 2026; Patin, Rahman, & Mustafa, 2020; Syifa and Maiyaliza, 2026). Firm Size is used because large-scale companies enjoy economies of scale and risk diversification, yet at the same time bear the burden of internal bureaucracy and agency costs that can hinder the efficient channeling of efficiency gains (Canbäck, Samouel, & Price, 2006; Yadav, Pahi, & Gangakhedkar, 2022). Indonesia non-financial sector is a relevant focus because the range of asset sizes among its listed companies is extremely broad, spanning from startup manufacturers to nationwide downstream conglomerates (Nguyen & Pham, 2026).

Three aspects constitute the novelty of this study. First, the four-dimensional ERM and Sales Growth are integrated simultaneously into a single causal model, rather than being tested individually as was customary in previous research (Horvey and Odei-Mensah, 2024; Vinh et al., 2024). Second, TATO is

treated as a formal mediating variable an approach rarely encountered in the literature on risk management among Indonesian non-financial issuers (Resende et al., 2024). Third, the estimation results show that Firm Size negatively moderates the TATO-ROA relationship, contrary to the common assumption based on the theory of economies of scale, thus offering a perspective that organizational complexity acts as a barrier, not a lever, when asset efficiency is to be converted into profit (Ahmed, Nugraha, & Hágen, 2023; Canbäck et al., 2006).

2. Literature Review and Hypotheses Development

2.1 Theoretical Framework

The model tested is grounded in three theoretical frameworks. Agency Theory positions ERM as a control mechanism that mitigates information asymmetry, conflicts of interest, and agency costs through closer oversight and more transparent reporting (Altin, 2024; Jensen & Meckling, 1976). Within this research framework, the dimensions *of reporting* and *compliance* are closely linked to agency mechanisms because both demand management accountability and align risk decisions with shareholder interests (Syamsi & Hanggraeni, 2025). Effective risk control allows management to reduce waste and direct resources toward the right targets, thereby boosting ROA (Saeidi et al., 2021; Santoso & Husaini, 2025).

The Resource-Based View (RBV) regards ERM and sales growth as both resources and internal capabilities that enhance asset productivity (Vinh Quang et al., 2024; Yadav et al., 2022). ERM, integrated across its four dimensions, enables companies to more effectively assess risks, allocate resources, and optimize asset utilization (Handoyo et al., 2023; Malik et al., 2020). RBV implies that this sequence does not directly lead to profit but first drives efficiency in asset utilization as reflected by TATO and only then increases ROA (Handoyo et al., 2023; Hermawan et al., 2025). This logic forms the basis for positioning TATO as a mediating mechanism.

Contingency Theory states that the effectiveness of ERM and a firm's ability to convert sales growth into efficiency and profit are determined by each firm's internal conditions (Aksoy et al., 2024; Georgakopoulos et al., 2022). Firm size is positioned as a contingency factor because companies of different scales possess varying resource capacities, organizational structures, and readiness to implement ERM (Aksoy et al., 2024; Yousaf, 2025). These three theories form a continuous framework: Agency Theory explains ERM as a control mechanism; RBV explains ERM and Sales Growth as capabilities that drive asset efficiency toward ROA, while Contingency Theory explains Firm Size as the condition that determines the strength or weakness of this conversion (Altin, 2024; Danilov, 2024).

2.2 Critical Comparison of Previous Studies

Table 1. Critical comparison of findings from previous studies and sources of inconsistency

Relationship Tested	Positive Findings	Negative / Non-significant Findings	Sources of Inconsistency
ERM → Profitability	Horvey & Odei-Mensah (2024) on South African insurance; Olaoye & Olaoye (2022) on Nigerian manufacturing; Hermawan et al. (2025) on Indonesian issuers	Soladoye et al. (2024) on the Nigerian insurance industry; Otero González et al. (2020) on Spanish listed companies; Pagach & Warr (2008) on U.S. listed companies	Non-uniform ERM proxies (disclosure index, presence of a CRO, or dummy variable), differing time horizons, and initial implementation costs that depress short-term profits (Farooq et al., 2025; Saka & Abere, 2026)

Relationship Tested	Positive Findings	Negative / Non-significant Findings	Sources of Inconsistency
Sales Growth → Profitability	Dakić et al. (2025) on Serbian wholesale trade; Olaoye & Olaoye (2022)	Mansikkamäki (2023) on Finnish firms; Alsalami et al. (2023) on GCC Islamic banks	The relationship is nonlinear, resembling an inverted U-shape, and is determined by leverage, age, and the company's asset turnover (Anokhin et al., 2026)
TATO → ROA	Patin et al. (2020) on 1,961 U.S. issuers; Chandra et al. (2021) and Fauzia et al. (2026) on Indonesian issuers	Hasanatun et al. (2025) on the banking subsector; Alkhyyoon et al. (2023) on select Middle Eastern industries	Asset intensity by industry: in high-asset-intensity sectors, an increase in turnover is not proportional to a decline in margins (Dincă & Akomeah, 2026)
Firm Size → Performance	Ofori et al. (2025) on the Ghanaian banking sector; Goh et al. (2022) on Indonesian listed companies	Yadav et al. (2022) in the Asia–Pacific market; Canbäck et al. (2006) in 784 U.S. manufacturing firms	Trade-off between economies of scale and bureaucratic costs; the net direction is determined by the firm's position on the cost curve (Canbäck et al., 2006; Mansikkamäki, 2023)

Table 1 below summarizes the findings of previous studies and critically compares the differences in results among them.

Three lessons can be drawn from Table 1. First, the conflicting views on the ERM pathway are not merely a matter of empirical evidence but stem from the measurement methods: studies relying on multidimensional disclosure indices tend to find a positive effect, whereas those using a dummy variable for the presence of a Chief Risk Officer more often yield no significant results because the existence of the position does not necessarily imply the maturity of the practice (Horvey & Odei-Mensah, 2024; Otero González et al., 2020). Second, the discrepancy in the Sales Growth channel is not actually a contradiction but rather a symptom of specification error. Among 1,591 technology firms, Anokhin et al. (2026) found that profitability follows an inverted U-curve with respect to growth, with scale, age, leverage, and asset turnover acting as moderators; even studies that enforce a linear specification end up with coefficient signs that vary depending on the sample's position along the curve. Third, and most significant for this study, the differences in the Firm Size channel are rooted in theory: RBV predicts a positive relationship through resource completeness, while transaction cost economics predicts a negative relationship through bureaucratic failure, and evidence from Canbäck et al. (2006) shows that bureaucratic isolation and weak incentives significantly suppress the profits of large firms.

This comparison underscores the significance of this study. Previous research has generally focused on only one channel in isolation, making it impossible to determine whether conflicting results stem from the absence of an effect or from an unaccounted-for mediator (Resende et al., 2024; Vinh Quang et al., 2024). By testing mediation alongside moderation, this study offers a framework that resolves this contradiction, rather than merely adding a new finding to it (Zhao et al., 2010).

2.3 Hypotheses Development

ERM and asset efficiency. According to the Resource-Based View (RBV), the ability to integrate risk information into both strategic and operational decisions is classified as an organizational capability that enhances resource efficiency (Handoyo et al., 2023; Vinh Quang et al., 2024). Effective ERM

enables companies to anticipate operational disruptions earlier, reduce waste, and fully utilize asset capacity to generate revenue (Alkhyyoon et al., 2023; Malik et al., 2020).

H_1: Enterprise Risk Management has a positive effect on Total Asset Turnover

Sales growth and asset efficiency. An increase in sales supported by full utilization of asset capacity shortens the asset utilization cycle, and this is reflected in TATO (Goh et al., 2022; Syifa & Maiyaliza, 2026). The magnitude of this effect depends on the company's funding structure and " " policy; thus, the positive relationship holds as long as the growth in the asset base does not outpace sales growth (Dewi & Priyadi, 2023; Liviani & Rachman, 2021).

H_2: Sales Growth has a positive effect on Total Asset Turnover

Asset efficiency and profitability. Faster turnover allows a company to achieve greater sales volume from the same asset base, thereby increasing the profit-generating capacity of assets (Patin et al., 2020; Syifa & Maiyaliza, 2026).

H_3: Total Asset Turnover has a positive effect on Return on Assets

Mediation by asset efficiency. When ERM is implemented in an integrated manner, risk information is immediately utilized in operational decisions, enabling the company to mitigate disruptions and increase asset productivity before the benefits are reflected in profits (Restiana et al., 2025). Recent literature indicates that the impact of ERM on performance flows through internal mechanisms such as knowledge management and technology utilization; therefore, testing only the direct path risks leading to erroneous conclusions (Resende et al., 2024; Vinh et al., 2024). The same argument applies to sales growth: expanding into new markets increases profits when accompanied by efficient asset utilization (Anokhin et al., 2026; Goh et al., 2022).

H_4: Total Asset Turnover positively mediates the effect of Enterprise Risk Management on Return on Assets

H_5: Total Asset Turnover positively mediates the effect of Sales Growth on Return on Assets

Moderation by firm size. The theoretical basis for the moderation hypothesis requires a more definitive explanation because two theories offer conflicting predictions. The Resource-Based View (RBV) and the theory of economies of scale suggest that larger firms possess greater resources, technological capacity, and access to financing, so improvements in asset efficiency should result in higher profits (Goh et al., 2022; Ofori et al., 2025). Conversely, transaction cost economics predicts that increasing size leads to bureaucratic isolation, miscommunication, and blunted incentives, so that efficiency gains are absorbed before they reach profits (Canbäck et al., 2006; Williamson, 1975). Cross-market evidence tends to show a negative relationship between firm size and profitability after controlling for interfirm heterogeneity (Yadav et al., 2022), and small firms are actually more adept at converting growth into profits (Anokhin et al., 2026). Since the subject of this study is Indonesia non-financial sector, which is currently entering a phase of asset-intensive downstream processing, the RBV prediction is used as a working hypothesis as well as a counter-test to the transaction cost economics prediction.

H_6: Firm size strengthens the positive effect of Total Asset Turnover on Return on Assets

Moderation on the indirect path. While H_6 highlights the strength of path *b*, the following hypothesis examines whether the overall indirect effect of ERM via TATO is also determined by firm size. This type of test is known as *moderated mediation* and differs from a simple moderation test (Hayes & Rockwood, 2017; Preacher & Hayes, 2008).

H_7: Firm size strengthens the indirect effect of Enterprise Risk Management on Return on Assets through Total Asset Turnover

It should be noted that the previous draft contained three moderation hypothesis formulations that were statistically based on the same interaction term. These three have now been combined into H_6 and H_7 to eliminate redundant arguments without reducing the scope of the analysis (Aiken & West, 1991).

3. Research Methodology

3.1 Design, Population, and Sample

A quantitative approach with an explanatory design was used to examine the causal relationships among variables. A panel data structure was chosen because it integrates both cross-sectional and time-series dimensions, thereby making estimations more efficient, reducing bias caused by unobserved firm-level heterogeneity, and providing greater flexibility in the number of degrees of freedom compared to using cross-sectional or time-series data separately (Baltagi, 2021). All non-financial sector companies listed on the Indonesia Stock Exchange constitute the study population. Sampling was conducted using purposive sampling based on three criteria, each grounded in methodological rationale rather than mere administrative screening.

The first criterion being listed continuously throughout 2018–2025 is necessary to form a balanced panel. A balanced panel mitigates selection bias that arises when poorly performing companies are dropped from the sample mid-period, as their exit is not random and is related to the dependent variable (Baltagi, 2021). The consequence is a survivorship bias.

The second criterion. the availability of complete and consistent financial statements and annual reports is necessary because ERM scores are derived from narrative disclosures in annual reports. Without continuity in the documents, fluctuations in ERM scores over time would merely reflect differences in document availability rather than differences in risk management practices, and such measurement issues are often the root cause of inconsistent results in the ERM literature (Horvey & Odei-Mensah, 2024).

The third criterion, data completeness across all variables is required so that within-firm estimates in the fixed-effects model do not lose degrees of freedom disproportionately across firms (Wooldridge, 2010). The financial sector was excluded because its balance sheet structure and regulatory capital requirements make this sector's asset turnover ratios incomparable to those of the real sector (Msomi, Olarewaju, & Sibanda, 2025). Filtering based on these three criteria left 143 firms that, over the eight-year observation period, formed 1,144 balanced panel observations. All data were secondary and analyzed using EViews.

3.2 Operational Definitions and Measurement of Variables

To ensure consistency in measurement and the replicability of the study, each variable is provided with an operational definition and measured using quantitative proxies that are standard in the financial accounting literature. The details are presented in Table 2.The measurement of all variables is based on secondary data in the form of financial statements and annual reports, ensuring that the results can be back-tested and replicated (Anugerah et al., 2023). The consistency of these proxies is a prerequisite for comparing the path coefficients in Model 1 and Model 2 (Chandra et al., 2021; Suyanto & Bilang, 2023).

Table 2. Operational definitions and measurement of variables

Variables	Type	Operational Definition	Measurement	Source
ERM	Independence	Degree of risk management implementation across four dimensions (strategy, operations, reporting, compliance)	Total disclosure score for the four dimensions of ERM derived from annual reports	(Anugerah et al., 2023; Farooq et al., 2025)
SALES_GROWTH	Independence	Annual sales growth rate	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$	(Anokhin et al., 2026; Syifa, 2026)
TATO	Mediator	Total asset efficiency in generating sales	Sales / Total Assets	(Napitupulu et al., 2023; Patin et al., 2020)
F_SIZE	Moderator	The magnitude of resources and operational capacity	Natural logarithm of Total Assets	(Ahmed et al., 2023; Nunthaphad, 2025)
TATO × F_SIZE	Moderation interaction	Moderating effect of firm size on the TATO–ROA relationship	Product of TATO and F_SIZE (without mean-centering)	(Aiken, 1991; Hayes, 2017)
ROA	Dependent	Total assets' ability to generate profit	Net Income / Total Assets	(Khalifaturofi, 2024; Msomi et al., 2025)
DER	Control	Capital Structure / Leverage Ratio	Total Debt / Total Equity	(Ananda et al., 2024; Khoza, 2025)
AGE	Control	Company age calculated from the start of operations or listing	Observation year − year of establishment/listing	(Julito & Ticoalu, 2022)
CR	Control	Degree of short-term liquidity	Current Assets / Current Liabilities	(Khoza, 2025; Restiana et al., 2025)
AUDIT_COM	Control	Audit Committee Vigilance	Natural logarithm of the number of audit committee members	(Almega, 2024; Karim et al., 2023)

3.3 Data Analysis Methods and Model Selection

The analysis proceeds in stages. The initial stage presents descriptive statistics to map the central tendencies and distribution of the data. The next stage involves a stepwise determination of the panel estimation model, beginning with the Chow test, followed by the Hausman test, and then the *Lagrange Multiplier* test (Breusch & Pagan, 1980; Chow, 1960; Hausman, 1978). The third stage involves testing the classical assumptions, while the final stage tests the hypotheses using the F-test, the t-test, and the coefficient of determination at a significance level of α = 5%.

Two panel data regression equations are formulated in Formula 1& 2:

$$\begin{aligned} \mathrm{TATO}_{it} = \beta_0 + \beta_1 \mathrm{ERM}_{it} + \beta_2 \mathrm{SALES\_GROWTH}_{it} + \beta_3 \mathrm{DER}_{it} \\ + \beta_4 \mathrm{AGE}_{it} + \beta_5 \mathrm{CR}_{it} + \beta_6 \mathrm{AUDIT\_COM}_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

$$\begin{aligned} \mathrm{ROA}_{it} = \beta_0 + \beta_1 \mathrm{ERM}_{it} + \beta_2 \mathrm{SALES\_GROWTH}_{it} + \beta_3 \mathrm{TATO}_{it} + \beta_4 \mathrm{F\_SIZE}_{it} \\ + \beta_5 (\mathrm{TATO} \times \mathrm{F\_SIZE})_{it} + \beta_6 \mathrm{DER}_{it} + \beta_7 \mathrm{AGE}_{it} + \beta_8 \mathrm{CR}_{it} + \beta_9 \mathrm{AUDIT\_COM}_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

The subscript *i* denotes the *cross-sectional* unit, while *t* denotes the time dimension. The coefficient β_5 in Formula (2) serves as the key parameter for the moderation effect; moderation is considered significant if the interaction coefficient is statistically significant, regardless of whether each main variable is significant on its own (Aiken & West, 1991; Hair et al., 2019).

3.3.1 Justification for Selecting the Fixed-Effects Model

The decision to use the Fixed Effects Model (FEM) is not based solely on statistical test results but also on substantive considerations. From a statistical perspective, the Chow test ruled out the Common Effects Model, and the Hausman test ruled out the Random Effects Model for both equations, indicating that firm-specific effects are correlated with the explanatory variables (Chow, 1960; Hausman, 1978). From a substantive perspective, such correlations are indeed expected to arise because managerial quality, competitive position, and risk culture are unobservable firm characteristics that are closely related to both the intensity of ERM implementation and the asset turnover rate (Baltagi, 2021; Wooldridge, 2010). The Random Effects Model requires orthogonality between individual effects and explanatory variables an assumption that is difficult to justify theoretically in this context and thus its use results in inconsistent estimators (Hausman, 1978).

Another advantage of the FEM lies in the within transformation, which involves subtracting each observation by its firm's mean. This procedure eliminates firm characteristics that remain constant over time ranging from industry sector, controlling ownership structure, to location so that the remaining coefficients capture the impact of changes within the firm rather than differences between firms (Baltagi, 2021). At the same time, the influence of extreme values across firms is dampened, and the overlapping variance in the interaction terms is reduced even without mean-centering (Hayes & Rockwood, 2017).

The consequences of this choice must be stated as they are. Variables whose values remain constant over time cannot have their coefficients estimated by FEM, and the efficiency of the estimation decreases when the within- ation of a variable is relatively low (Wooldridge, 2010). Changes in firm size over time are relatively slow, so the F_SIZE coefficient in Model 2 is more accurately interpreted as the effect of increasing scale within a single firm, rather than the result of comparing large firms with small ones (Baltagi, 2021).

3.3.2 Potential for Endogeneity

Three common sources of endogeneity found in corporate performance research are acknowledged in this study (Ullah et al., 2018; Wintoki et al., 2012). First, unobserved heterogeneity. Leadership quality or brand strength has the potential to influence ERM, TATO, and ROA simultaneously. FEM addresses this source of bias directly as long as these factors remain relatively constant over the observation period (Baltagi, 2021).

Second, simultaneity or reverse causality. More profitable firms may have greater financial flexibility to establish risk management systems, so the direction of causality could run from ROA to ERM, rather than the other way around (Otero González et al., 2020; Wintoki et al., 2012). This issue is not resolved by the FEM. Third, dynamic endogeneity. Profits from the previous period influence decisions regarding asset investment and the implementation of ERM in the current period, meaning that explanatory variables are correlated with past errors (Wintoki et al., 2012). Static panel models ignore such persistence.

Since the FEM does not address the latter two sources, the findings of this study should be interpreted as strong conditional associations rather than pure causal evidence. To address all three simultaneously, the standard approach is the system-GMM estimator, which treats the lags of endogenous variables as instruments, with the validity of the instruments tested using the Hansen statistic and the Arellano-Bond AR(2) statistic (Arellano & Bond, 1991; Horvey & Odei-Mensah,

2024; Ullah et al., 2018). The application of this dynamic estimator is outlined as a topic for further research

3.3.3 Robustness Test Procedures
A panel of firms is susceptible to cross-section dependence because common factors such as macroeconomic conditions, market movements, and policy shocks-affect all listed firms simultaneously. Driscoll and Kraay (1998) and Hoechle (2007) demonstrated through Monte Carlo simulations that standard errors that ignore such dependence tend to be too small, causing t-values to increase and the risk of false significance to rise. Hoechle (2007) also points out that such corrections do not always move in one direction: corrected standard errors are not necessarily larger than conventional standard errors, so the direction of the shift in probability values cannot be determined in advance.

Based on these considerations, both equations were re-estimated using a Fixed Effects Model with White cross-section covariance correction, and the results were compared with the baseline specification of a Fixed Effects Model with Ordinary covariance. The White cross-section correction groups errors by period, making it robust to heteroscedasticity as well as contemporaneous correlations among firms, and is algebraically equivalent to the Driscoll-Kraay estimator at a lag length of zero (Hoechle, 2007). The full version of the Driscoll-Kraay estimator, which also corrects for autocorrelation up to a certain lag, was not applied because it relies on long-run asymptotic assumptions, whereas this panel study spans only eight years, so its calibration could actually deteriorate (Hoechle, 2007).

Since only the covariance matrix is adjusted, the point estimates do not shift, and the coefficients in both specifications are exactly the same. The robustness of the model is therefore assessed based on the consistency of the direction of the coefficients and the significance conclusions of the hypothesis-testing variables, rather than on changes in the magnitude of the coefficients. The numerical results are presented in Section 4.10, specifically Table 9 for Model 1 and Table 10 for Model 2.

3.4 Control Variables
Four control variables were included so that the coefficients of the main variables reflect net effects. The Debt-to-Equity Ratio (DER) was controlled because debt-financed capital increases interest expenses and debt agency costs, which can potentially erode profits (Jensen & Meckling, 1976; Khoza, 2025). AGE was controlled because more mature companies typically exhibit better learning curves and operational efficiency (Julito & Ticoalu, 2022). CR was controlled because short-term liquidity reflects the effectiveness of working capital management (Khoza, 2025). AUDIT_COM is controlled because governance oversight influences the quality of reporting and managerial decisions (Almega & Yuliansyah, 2024; Karim et al., 2023).

4. Results and Discussions

4.1 Descriptive Statistics
Table 3 summarizes the descriptive statistics for 1,144 panel observations from 2018 to 2025.

Table 3. Descriptive statistics

Variables	Minimum	Maximum	Mean	Standard Deviation
ROA	−2.7560	0.9210	0.0293	0.1454
ERM	−3.1522	8.0971	0.8424	1.2969
SALES_GROWTH	−1.3598	15.3584	0.1236	0.9255
TATO	0.0000	6.9494	0.8045	0.8281
F_SIZE	24.2778	33.3337	28.9605	1.6857
TATO_FSIZE	0.0001	187.1928	23.1673	23.5400
DER	−30.1534	190.3070	1.5029	7.5676

Variables	Minimum	Maximum	Mean	Standard Deviation
CR	0.0002	486.7174	4.8254	27.0155
AGE	3.00	94.00	38.1783	16.3179
AUDIT_COM	0.6931	1.9459	1.1193	0.1297

Three patterns stand out. First, the sample's profits are both low and volatile: the average ROA stands at 2.93%, while its standard deviation is nearly five times that figure a reasonable condition for a panel of non-financial issuers whose time range encompasses the pandemic and global interest rate volatility (Khalifaturofi'ah & Setiawan, 2024). Second, the heterogeneity of the three main variables is high: the distribution of ERM scores is wide; Sales Growth skews sharply to the right due to a handful of companies whose sales surged dramatically; and the TATO range spans from companies whose assets generate almost no sales to those with extremely high asset turnover (Mansikkamäki, 2023). Third, Firm Size exhibits the most stable distribution, indicating that the natural logarithmic transformation successfully normalized the scale of total assets (Nunthaphad, 2025).

The extreme distribution in TATO_FSIZE arises as a mathematical consequence of multiplying two variables with different scales (Aiken & West, 1991). Similar patterns in DER and CR frequently appear in real financial data covering volatile periods (Khoza, 2025). The within transformation in FEM accommodates these conditions, thereby mitigating the influence of inter-firm extreme values on coefficient estimates (Baltagi, 2021).

4.2 Multicollinearity Test

Signs of multicollinearity among independent variables were examined using a Pearson correlation matrix with a critical threshold of 0.80 (Hair et al., 2019). Table 4 presents the results for Model 1.

Table 4. Pearson correlation matrix for model 1 (dependent variable: TATO)

	ERM	SG	FS	DER	CR	AGE	AC
ERM	1.000						
SG	0.142	1.000					
FS	−0.138	−0.035	1.000				
DER	−0.017	−0.011	0.080	1.000			
CR	−0.002	0.127	−0.132	−0.024	1.000		
AGE	0.004	−0.061	0.155	0.043	−0.117	1.000	
AC	−0.051	−0.034	0.357	0.032	−0.022	0.036	1.000

Notes: ERM = Enterprise Risk Management; SG = Sales Growth; FS = Firm Size; DER = Debt-to-Equity Ratio; CR = Current Ratio; AGE = firm age; AC = audit committee.

All correlation coefficients in Model 1 are well below the critical threshold; the highest value is only 0.357 for the *Firm Size* and Audit Committee pair, indicating that Model 1 is free from serious multicollinearity (Hair et al., 2019). The correlation matrix for Model 2 is presented in Table 5.

Table 5. Pearson correlation matrix for model 2 (dependent variable: ROA)

	ERM	SG	TATO	FS	TFS	DER	CR	AGE	AC
ERM	1.000								
SG	0.142	1.000							
TATO	0.670	0.087	1.000						
FS	−0.138	−0.035	−0.094	1.000					
TFS	0.665	0.086	0.997	−0.044	1.000				
DER	−0.017	−0.011	0.039	0.080	0.043	1.000			
CR	−0.002	0.127	−0.083	−0.132	−0.085	−0.024	1.000		
AGE	0.004	−0.061	0.031	0.155	0.042	0.043	−0.117	1.000	
AC	−0.051	−0.034	−0.033	0.357	−0.022	0.032	−0.022	0.036	1.000

Note: TFS = TATO_FSIZE (TATO × Firm Size interaction). Other variables are the same as in Table 4.

Two figures are worth noting. The ERM–TATO correlation of 0.670 makes conceptual sense because the strategy and operations dimensions of the ERM index also capture operational efficiency, and the figure remains below the critical threshold (Alkhyyoon et al., 2023). Meanwhile, the correlation between TATO and its interaction term, which reaches 0.997, is a common phenomenon in moderation regression without *mean-centering*; the methodological literature refers to this as non-essential or structural multicollinearity, and its nature is fundamentally different from essential multicollinearity, which truly undermines estimates (Aiken & West, 1991; Hayes & Rockwood, 2017). Since the model was estimated using FEM with within transformations, overlapping variances were significantly reduced, thereby maintaining the validity of the estimates (Baltagi, 2021).

4.3 Model 1: The Effects of ERM and Sales Growth on TATO

Estimating path *a* within the mediation framework is the first step. Table 6 presents the results.

Table 6. Regression results for model 1 - dependent variable: TATO (fixed effects model)

Variables	Coefficient	t-statistic	Prob.	Conclusion
C (constant)	0.900154	—	0.0003	Not a hypothesis test parameter
ERM	0.175236	16.2331	0.0000	Significant (+)
SALES_GROWTH	0.053929	4.5806	0.0000	Significant (+)
DER (control)	0.000448	—	0.7659	Not significant
AGE (control)	−0.004162	—	0.3505	Not significant
CR (control)	−0.000741	—	0.2899	Not significant
AUDIT_COM (control)	−0.078764	—	0.6129	Not significant

R^2 = 0.8498 | Adj. R^2 = 0.8274 | F-stat = 38.0329 | Prob(F) = 0.0000. Sample: 2018–2025; 143 companies; 1,144 balanced panel observations.

Model 1 exhibits high explanatory power. After accounting for cross-section fixed effects, ERM, along with *Sales Growth* and the control variables, explains 82.74% of the variation in TATO, and the model is simultaneously significant at the 99% confidence level. Partially, both ERM and *Sales Growth* have a positive and highly significant effect on TATO. The four control variables are not significant, indicating that capital structure, firm age, short-term liquidity, and audit committee size are not the primary determinants of asset turnover efficiency in this sample (Karim et al., 2023; Khoza, 2025).

4.4 Model 2: Mediation of TATO and Moderation of Firm Size on ROA

The regression results for Model 2, which examines the effect of the independent variables on Return on Assets (ROA) using the Fixed Effects Model, are presented in Table 7.

Table 7. Regression results for model 2 - dependent variable: ROA (fixed effects model)

Variables	Coefficient	t-Statistic	Prob.	Conclusion
C (constant)	−2.289726	—	0.0000	Not a hypothesis test parameter
ERM (direct path)	0.009250	—	0.0162	Significant (+)
SALES_GROWTH (direct path)	0.022777	—	0.0000	Significant (+)
TATO (mediator)	2.266948	13.0055	0.0000	Significant (+)
F_SIZE	0.085967	—	0.0000	Significant (+)

Variables	Coefficient	t-Statistic	Prob.	Conclusion
TATO × F_SIZE (interaction)	−0.083728	−13.4520	0.0000	Significant (−)
DER (control)	−0.000442	—	0.3541	Not significant
AGE (control)	−0.002588	—	0.0737	Not significant
CR (control)	−0.00000334	—	0.9880	Not significant
AUDIT_COM (control)	0.030658	—	0.5341	Not significant

$R^2 = 0.5136$ | Adj. $R^2 = 0.4395$ | F-stat = 6.9364 | Prob(F) = 0.0000. Sample: 2018–2025; 143 firms; 1,144 balanced panel observations.

The structural equation form of Model 2 is as follows in Formula 3:

$$\begin{aligned} \mathrm{ROA} = & -2.289726 + 0.009250\,\mathrm{ERM} + 0.022777\,\mathrm{SALES\_GROWTH} \\ & + 2.266948\,\mathrm{TATO} + 0.085967\,\mathrm{F\_SIZE} \\ & - 0.083728\,(\mathrm{TATO} \times \mathrm{F\_SIZE}) - 0.000442\,\mathrm{DER} \\ & - 0.002588\,\mathrm{AGE} - 0.00000334\,\mathrm{CR} + 0.030658\,\mathrm{AUDIT\_COM} \end{aligned} \quad (3)$$

Three key findings emerged. First, among all the main variables, TATO had the highest coefficient and exerted a highly significant positive influence on ROA, thereby proving and reinforcing that asset turnover is the dominant determinant of profit (Patin et al., 2020). Second, the magnitude of the ERM coefficient on ROA plummeted from 0.175236 in path *a* to 0.009250 in path *c′*, although its significance persisted; such a pattern is characteristic of partial mediation (Zhao et al., 2010). Third, the TATO × F_SIZE interaction term is negative and highly significant, contrary to the hypothesis, and this is the central finding of the study.

4.5 Summary of Hypotheses Testing

Five of the seven hypotheses as presented in Table 8 namely, H_1 through H_5 were fully accepted. The remaining two, H_6 and H_7, were statistically significant but their directions deviated from expectations. These results form a coherent conclusion: both the ERM → TATO → ROA chain and the Sales Growth → TATO → ROA chain function as partial mediators as proposed by RBV, while firm size acts as a contingent condition that moderates the rate at which asset efficiency translates into profit (Vinh Quang et al., 2024; Yadav et al., 2022).

Table 8. Summary of hypotheses testing results

Hypotheses	Tested Path	Hypothesized Direction	Coefficient	Prob.	Decision
H_1	ERM → TATO	+	0.175236	0.0000	Accepted
H_2	Sales Growth → TATO	+	0.053929	0.0000	Accepted
H_3	TATO → ROA	+	2.266948	0.0000	Accepted
H_4	ERM → TATO → ROA	+ (mediation)	paths a and b are significant; c′ shrinks but remains significant	0.0000 / 0.0162	Accepted (partial mediation)
H_5	Sales Growth → TATO → ROA	+ (mediation)	Paths a and b are significant; c′ remains strong	0.0000	Accepted (partial mediation)
H_6	TATO × Firm Size → ROA	+ (reinforcing)	−0.083728	0.0000	Rejected; significant negative moderation

Hypotheses	Tested Path	Hypothesized Direction	Coefficient	Prob.	Decision
H_7	Moderation on the indirect path of ERM	+ (reinforcing)	significant indirect effect, negative interaction	0.0000	Rejected; significant negative moderation

4.6 Discussion: ERM and Sales Growth as Drivers of Asset Efficiency

The positive and highly significant effect of ERM on TATO indicates that the relationship between the two holds consistently across all 1,144 panel observations, thus accepting H_1. RBV views the ability to integrate risk information into strategic and operational decisions as an organizational capability that directs assets toward productive activities and away from activities prone to disruptions (Handoyo et al., 2023). The managerial mechanism is evident: routine operational risk mapping enables companies to schedule equipment maintenance before breakdowns occur, reduce production line downtime, and shorten inventory cycles. These three steps increase sales from the existing asset base without the need for new capital expenditures (Alkhyyoon et al., 2023; Malik et al., 2020). These findings align with those of Vinh Quang et al. (2024) regarding the contribution of ERM to performance through organizational mechanisms, as well as with Horvey and Odei-Mensah (2024), who emphasize that the role of ERM becomes more pronounced when governance is effective.

Sales Growth also has a positive and significant effect on TATO, so H_2 is accepted, although its marginal contribution is smaller than that of ERM. Mechanically, this is reasonable because sales serve as the numerator in the TATO ratio; thus, an increase in sales directly boosts the turnover ratio as long as the asset base does not grow faster than sales (Syifa & Maiyaliza, 2026). From an RBV perspective, companies with rapidly growing sales have generally built superior internal capabilities in leveraging their productive assets (Goh et al., 2022). The difference in the magnitude of the coefficients between ERM and *Sales Growth* holds its own managerial significance: efficiency improvements stemming from risk management systems are structural and recurring, whereas those arising from sales surges are cyclical and may reverse when demand weakens (Anokhin et al., 2026).

4.7 Discussion: TATO as the Dominant Determinant of Profitability

TATO was found to be the variable with the largest coefficient in Model 2, therefore, H_3 is accepted with very high confidence. Operationally, a high TATO indicates that assets are being utilized to their fullest capacity to generate sales; the greater the sales volume from the same asset base, the greater the opportunity to generate net profit, assuming relatively stable margins (Patin et al., 2020). According to the Resource-Based View (RBV), the ability to efficiently convert asset investments into revenue is a capability that competitors find difficult to replicate in the short term (Yousaf, 2025). For management, the implication is clear: in capital-intensive companies, the most responsive profit lever is not adding assets but optimizing existing assets by divesting idle assets, increasing capacity utilization, and accelerating the cash conversion cycle (Dincă & Akomeah, 2026; Fauzia et al., 2026).

4.8 Discussion: Partial Mediation by TATO

In the ERM pathway, the direct coefficient on ROA shrinks sharply once TATO is controlled for but does not disappear entirely, and this pattern indicates partial mediation, thus supporting H_4 (Zhao et al., 2010). ERM is thus not merely a defensive risk-control mechanism but an organizational capability that first enhances asset utilization efficiency before its benefits translate into profits (Resende et al., 2024). The remaining direct effects continue to operate through agency mechanisms in the form of improved managerial decision-making quality and reduced failure and compliance costs, which are not fully captured by the asset turnover ratio (Altin, 2024; Jensen & Meckling, 1976).

In the Sales Growth pathway, the direct coefficient on ROA remains robust, and its decline is not as drastic as in the patterns observed for H_4, H_5 is therefore accepted as a partial mediator, with the direct pathway still taking precedence. RBV implies that new sales growth is fully valuable for profits when accompanied by efficient asset utilization, and it is at this point that TATO acts as a bridge that translates market expansion into profits (Goh et al., 2022). These results also address Mansikkamäki's (2023) warning that sales expansion without cost efficiency risks depressing ROA. This finding aligns

with Anokhin et al. (2026), companies with faster asset turnover are better positioned to convert sales growth into profit.

4.9 Discussion: Negative Moderation by Firm Size

Firm size was found to moderate rather than strengthen the effect of TATO on ROA; thus, H_6 and H_7 were rejected in the hypothesized direction, although the moderating effect was significant. The larger the firm's scale, the smaller the marginal contribution of asset turnover efficiency to profit growth. This finding requires an explanation that goes beyond the theoretical level, and is supported by at least four layers of empirical evidence.

The first line of evidence comes from the literature on diseconomies of scale. Williamson's (1975) proposition was tested by Canbäck et al. (2006) using data from 784 manufacturing firms in the United States. The results showed that the profits of large firms were significantly suppressed by bureaucratic isolation and blunt incentives, while miscommunication played only a minor role. This implies that what erodes efficiency gains in large firms is not a failure of technical communication, but rather the accumulation of layers of decision-making that absorb value before it reaches profits.

The second piece of evidence comes from a cross-country panel study. Yadav et al. (2022) examined the Asia-Pacific market and found a negative relationship between firm size and profitability alongside a positive relationship between growth and profitability. They interpreted this as a sign that profits initially rise with growth but then begin to decline once a firm exceeds its efficient scale.

The third piece of evidence stems from recent research on the conversion of growth into profits. Across 1,591 firms, Anokhin et al. (2026) found that the most advantageous position for converting sales growth into profits was held by small-scale, low-leverage firms with fast asset turnover. This finding aligns directly with the negative sign of the TATO × *Firm Size* interaction in this study.

The fourth piece of evidence stems from the Indonesian institutional context. Ofori et al. (2025) found that the role of firm size in the relationship between corporate governance and performance is conditional, while Ahmed et al. (2023) found that the direction of the moderating effect of firm size on the relationship between financial ratios and profits is also context-dependent. The context of Indonesian non-financial issuers is unique: the 2018–2025 period coincided with a wave of downstream industrialization that prompted large conglomerates to establish smelters, industrial parks, and processing facilities that were not yet fully operational (Nguyen & Pham, 2026; Suteja et al., 2023). Such assets inflate the denominators of ROA and TATO without being offset by commensurate sales in the current year, so that efficiency improvements in operational segments are masked by assets still under construction.

The managerial interpretation can be refined. In small and medium-sized companies, an additional unit of asset turnover typically yields immediate profits because decision-making chains are short and asset portfolios are homogeneous (Anokhin et al., 2026). In large conglomerates, an increase in turnover in one segment must pass through internal capital allocation, cross-subsidies between units, and layers of oversight before it appears in consolidated profits, while each layer absorbs a portion of the efficiency gains through coordination and oversight costs (Canbäck et al., 2006; Jensen & Meckling, 1976). Therefore, operational efficiency targets for large firms should be set by business segment, complete with profit accountability assigned to the generating units, rather than being set on a consolidated basis (Aksoy et al., 2024).

The mediation path ERM → TATO → ROA proved significant for H_4, and its interaction term was also significant; thus, the indirect effect of ERM on ROA is indeed moderated by firm size, albeit in a moderating direction (H_7). The logic is straightforward: the weakening of TATO influence on ROA in large firms automatically weakens the indirect effect of ERM flowing through TATO (Preacher & Hayes, 2008). *Contingency Theory* explains that bureaucracy and thickening layers of oversight slow

down the transmission of asset efficiency signals to profits; thus, firm size as a contingent condition does not always move in the same direction as assumed by classical economies of scale (Aksoy et al., 2024; Georgakopoulos et al., 2022).

4.10 Robustness Check

To ensure that the conclusions in Sections 4.3 through 4.9 do not rely solely on a single standard error assumption, both equations were re-estimated using a Fixed Effects Model with White cross-sectional covariance correction. This correction is robust to both heteroscedasticity and cross-sectional dependence, and the results are compared with the Ordinary Least Squares (OLS) estimates, which serve as the baseline specification (Baltagi, 2021; Driscoll & Kraay, 1998; Hoechle, 2007). Since only the covariance matrix is adjusted, the point estimates do not shift, so the coefficients in both columns are exactly the same; the focus of the comparison then shifts to changes in p-values and the consistency of the conclusions for each variable. To assess the consistency of the empirical findings, the robustness test results for Model 1 with TATO as the dependent variable are reported in Table 9.

Table 9. Results of the robustness test for model 1 - dependent variable: TATO

Variables	**FEM (Ordinary)**		**FEM (White Cross-section)**	
Coefficient	Prob.	Coefficient	Prob.	
C (constant)	0.900154	0.0001	0.900154	0.0000
ERM	0.175236	0.0000**	0.175236	0.0000**
SALES_GROWTH	0.053929	0.0000**	0.053929	0.0332**
DER (control)	0.000448	0.3819	0.000448	0.3098
AGE (control)	−0.004162	0.1752	−0.004162	0.1934
CR (control)	−0.000741	0.1449	−0.000741	0.0014**
AUDIT_COM (control)	−0.078764	0.6129	−0.078764	0.2428
R^2	0.849786	—	0.849786	—
Adj. R^2	0.827442	—	0.827442	—
F-stat	38.03287	—	38.03287	—
Prob(F)	0.000000	—	0.000000	—
Number of observations	1.144	—	1.144	—

*** significant at α = 5%. The coefficients are identical in both specifications because the White cross-section correction only adjusts for standard errors. Sample: 2018–2025; 143 firms; 1,144 balanced panel observations. Source: processed from EViews output.*

The robustness of Model 1 is confirmed. The positive and significant effect of ERM on TATO holds at α = 5% for both Ordinary and White cross-section standard errors, as does Sales Growth, which remains positively significant even though its p-value shifts from 0.0000 to 0.0332. The conclusions regarding H_1 and H_2 therefore remain unchanged. DER, AGE, and AUDIT_COM remain insignificant in both specifications. The only change affects CR: initially insignificant (p = 0.1449), it becomes significantly negative after correction (p = 0.0014). Such an opposite shift is not unusual because covariance correction, which accounts for cross-sectional dependence, does not always increase the standard error, so probability values can move in either direction (Hoechle, 2007). Since CR serves as a control variable rather than a hypothesis-testing parameter, this change does not affect the conclusions of the main hypotheses. To evaluate the consistency of the empirical findings, the robustness test results for Model 2 with Return on Assets (ROA) as the dependent variable are presented in Table 10 .

Table 10. Results of the robustness test for model 2 - dependent variable: ROA

Variables	FEM (Ordinary)		FEM (White Cross-section)	
Coefficient	Prob.	Coefficient	Prob.	
C (constant)	−2.289726	0.0000	−2.289726	0.0001
ERM	0.009250	0.0081**	0.009250	0.0411**
SALES_GROWTH	0.022777	0.0000**	0.022777	0.0003**
TATO	2.266948	0.0000**	2.266948	0.0063**
F_SIZE	0.085967	0.0000**	0.085967	0.0003**
TATO × F_SIZE (interaction)	−0.083728	0.0000**	−0.083728	0.0071**
DER (control)	−0.000442	0.1740	−0.000442	0.1444
AGE (control)	−0.002588	0.0286**	−0.002588	0.0573
CR (control)	−0.00000334	0.4940	−0.00000334	0.4827
AUDIT_COM (control)	0.030658	0.2670	0.030658	0.1937
R^2	0.513582	—	0.513582	—
Adj. R^2	0.439541	—	0.439541	—
F-stat	6.936425	—	6.936425	—
Prob(F)	0.000000	—	0.000000	—
Number of observations	1.144	—	1.144	—

*** significant at α = 5%. The coefficients are identical in both specifications because the White Cross-section s only adjusts for standard errors. Sample: 2018–2025; 143 firms; 1,144 balanced panel observations. Source: processed from EViews output.*

All hypotheses test parameters in Model 2 also hold. ERM, Sales Growth, TATO, and F_SIZE remain positively significant at α = 5%, while the negative sign of the TATO × F_SIZE interaction term remains unchanged and significant (p = 0.0000 for Ordinary and p = 0.0071 for White Cross-section). The weakening of TATO positive effect on ROA as firms grow a central finding discussed in Section 4.9 is therefore not a result of the choice of standard error assumptions. DER, CR, and AUDIT_COM remain consistently insignificant. The only shift occurred with AGE: it was significant in the Ordinary specification (p = 0.0286) but lost significance after correction (p = 0.0573). This value is right around the 5% threshold and serves as a control, so the conclusions of the main hypothesis remain unchanged.

Overall, both models held up under the White cross-sectional covariance correction. The magnitude and direction of each coefficient remained unchanged, no main variables changed their conclusions, and the measures of model fit R^2, adjusted R^2, and the F-statistic remained exactly the same. Changes in significance are limited to two control variables CR in Model 1 and AGE in Model 2 both of which are near the significance threshold and are not related to the hypotheses. The research findings are therefore not the result of heteroscedasticity or cross-sectional dependence in the model errors (Baltagi, 2021; Driscoll & Kraay, 1998; Hoechle, 2007).

4.11 Implications

At the theoretical level, this study confirms that the effectiveness of ERM as a driver of profits through operational efficiency is scale-dependent; its contribution, therefore, goes beyond merely reaffirming the link between ERM and performance, but also reveals the boundary conditions that determine when that link works best (Vinh Quang et al., 2024). The gap between initial theoretical assumptions and empirical results is presented as is: statistical significance does not automatically imply that the direction aligns with the hypothesis, and the rejection of the directions of H_6 and H_7 is

theoretically intriguing rather than indicative of a failed model (Canbäck et al., 2006; Yadav et al., 2022).

On a practical level, efforts to boost asset turnover efficiency are most effective when applied to small- to medium-sized enterprises (Anokhin et al., 2026). Large companies require additional measures, such as streamlining bureaucracy, improving corporate governance, and strengthening internal controls, so that operational efficiency translates into ROA more optimally (Altin, 2024; Ofori et al., 2025). For regulators, these findings suggest that policies to strengthen risk management must be accompanied by attention to the governance structures of large-scale companies, as it is within this group that the benefits of efficiency are most vulnerable to being eroded by organizational complexity (Anugerah et al., 2023; Napitupulu et al., 2023).

5. Conclusions

5.1 Conclusion

The sample for this study comprises 143 non-financial listed companies on the Indonesia Stock Exchange with an observation period of 2018-2025, equivalent to 1,144 panel observations. The model constructed includes the four-dimensional ERM alongside *Sales Growth* as predictors of ROA, TATO as a mediator, and *Firm Size* as a moderator. The results of *the Fixed Effects Model* show that both ERM and *Sales Growth* positively and significantly drive TATO (H_1 and H_2 accepted). TATO itself has the highest coefficient among the main variables and exerts a highly significant positive effect on ROA (H_3 accepted). The mediation analysis confirms TATO role as a partial mediator of the effects of both ERM and *Sales Growth* on ROA (H_4 and H_5 accepted); that is, most of the benefits of ERM for profits flow through improvements in asset utilization efficiency.

The most striking aspect of the estimation results is the moderating role *of Firm Size*. The TATO × F_SIZE interaction actually has a highly significant negative coefficient, contrary to the hypothesis that firm size would strengthen the relationship between TATO and ROA; H_6 and H_7 are therefore rejected in terms of direction, even though the moderating effect is statistically significant. As a company's scale increases, the marginal contribution of asset turnover efficiency to profits diminishes, a pattern consistent with the logic of agency costs and bureaucratic inefficiencies that also increase with scale. In summary, risk management and sales growth create value primarily through operational efficiency, and the magnitude of these benefits is determined by scale: they are most optimal in small to medium-sized companies, while large companies need to strengthen governance and streamline their organizational structures to maintain these benefits.

5.2 Research Limitations

First, the sample scope is limited to 143 non-financial issuers listed on the IDX; therefore, extending the findings to other national stock exchanges or the financial sector should be approached with caution. Second, the requirement to construct a balanced panel may introduce *survivorship bias*, as issuers that were delisted or failed to disclose complete information during the observation period were excluded. Consequently, the findings may primarily reflect the characteristics of surviving firms rather than the broader population of listed companies. Third, the ERM score is derived from the aggregation of four disclosure dimensions in annual reports. Although this approach provides a practical means of quantification, it may not fully capture the maturity of ERM implementation or the relative importance of each dimension, particularly because disclosure practices remain largely voluntary. Fourth, the interaction terms were constructed without *mean-centering*, which may generate potential structural multicollinearity. Although this issue has been addressed through the Fixed Effects Model (FEM), caution remains necessary when interpreting the moderation coefficients. Fifth, the static panel approach does not completely resolve issues of simultaneity and dynamic endogeneity, as discussed in Section 3.3.2; thus, the results should be interpreted as conditional associations rather than definitive causal relationships. Sixth, the *Adjusted* R^2 value of Model 2, which reaches 43.95%, suggests that additional factors beyond those incorporated in the model may also contribute to variations in ROA.

5.3 Recommendations and Directions for Future Research

Future research is recommended to shift to dynamic panel methods, such as *the system-GMM,* which can address both simultaneity and dynamic endogeneity while capturing the time lags between ERM, TATO, and ROA; the validity of the instruments should be tested using the Hansen and Arellano-Bond AR(2) statistics. Decomposing ERM into four separate dimensions is also worth exploring to identify which dimensions contribute most to asset efficiency and profits, replacing the use of aggregate indices. From a methodological perspective, centered interaction terms should be considered to make the economic interpretation of moderation coefficients easier to understand.

Since *firm size* has been shown to weaken the link between TATO and ROA, further research could explore the nature of this nonlinear relationship through a quadratic term for firm size to determine whether there is a tipping point at which the costs of organizational complexity begin to outweigh economies of scale. Including other moderators such as ownership structure, board independence, the degree of digitalization, or governance quality could enrich our understanding of the conditions that facilitate the conversion of asset efficiency into profits. Reproducing the study across ASEAN countries or within the financial industry would reveal whether the negative moderation effect *of firm size* is *generalizable* or specific to Indonesia. Finally, extending the observation period beyond 2025 provides an opportunity to test the persistence of this pattern once the post-pandemic recovery period has fully concluded.

Acknowledgement

The authors would like to express their sincere gratitude to the Faculty of Economics and Business of Universitas Trisakti, Sekolah Tinggi Ilmu Ekonomi Trisakti, and Universitas Nasional Jakarta for their academic support and institutional encouragement throughout this research. The authors also appreciate the Indonesia Stock Exchange (IDX) for providing access to the financial data used in this study. Special thanks are extended to all colleagues and reviewers who provided valuable insights and constructive feedback to improve the quality of this research.

Author Contributions

SW contributed to the conceptualization, research methodology, data collection, data analysis, and initial manuscript preparation. FML contributed to the development of the theoretical framework, research supervision, and critical revision of the manuscript. HSL contributed to the literature review, methodological validation, interpretation of findings, and manuscript refinement. ES contributed to data analysis, validation, and evaluation of research results. ASW contributed to supervision, academic review, and improvement of the manuscript structure. NP contributed to data management, manuscript editing, visualization, and final review. All authors have read and approved the final version of the manuscript and agreed to be accountable for all aspects of the research.

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