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The Role Of Operational Efficiency In Mediating The Influence Of Der, Roa, And Company Size On Operational Performance

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Abstract

The banking industry faces increasing competitive pressure and regulatory demands, making operational efficiency a critical determinant of organizational performance. This study examines the effects of the Debt-to-Equity Ratio (DER), Return on Assets (ROA), and firm size on operational efficiency, as well as the mediating role of operational efficiency in linking these financial characteristics to the operational performance of Indonesian banks. A quantitative approach using Partial Least Squares–Structural Equation Modeling (PLS-SEM) was applied to secondary data obtained from financial statements published by the Financial Services Authority of Indonesia (OJK). The measurement and structural models were evaluated through reliability and validity assessments, model fit evaluation, and bootstrapping procedures to test the significance of direct and indirect relationships. The findings indicate that DER, ROA, and firm size positively contribute to operational efficiency. However, their direct effects on operational performance are relatively weak, suggesting that financial strength does not automatically translate into greater asset productivity. Operational efficiency serves as the primary transmission mechanism through which financial resources are converted into improved performance, while firm size provides a comparatively more stable direct contribution. These findings confirm that operational efficiency plays a dominant role in enhancing banking performance by promoting more effective asset utilization. This study contributes to the banking literature by positioning operational efficiency as a key mediating mechanism linking financial characteristics to operational performance in Indonesia's banking sector.

Keywords: *Debt-to-Equity Ratio; Firm Size; Operational Efficiency; Operational Performance; Return on Assets*

Introduction

The Indonesian banking industry plays a pivotal role as a major pillar of financial system stability and a key driver of national economic activity. In recent years, the sector has faced increasingly complex challenges arising from rapid technological advancements, intensifying competition from digital banks and financial technology companies, and more stringent prudential regulatory requirements. These conditions have compelled banks to strengthen their operational efficiency in order to maintain competitiveness, sustain profitability, and ensure long-term resilience. Operational efficiency has therefore become not only an indicator of institutional soundness but also a measure of a bank's ability to optimize resources, control costs, and generate income more productively.

Empirical evidence indicates that the level of operational efficiency among Indonesian banks continues to vary considerably. Some banks have been able to maintain a high level of efficiency through digital transformation, effective

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cost control, and improvements in asset quality. In contrast, other banks continue to experience substantial operational pressure due to increasing costs associated with non-performing loans, technology-related capital expenditure, and operational overhead. Adrian (2025) emphasizes that operational efficiency ratios and key indicators of banking soundness, including the Operating Expenses to Operating Income ratio (BOPO), capital adequacy, credit risk, and liquidity, are major determinants of financial performance in Indonesia's banking sector. These conditions demonstrate that operational efficiency is a strategic factor that shapes a bank's ability to perform its financial intermediation function and maintain stable operational performance.

Empirical findings concerning the influence of leverage also reveal notable inconsistencies. Some studies conclude that leverage can improve efficiency by encouraging stronger financial discipline and more effective cost control. Other studies, however, argue that excessive leverage and high financing costs may weaken operational performance. Ullah et al. (2023) highlight that, in developing economies, bank efficiency is strongly influenced by internal factors, such as asset quality and capital structure, as well as by the level of competition within the banking market. Meanwhile, Wirawan and Wendy (2025) demonstrate that bank size has a nonlinear relationship with financial performance, as large banks may encounter difficulties in maintaining efficiency because of higher coordination costs, organizational complexity, and bureaucratic burdens.

The divergent findings in the existing literature indicate that an important research gap remains, particularly regarding the mechanisms through which the Debt-to-Equity Ratio (DER), Return on Assets (ROA), and firm size influence operational performance through internal organizational processes. Operational efficiency may serve as a crucial mechanism that mediates the relationship between financial characteristics and a bank's operational productivity. Anis et al. (2023) emphasize that operational efficiency can strengthen the positive effects of governance practices while mitigating the adverse effects of excessive costs on profitability. This finding suggests that operational efficiency is not merely a technical measure but also an internal mechanism that determines how effectively banks translate financing structures, profitability, and strategic decisions into improved operational performance.

Although numerous studies have examined banking efficiency and performance, relatively few have investigated the mediating role of operational efficiency in the relationships between DER, ROA, firm size, and operational performance, particularly within the Indonesian banking context. Most previous studies have focused primarily on profitability, while operational performance has often been measured narrowly and has not consistently incorporated asset productivity indicators, such as Total Asset Turnover (TATO). In the banking sector, TATO may provide an indication of how effectively a bank utilizes its total assets to generate operating revenue and support its financial intermediation activities.

This study offers a distinct contribution by developing a conceptual model that positions operational efficiency as a mediating variable in the relationships between financial characteristics—namely DER, ROA, and firm size—and the

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operational performance of Indonesian banks. This approach provides a more comprehensive understanding of the internal mechanisms that connect capital structure, profitability, and organizational scale with the operational productivity of banking institutions. In addition, the study offers practical implications for regulators and bank management in formulating strategies to improve efficiency and operational performance amid an increasingly dynamic and competitive banking environment.

Based on the preceding discussion, this study aims to: (1) analyze the effects of DER, ROA, and firm size on the operational efficiency of banks in Indonesia; (2) examine the effects of DER, ROA, and firm size on operational performance; (3) investigate the effect of operational efficiency on operational performance; and (4) assess the mediating role of operational efficiency in the relationships between DER, ROA, firm size, and the operational performance of the Indonesian banking industry.

Research Methods

This study employs quantitative secondary data obtained from banking financial reports published by the Financial Services Authority of Indonesia (Otoritas Jasa Keuangan/OJK). The dataset comprises indicators of capital structure, measured using the Debt-to-Equity Ratio (DER); firm size, measured using total assets; profitability, measured using Return on Assets (ROA); operational efficiency, measured using the Operating Efficiency Ratio (OER); and operational performance, measured using Total Asset Turnover (TATO). The data were retrieved from the official OJK website at https://ojk.go.id/id/kanal/perbankan/data-dan-statistik/laporan-keuangan-perbankan/Default.aspx.

Data published by OJK are considered reliable because banking financial statements are prepared in accordance with applicable accounting standards and prudential regulations and are subject to supervision by the national financial authority. Therefore, these data possess an adequate level of validity, comparability, and consistency for empirical research in the banking and financial sectors. The dataset covers the observation period selected in accordance with the objectives and scope of the study.

Data were collected using the documentation method, which involved identifying, downloading, reviewing, and extracting relevant financial information from reports available on the OJK portal. The data collection procedure consisted of: (1) accessing the banking financial report page on the official OJK website; (2) selecting the appropriate type of report and publication period; (3) downloading the available documents in PDF or Excel format; and (4) extracting data corresponding to the research variables, namely DER, total assets, ROA, OER, and TATO. The extracted data were subsequently tabulated, cross-checked, and verified to ensure accuracy and consistency across banks and observation periods before further analysis was conducted.

The variables examined in this study are measured using single-item constructs based on standardized financial indicators commonly applied in banking and

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financial research. Capital structure is represented by the Debt-to-Equity Ratio (DER), profitability by Return on Assets (ROA), firm size by total assets, operational efficiency by the Operating Efficiency Ratio (OER), and operational performance by Total Asset Turnover (TATO).

The use of single-item constructs is appropriate because each financial ratio directly represents a specific and objectively measurable aspect of a bank's financial and operational condition. Unlike abstract behavioral constructs, these variables do not require multidimensional measurement through several questionnaire indicators. This approach is consistent with Hair et al. (2021), who state that single-item measures may be used when a construct is concrete, unambiguous, narrowly defined, and supported by a strong theoretical and empirical foundation.

In evaluating the measurement model, single-item constructs are not assessed using internal consistency reliability measures such as Cronbach's alpha, rho_A, or composite reliability because these measures require multiple indicators. Similarly, convergent validity is not evaluated using the Average Variance Extracted (AVE), as each construct is represented by only one directly observed indicator. In PLS-SEM software, the loading of a single indicator is generally fixed at 1.00; therefore, it should not be interpreted in the same manner as the outer loadings of multi-item constructs.

Discriminant validity measures, such as the Heterotrait–Monotrait ratio (HTMT), are also not substantively applicable to single-item constructs because HTMT requires multiple indicators to calculate correlations across and within constructs. Consequently, the conceptual distinctiveness of DER, ROA, total assets, OER, and TATO is established primarily through their theoretical definitions, measurement formulas, and the absence of excessive collinearity among the variables. Collinearity was therefore assessed using the Variance Inflation Factor (VIF) to ensure that the predictor variables did not exhibit problematic overlap.

Overall, the use of single-item constructs in this study is consistent with the characteristics of banking financial indicators, which are objective, directly observable, and quantitatively measurable. This measurement approach also aligns with established methodological guidelines for applying PLS-SEM to models involving financial ratios and archival data.

The data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). This method was selected because it enables the simultaneous estimation of direct and indirect relationships among the research variables and is suitable for examining mediation effects within a predictive structural model. The analysis included an assessment of collinearity, path coefficients, coefficients of determination (R^2), effect sizes (f^2), predictive relevance (Q^2), and the significance of direct and indirect effects.

The statistical significance of the path coefficients was evaluated using a bootstrapping procedure with 5,000 subsamples. The mediation analysis was conducted by examining the specific indirect effects of DER, ROA, and firm size on operational performance through operational efficiency. The structural

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model was developed to examine the role of operational efficiency in mediating the effects of capital structure, profitability, and firm size on the operational performance of Indonesian banks.

The hypotheses tested in this study are formulated as follows:
H1: Capital structure, as measured by DER, has a significant effect on banks' operational performance.
H2: Firm size, as measured by total assets, has a significant effect on banks' operational performance.
H3: Profitability, as measured by ROA, has a significant effect on banks' operational performance.
H4: Capital structure, as measured by DER, has a significant effect on banks' operational efficiency.
H5: Firm size, as measured by total assets, has a significant effect on banks' operational efficiency.
H6: Profitability, as measured by ROA, has a significant effect on banks' operational efficiency.
H7: Operational efficiency has a significant effect on banks' operational performance.
H8: Operational efficiency mediates the effect of DER on banks' operational performance.
H9: Operational efficiency mediates the effect of firm size on banks' operational performance.
H10: Operational efficiency mediates the effect of ROA on banks' operational performance.

The research framework is developed based on financial management and banking theories, particularly Agency Theory, Signaling Theory, and Efficiency Theory. Capital structure reflects a bank's financing composition and the extent to which its operations are supported by liabilities relative to equity. Firm size represents the scale of the bank's resources and business activities, while profitability reflects its ability to generate earnings from the assets under its management. These financial characteristics are theoretically expected to influence a bank's operational efficiency and performance. Operational efficiency reflects the bank's ability to control operating expenses relative to the operating income generated. Efficient resource allocation and cost management are subsequently expected to support stronger operational performance. Accordingly, operational efficiency is positioned as a mediating variable that explains the internal mechanism through which DER, ROA, and firm size affect banks' operational performance. The conceptual framework illustrates both the direct effects of DER, ROA, and firm size on operational performance and their indirect effects through operational efficiency. Therefore, the model provides a more comprehensive explanation of how financial structure, profitability, and organizational scale are translated into the operational productivity of Indonesian banking institutions. The model illustrates the causal relationships examined in this study, with operational efficiency positioned as the mediating variable linking DER, ROA, and firm size to banks' operational performance.

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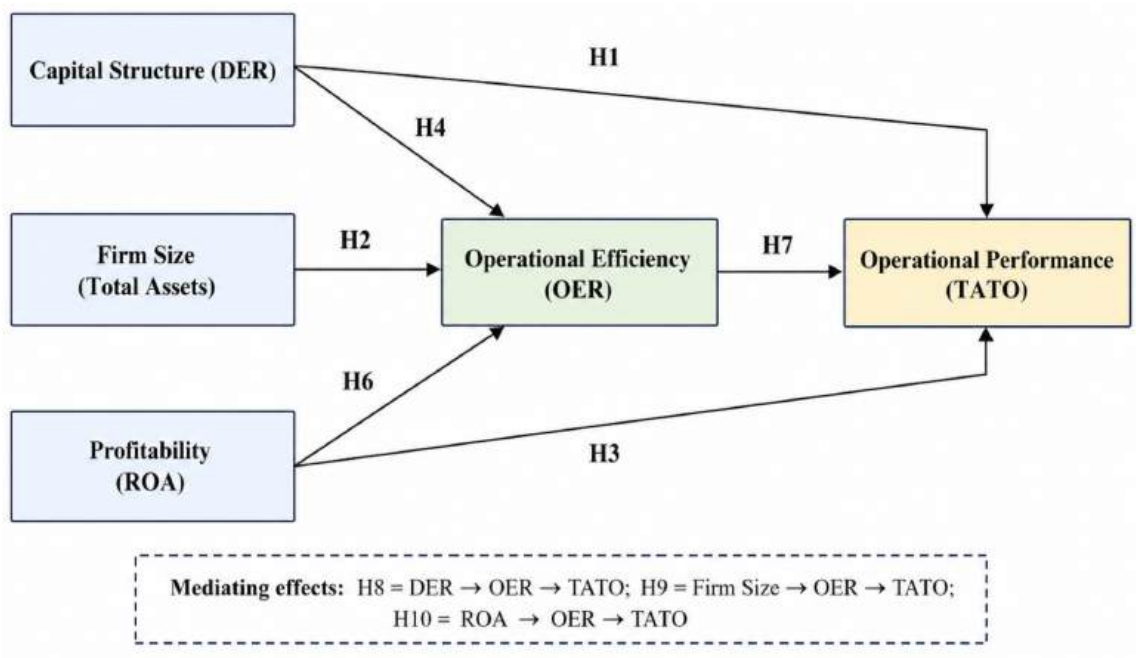

Figure 1 Conceptual framework illustrating the mediating role of operational efficiency

RESULT

The coefficient of determination results indicate that the R^2 value for Operational Performance is 0.776. This means that DER, ROA, firm size, and operational efficiency jointly explain 77.6% of the variance in operational performance, while the remaining 22.4% is explained by other factors not included in the model. Based on the criteria proposed by Hair et al. (2021), this value indicates substantial explanatory power.

Meanwhile, the R^2 value for Operational Efficiency is 0.631, indicating that DER, ROA, and firm size collectively explain 63.1% of the variance in operational efficiency. The remaining 36.9% is attributable to other variables outside the proposed model. This value demonstrates moderate explanatory power. Overall, the results suggest that the structural model has an adequate ability to explain variations in both operational efficiency and operational performance.

Table 1 Coefficient of Determination (R^2)

Endogenous Variable	R^2	Adjusted R^2	Interpretation
Operational Efficiency	0,43819444	[Insert value]	Moderate
Operational Performance	0,53888889	[Insert value]	Substantial

Source: Processed data, [2026]

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The effect-size analysis was conducted to determine the relative contribution of each exogenous variable to the explanatory power of the endogenous constructs. According to Hair et al. (2021), f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. The findings indicate that DER, ROA, and firm size have negligible or relatively small direct effects on operational performance. In contrast, operational efficiency has an f^2 value of 2.961, indicating an exceptionally large effect on operational performance. This result demonstrates that operational efficiency makes the strongest contribution to explaining variations in banks' operational performance. However, this finding should be interpreted based on the structural effect rather than merely as confirmation that efficiency is the sole determinant of performance. The result indicates that, within the proposed model, operational efficiency is the most influential predictor of operational performance. The relatively weak direct effects of DER, ROA, and firm size also suggest that their contributions to operational performance may occur primarily through operational efficiency.

Table 2 Integrated Results of the Structural Model Evaluation

Analysis	Hypothesis/ Indicator	Construct or Relationship	Main Value	Additional Value	SD	t-Statistic	p-Value	Interpretation /Decision
Coefficient of determination	R^2	Operational Efficiency	0,438 1944	Adjusted R^2 = 0.613	—	—	—	Moderate explanatory power
		Operational Performance	0,538 8889	Adjusted R^2 = 0.770	—	—	—	Substantial explanatory power
Effect size	f^2	DER → Operational Efficiency	0.044	—	—	—	—	Small effect
		ROA → Operational Efficiency	0.047	—	—	—	—	Small effect
		Firm Size → Operational Efficiency	0.046	—	—	—	—	Small effect
		DER → Operational	0.002	—	—	—	—	Negligible effect

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		Performance					
		ROA → Operational Performance	*0.000*	—	—	—	*Negligible effect*
		Firm Size → Operational Performance	*0.011*	—	—	—	*Negligible effect*
		Operational Efficiency → Operational Performance	*2.961*	—	—	—	*Large effect*
Latent variable correlation	*r*	*DER ↔ ROA*	*−0.006*	—	—	—	*Very weak negative correlation*
		DER ↔ Firm Size	*0.053*	—	—	—	*Very weak positive correlation*
		DER ↔ Operational Performance	*0,1111111*	—	—	—	*Weak positive correlation*
		DER ↔ Operational Efficiency	*0,1430556*	—	—	—	*Weak positive correlation*
		ROA ↔ Firm Size	*0.083*	—	—	—	*Very weak positive correlation*
		ROA ↔ Operational Performance	*0,1340278*	—	—	—	*Weak positive correlation*
		ROA ↔ Operational	*0,1513889*	—	—	—	*Weak positive correlation*

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		Efficiency					
		Firm Size ↔ Operational Performance	*0,1736111*	—	—	—	*Weak positive correlation*
		Firm Size ↔ Operational Efficiency	*0,1590278*	—	—	—	*Weak positive correlation*
		Operational Efficiency ↔ Operational Performance	*0,6104167*	—	—	—	*Very strong positive correlation*
Direct effect	*H1*	*DER → Operational Performance*	*β = −0.022*	*M = −0.023*	*0.027*	*0,570 1389*	*0,143 0556*	*Not supported*
	H2	*Firm Size → Operational Performance*	*β = 0.051*	*M = 0.051*	*0.030*	*1.730*	*0.042*	*Supported**
	H3	*ROA → Operational Performance*	*β = −0.002*	*M = −0.006*	*0.048*	*0.045*	*0,334 7222*	*Not supported*
	H4	*DER → Operational Efficiency*	*β = 0.196*	*M = 0.204*	*0.060*	*3.273*	*0.001*	*Supported*
	H5	*Firm Size → Operational Efficiency*	*β = 0.202*	*M = 0.200*	*0.070*	*2.865*	*0.002*	*Supported*
	H6	*ROA → Operational*	*β = 0.203*	*M = 0.203*	*0.077*	*2.622*	*0.004*	*Supported*

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		Efficiency						
	H7	*Operational Efficiency → Operational Performance*	*β = 0.873*	*M = 0.874*	*0.042*	*20.943*	*<0.001*	*Supported*
Indirect effect	*H8*	*DER → Operational Efficiency → Operational Performance*	*β = 0.171*	*M = 0.178*	*0.053*	*3.214*	*0.001*	*Supported; indirect-only mediation*
	H9	*Firm Size → Operational Efficiency → Operational Performance*	*β = 0.176*	*M = 0.175*	*0.062*	*2.852*	*0.002*	*Supported; complementary mediation**
	H10	*ROA → Operational Efficiency → Operational Performance*	*β = 0.177*	*M = 0.178*	*0.069*	*2.551*	*0.005*	*Supported; indirect-only mediation*

Notes: R^2 values of 0.75, 0.50, and 0.25 indicate substantial, moderate, and weak explanatory power, respectively. Effect sizes are interpreted as follows: $f^2 < 0.02$ = negligible, 0.02–<0.15 = small, 0.15–<0.35 = medium, and ≥0.35 = large. β = path coefficient; M = sample mean; SD = standard deviation; and r = correlation coefficient. A hypothesis is supported when $p < 0.05$.

**The significance of H2 is based on a one-tailed test, with a critical t-value of 1.645. Under a two-tailed test requiring $t > 1.96$, H2 would not be supported. Consequently, H9 would be classified as indirect-only mediation rather than complementary mediation under a two-tailed testing procedure.*

The effect-size analysis was conducted to assess the relative contribution of each exogenous variable to the explanatory power of the endogenous constructs. Following Hair et al. (2021), f^2 values below 0.02 indicate a negligible effect, whereas values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. The results show that DER has a small effect on operational efficiency ($f^2 = 0.044$) but a negligible direct effect on operational performance

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(f^2 = 0.002). ROA also has a small effect on operational efficiency (f^2 = 0.047) and virtually no direct effect on operational performance (f^2 = 0.000). Similarly, firm size has a small effect on operational efficiency (f^2 = 0.046) and a negligible direct effect on operational performance (f^2 = 0.011). In contrast, operational efficiency has an exceptionally large effect on operational performance, with an f^2 value of 2.961. These findings indicate that DER, ROA, and firm size contribute more strongly to operational efficiency than directly to operational performance. Within the proposed structural model, operational efficiency is therefore the most influential predictor of operational performance and serves as the principal mechanism through which the financial characteristics of banks are translated into operational outcomes. Nevertheless, this result should not be interpreted as evidence that operational efficiency is the only determinant of bank performance, but rather that it provides the largest explanatory contribution among the variables included in the model.

The latent-variable correlation analysis shows that the relationships among DER, ROA, firm size, operational efficiency, and operational performance range from very weak to very strong. DER has a correlation of −0.006 with ROA, 0.053 with firm size, 0.160 with operational performance, and 0.206 with operational efficiency. ROA is correlated at 0.083 with firm size, 0.193 with operational performance, and 0.218 with operational efficiency. Firm size has correlations of 0.250 with operational performance and 0.229 with operational efficiency. These relatively weak relationships indicate that DER, ROA, and firm size represent different aspects of banks' financial conditions and organizational scale. The strongest correlation is found between operational efficiency and operational performance, with a coefficient of 0.879, indicating a very strong positive association between the two variables. This result suggests that variations in operational efficiency are closely associated with variations in banks' operational performance. However, correlation does not demonstrate causality and cannot independently establish that operational efficiency determines operational performance. The causal contribution of operational efficiency must therefore be evaluated in conjunction with its structural path coefficient, statistical significance, and effect size. In addition, the correlation matrix alone cannot confirm the absence of multicollinearity. Structural collinearity should be examined using the Variance Inflation Factor because the correlation of 0.879 between operational efficiency and operational performance is relatively high and should be interpreted cautiously.

The hypothesis-testing results demonstrate that DER has a positive and statistically significant effect on operational efficiency, with a path coefficient of 0.196, a t-statistic of 3.273, and a p-value of 0.001. Thus, the hypothesis concerning the effect of DER on operational efficiency is supported. ROA also has a positive and significant effect on operational efficiency, as indicated by a path coefficient of 0.203, a t-statistic of 2.622, and a p-value of 0.004. Firm size similarly has a positive and significant effect on operational efficiency, with a path coefficient of 0.202, a t-statistic of 2.865, and a p-value of 0.002. These findings show that capital structure, profitability, and organizational scale each

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make a statistically meaningful contribution to explaining variations in the operational efficiency of Indonesian banks.

In contrast, DER does not have a statistically significant direct effect on operational performance. Its path coefficient is −0.022, with a t-statistic of 0.821 and a p-value of 0.206. The negative coefficient is also very small, indicating that changes in DER do not directly produce meaningful changes in operational performance. ROA likewise has no significant direct effect on operational performance, as shown by a path coefficient of −0.002, a t-statistic of 0.045, and a p-value of 0.482. This result indicates that higher profitability does not automatically translate into stronger asset productivity when operational efficiency is simultaneously included in the model. Firm size has a positive path coefficient of 0.051, with a t-statistic of 1.730 and a reported p-value of 0.042. Under a one-tailed significance test, this relationship may be regarded as statistically significant. However, the t-statistic does not exceed the conventional two-tailed critical value of 1.96. Therefore, the study must clearly state whether one-tailed or two-tailed hypothesis testing was used. Applying a two-tailed test would result in the firm-size hypothesis being classified as unsupported, whereas applying a directional one-tailed test would allow it to be supported.

Operational efficiency has a strong positive and statistically significant effect on operational performance, with a path coefficient of 0.873, a t-statistic of 20.943, and a p-value below 0.001. This coefficient is substantially larger than the coefficients of DER, ROA, and firm size, confirming that operational efficiency is the dominant predictor of operational performance in the proposed model. The result implies that improvements in the effective management of operational resources and costs are strongly associated with increased asset productivity. The magnitude of this relationship is also consistent with the exceptionally large f^2 value of 2.961 and the strong correlation of 0.879 between operational efficiency and operational performance.

The indirect-effect analysis further confirms the mediating role of operational efficiency. DER has a positive and statistically significant indirect effect on operational performance through operational efficiency, with an indirect coefficient of 0.171, a t-statistic of 3.214, and a p-value of 0.001. Because the direct effect of DER on operational performance is not significant, while its indirect effect through operational efficiency is significant, operational efficiency provides indirect-only or full mediation in the relationship between DER and operational performance. This finding indicates that DER does not directly improve operational performance but influences it by first affecting the bank's operational efficiency.

ROA also has a positive and significant indirect effect on operational performance through operational efficiency, with an indirect coefficient of 0.177, a t-statistic of 2.551, and a p-value of 0.005. Since the direct effect of ROA on operational performance is not significant, the relationship is also characterized by indirect-only or full mediation. Thus, profitability contributes to operational performance primarily when the financial returns generated by bank assets are translated into more efficient operational processes.

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Firm size has a positive and statistically significant indirect effect on operational performance through operational efficiency, with an indirect coefficient of 0.176, a t-statistic of 2.852, and a p-value of 0.002. The classification of this mediation effect depends on the significance criterion applied to the direct effect of firm size. When the reported one-tailed p-value of 0.042 is used, both the direct and indirect effects are significant and positive, indicating complementary partial mediation. In this case, firm size affects operational performance both directly and indirectly through operational efficiency. However, when a conventional two-tailed test is applied, the direct effect is not significant because the t-statistic is below 1.96, resulting in indirect-only or full mediation. The study must therefore use a consistent significance-testing procedure before assigning the final mediation category.

Overall, the findings demonstrate that operational efficiency occupies a central position in the structural model. DER, ROA, and firm size have significant effects on operational efficiency, but their direct contributions to operational performance are either negligible or weak. Their effects on operational performance are primarily transmitted through operational efficiency. Consequently, the results support the argument that the financial structure, profitability, and scale of banking institutions do not automatically produce stronger operational performance unless these resources are managed efficiently.

A critical issue must still be addressed in the interpretation. When operational efficiency is measured using the Operating Efficiency Ratio or BOPO, a higher ratio normally indicates lower efficiency because operating expenses consume a larger proportion of operating income. Therefore, a positive coefficient must not automatically be described as an improvement in efficiency unless the ratio has been reverse-coded. The manuscript must explicitly explain the direction of the OER measurement; otherwise, the interpretation of all paths involving operational efficiency may be conceptually reversed.

Discussion

The Effect of the Debt-to-Equity Ratio on Operational Efficiency

The results indicate that the Debt-to-Equity Ratio (DER) has a positive and statistically significant effect on operational efficiency. This finding suggests that an appropriately managed financing structure can strengthen financial discipline and encourage banks to utilize their resources more systematically. When leverage is maintained at a prudent level, the obligations associated with external financing may motivate management to exercise tighter cost control, improve resource allocation, and strengthen internal monitoring mechanisms (Jiménez-Hernández et al., 2019; Aliyah et al., 2023). Accordingly, DER can contribute to operational efficiency when financing decisions are accompanied by sound risk management and effective operational governance.

From an operational management perspective, financial obligations may place additional pressure on management to evaluate unnecessary expenditures, eliminate non-value-adding activities, and improve the consistency of operational procedures. Such pressure can encourage banks to

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redesign inefficient workflows and apply stricter performance controls across organizational units. This interpretation is consistent with studies suggesting that financial and structural pressures can be managed through process improvement, stronger internal governance, and more disciplined resource utilization (Joaquim & Reis, 2024; Ischak et al., 2024; Khan et al., 2025). Therefore, the contribution of DER to operational efficiency depends not merely on the amount of debt employed but also on management's ability to convert financing pressure into more efficient banking operations.

The Effect of Return on Assets on Operational Efficiency

The results demonstrate that Return on Assets (ROA) has a positive and statistically significant effect on operational efficiency. A higher ROA reflects a bank's ability to generate earnings from the assets under its management and indicates that productive resources are being utilized effectively. Strong profitability may provide banks with greater financial flexibility to strengthen cost-control systems, improve operational infrastructure, and optimize the deployment of internal resources (Aliyah et al., 2023; Ikhwan, 2022). Thus, ROA is not only an indicator of financial performance but may also represent the capacity of a bank to support more efficient operational processes.

From an operational management perspective, profitability enables management to invest in digital technologies, improve information systems, redesign service processes, and develop employee capabilities. These investments can shorten processing times, reduce administrative duplication, and improve the productivity of banking assets. Tan (2024), Le et al. (2022), and Elmahdy et al. (2025) similarly emphasize that profitability contributes more effectively to efficiency when earnings are reinvested in process improvement and organizational capabilities. Consequently, the positive relationship between ROA and operational efficiency indicates that financial returns can support operational improvements when they are directed toward productive and efficiency-enhancing activities.

The Effect of Firm Size on Operational Efficiency

The results indicate that firm size has a positive and statistically significant effect on operational efficiency. Larger banks generally possess broader asset bases, more developed technological infrastructure, and greater organizational resources, which can support the integration and standardization of operational activities. A larger scale of operations may also enable banks to spread fixed costs across a wider range of activities, thereby reducing average operating costs and creating economies of scale (Sapci & Miles, 2019; Le et al., 2022).

From an operational management perspective, larger institutions tend to have more formalized procedures, specialized organizational units, and stronger coordination mechanisms. These characteristics facilitate the adoption of high-capacity technologies, the consolidation of administrative functions, and the standardization of processes across branches and business units. Prior studies

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show that larger banks may obtain efficiency advantages through technological investment, centralized operations, and more stable cost structures (Ikhwan, 2022; Joaquim & Reis, 2024; Ischak et al., 2024; Khan et al., 2025). Nevertheless, organizational size does not automatically guarantee efficiency, because excessive complexity and bureaucracy may also generate additional costs. The positive result found in this study indicates that, within the observed sample, the benefits associated with scale outweigh the potential disadvantages of organizational complexity.

The Effect of the Debt-to-Equity Ratio on Operational Performance

The results indicate that DER does not have a statistically significant direct effect on operational performance. This finding suggests that an increase in leverage does not automatically improve the ability of a bank to utilize its assets more productively. Capital structure primarily reflects the composition of financing, whereas operational performance depends on how effectively those financial resources are allocated and managed. This result is consistent with previous research showing that the effect of leverage on banking performance depends on risk management, cost control, and the quality of internal governance rather than on the level of leverage alone (Ramli et al., 2019; Le et al., 2022).

From an operational management perspective, debt-related pressure may strengthen financial discipline, but it does not directly increase asset productivity. Improvements in operational performance require concrete changes in cost structures, process design, technology utilization, and resource allocation. Ikhwan (2022) and Tan (2024) similarly argue that banking performance is more strongly influenced by internal process stability, cost efficiency, and effective asset management than by financing structure itself. Therefore, the influence of DER on operational performance is more appropriately understood as an indirect process that operates through operational efficiency.

The Effect of Return on Assets on Operational Performance

The results show that ROA does not have a statistically significant direct effect on operational performance. This finding indicates that the ability of a bank to generate accounting profits from its assets does not necessarily translate directly into higher asset turnover or stronger operational productivity. Profitability represents the financial outcomes generated during a particular period, whereas operational performance reflects the effectiveness with which banking assets are utilized to generate operating activity.

Previous studies indicate that profitability may affect operational outcomes indirectly through cost efficiency, technological investment, risk management, and process improvement (Ischak et al., 2024; Tan, 2024). From an operational management perspective, earnings will contribute to stronger operational performance only when they are reinvested in productive systems, service technologies, human resources, and process improvements. Le et al. (2022) and

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Ramli et al. (2019) similarly emphasize that profitability must be supported by effective governance and resource-allocation strategies before it can produce measurable improvements in operational outcomes. Thus, ROA should be viewed as a financial resource that requires conversion into operational capabilities before it can improve operational performance.

The Effect of Firm Size on Operational Performance

The results indicate that firm size has a positive effect on operational performance, although the magnitude of the relationship is relatively weak. This finding suggests that larger banks possess greater structural capacity to support consistent operations, utilize productive assets, and respond to changes in the banking environment. Greater organizational scale may provide access to more extensive distribution networks, advanced technologies, diversified business activities, and stronger managerial capabilities (Sapci & Miles, 2019; Tran et al., 2020).

From an operational management perspective, larger banks generally have more comprehensive operating procedures, stronger cross-unit coordination, and more developed internal control systems. These characteristics can support consistent implementation of operational standards and improve the utilization of banking assets (Ischak et al., 2024). However, the relatively small effect indicates that organizational size alone is insufficient to produce substantial improvements in operational performance. The advantages of scale must still be supported by efficient processes and effective resource management. Therefore, firm size should be regarded as a facilitating condition rather than the primary determinant of operational performance.

The Effect of Operational Efficiency on Operational Performance

The results demonstrate that operational efficiency has a strong and statistically significant effect on operational performance. It is also the most influential predictor in the structural model. This finding indicates that the ability of banks to control operating costs, allocate resources efficiently, and manage internal processes effectively is critical to improving asset productivity. The result is consistent with prior studies that identify efficiency as a major determinant of banking performance (Jiménez-Hernández et al., 2019; Ischak et al., 2024; Khan et al., 2025).

From an operational management perspective, efficiency is not limited to reducing expenditure. It also reflects the capacity of a bank to coordinate activities, minimize process duplication, shorten operational cycles, and utilize assets productively. Banks that manage their operating resources more effectively are better positioned to generate higher levels of operational output from their available assets. This interpretation is consistent with Ikhwan (2022), Le et al. (2022), and Tan (2024), who emphasize that process efficiency and resource utilization are central to maintaining stable banking performance. Therefore, operational efficiency constitutes a strategic mechanism through which financial and organizational resources are converted into stronger operational outcomes.

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The Effect of Mediating Role of Operational Efficiency in the Relationship Between DER and Operational Performance

The results indicate that operational efficiency significantly mediates the relationship between DER and operational performance. The direct effect of DER on operational performance is not significant, whereas its indirect effect through operational efficiency is significant. This pattern demonstrates indirect-only, or full, mediation. In other words, leverage does not directly improve operational performance but influences it by first affecting the efficiency of banking operations.

From an operational management perspective, financing obligations may motivate management to strengthen expenditure controls, restructure inefficient activities, and improve the utilization of organizational resources. These operational adjustments subsequently contribute to stronger performance. Similar patterns have been identified in emerging-market research, where the effects of capital structure on organizational outcomes depend substantially on the institution's ability to maintain operational efficiency (Le et al., 2022; Ramli et al., 2019). Joaquim and Reis (2024) further emphasize that process improvement and internal governance are necessary for financial decisions to generate better performance. Therefore, operational efficiency serves as the principal channel through which DER is translated into operational performance.

The Mediating Role of Operational Efficiency in the Relationship Between ROA and Operational Performance

The results show that operational efficiency significantly mediates the relationship between ROA and operational performance. ROA does not have a significant direct effect on operational performance, but its indirect effect through operational efficiency is positive and significant. This finding indicates indirect-only, or full, mediation. Accordingly, profitability contributes to operational performance only when the financial resources generated by the bank are converted into more efficient processes and more productive resource utilization.

Operationally, profitability provides management with the capacity to invest in technology, information systems, employee competencies, and process innovation. However, these financial resources will not improve operational performance unless they are allocated to activities that reduce costs, eliminate inefficiencies, and strengthen asset productivity. Elmahdy et al. (2025) show that the reinvestment of financial returns in organizational systems and capabilities can improve both efficiency and performance. Consistent with the Resource-Based View, operational efficiency can therefore be regarded as an organizational capability that converts financial resources into superior operational outcomes (Le et al., 2022; Ramli et al., 2019).

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The Mediating Role of Operational Efficiency in the Relationship Between Firm Size and Operational Performance

The results demonstrate that operational efficiency significantly mediates the relationship between firm size and operational performance. This finding indicates that the operational benefits associated with a larger organizational scale depend on the ability of the bank to convert its resources into efficient processes. Large asset holdings, extensive branch networks, and advanced technologies will not necessarily improve operational performance unless they are managed through standardized workflows, effective cost controls, and coordinated resource utilization (Joaquim & Reis, 2024; Sapci & Miles, 2019).

The finding is consistent with the principle of economies of scale, which suggests that larger organizations have the potential to reduce average operating costs and improve productivity. However, these benefits are not automatic; they require effective governance and process integration (Ischak et al., 2024; Le et al., 2022). Operational efficiency therefore functions as a central mechanism that converts scale advantages into stronger operational performance. This result also indicates that the quality of process management is more decisive than the absolute size of a bank's assets in determining operational outcomes (Khan et al., 2025).

The final classification of this mediation effect should be aligned with the significance-testing approach used in the study. When the direct effect of firm size is considered significant under a one-tailed test, operational efficiency provides complementary partial mediation. However, when a two-tailed test is applied and the direct effect is classified as non-significant, the relationship represents indirect-only mediation.

Conclussion, Implication and Recommendation

This study confirms that banks' financial characteristics, represented by DER, ROA, and firm size, contribute to operational efficiency, which in turn becomes the primary mechanism through which financial resources are converted into stronger operational performance. DER and ROA do not directly improve operational performance, while the direct contribution of firm size remains relatively limited. These findings demonstrate that financial strength and organizational scale alone are insufficient to generate superior performance. The decisive factor is the bank's ability to manage costs, standardize processes, allocate resources productively, and convert its financial capacity into operational efficiency. Operational efficiency therefore occupies a central position in explaining how Indonesian banks maximize asset utilization and sustain operational performance.

Bank management must place operational efficiency at the core of financial and strategic decision-making. Capital-structure policies should not merely maintain an appropriate leverage ratio but must strengthen expenditure discipline, risk control, and operational accountability. Profitability should be reinvested in digital infrastructure, integrated information systems, process automation, and employee capabilities rather than treated solely as a financial

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achievement. Similarly, larger banks must convert their scale advantages into standardized procedures, integrated functions, and productive asset utilization. Without effective process governance, greater profitability and organizational size may create bureaucracy and additional costs instead of sustainable performance. Financial planning and operational management must therefore be integrated so that leverage, profitability, and firm size consistently support productivity, resilience, and long-term competitiveness.

Bank management should accelerate the development of efficient operating systems through digital transformation, workflow simplification, process integration, and stricter cost-control mechanisms. Regulators should strengthen efficiency standards and performance-monitoring frameworks that reflect technological developments and the changing operational structure of the banking industry. Future studies should extend the model by incorporating credit risk, asset quality, liquidity, governance quality, digital capability, and macroeconomic conditions to provide a more comprehensive explanation of banking performance. The measurement of operational efficiency must also be stated explicitly. When OER or BOPO is used in its conventional form, a higher value represents greater operating costs and lower efficiency; therefore, the interpretation of the coefficients must be adjusted unless the indicator has been reverse-coded.

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