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The Role of Port Performance and Logistics Efficiency in Regional Economic Competitiveness: Evidence from Indonesia

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ABSTRACT

Ports play a crucial role in maritime transportation by facilitating trade and supporting regional economic development. In Indonesia, an archipelagic country, port performance and logistics efficiency are important factors in ensuring effective goods distribution and strengthening regional economic competitiveness. This study aims to examine the individual and simultaneous effects of port performance and logistics efficiency on regional economic competitiveness in Indonesia. A quantitative approach was employed using secondary data from government statistical publications, port authority reports, and international logistics databases covering the 2018–2025 period. The data were analyzed using descriptive statistics and multiple linear regression. The results indicate that port performance has a positive and significant effect on regional economic competitiveness, with a regression coefficient of 0.462 and a significance value of 0.001. Logistics efficiency also demonstrates a positive and significant effect, with a coefficient of 0.398 and a significance value of 0.005. Furthermore, the model explains 59.1% of the variation in regional economic competitiveness, while the F-test confirms the joint significance of both independent variables. These findings highlight the importance of improving port operational productivity, reducing logistics costs, and strengthening supply chain reliability. The study concludes that port performance and logistics efficiency are important factors associated with regional economic competitiveness in Indonesia.

Keywords: *Indonesia, Logistics Efficiency, Maritime Transport, Port Performance, Regional Economic Competitiveness.*

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1. | INTRODUCTION

Ports play an important role in supporting trade and economic growth, as they constitute a key component of maritime transportation infrastructure. The increasing volume of international trade requires ports to provide productive and reliable services to ensure the smooth distribution of goods. Port operational performance can be reflected in cargo handling speed, vessel turnaround time, and terminal capacity to handle cargo flows (Wijaya & Nakamura, 2025). Optimal port operations can facilitate trade activities and improve the efficiency of maritime transportation systems. Therefore, port performance is a relevant factor to examine in relation to regional economic competitiveness, particularly in regions that depend on maritime transportation to support their economic activities (Amin et al., 2021).

Regional economic competitiveness reflects a region's capacity to enhance productivity, promote sustainable economic growth, and attract investment amid economic competition (Grassia et al., 2024). Achieving these objectives depends not only on the availability of resources and infrastructure but also on the efficiency of logistics systems that support production and trade activities. Logistics efficiency relates to the ability to control costs, shorten distribution times, and ensure the smooth movement of goods from producers to consumers. An efficient logistics system can help businesses reduce operational costs, improve delivery timeliness, and optimize resource utilization. Accordingly, logistics efficiency can be considered a potential driver of regional economic competitiveness through improved business productivity and smoother trade flows (Munim & Schramm, 2018).

In Indonesia, its geographical characteristics as an archipelagic country make maritime transportation and port infrastructure essential for connecting economic activities across regions. Ports serve as key links between production centers, industrial areas, domestic markets, and international trade networks (Yudhistira & Sofiyandi, 2018). Ports such as Tanjung Priok, Tanjung Perak, and Makassar, for example, play important roles in supporting cargo flows and trade within their respective service regions (Indriastiwi et al., 2021). Good port performance can accelerate cargo handling and reduce operational bottlenecks. Meanwhile, logistics efficiency is necessary to ensure that goods are distributed after passing through ports at manageable costs and within reasonable timeframes. Both aspects are relevant to supporting economic activities and regional competitiveness.

The Indonesian government has implemented various initiatives to improve port service quality and strengthen the national logistics system. These initiatives include modernizing port facilities, developing transportation infrastructure, and implementing the National Logistics Ecosystem (NLE). Such initiatives aim to strengthen coordination among logistics stakeholders, simplify administrative procedures, and reduce distribution bottlenecks. Improvements in port performance and logistics efficiency are expected to create a more effective trading system and enhance businesses' ability to access markets. In the long term, these improvements have the

potential to strengthen regional economic competitiveness and Indonesia's position in international trade (World Bank, 2023).

Despite these development efforts, maritime logistics in Indonesia continues to face several challenges. Congestion at certain ports, differences in infrastructure capacity across ports, and delays in cargo handling can disrupt the smooth distribution of goods (Bagus & Hanaoka, 2022). In addition, high transportation costs and long delivery times can increase business operating expenses and reduce supply chain efficiency. These challenges indicate that improving port performance should be accompanied by broader efforts to enhance logistics processes (Amin et al., 2021). Port performance and logistics efficiency are interconnected aspects of the maritime transportation system; however, they have distinct characteristics and should be analyzed separately to understand their respective relationships with regional economic competitiveness.

Previous studies on the maritime sector have examined port productivity, transportation infrastructure development, and logistics management. However, the direct relationships of port performance and logistics efficiency with regional economic competitiveness warrant further investigation in the context of Indonesia's major commercial ports (Zhang et al., 2024) Assessing port performance alone may not provide a comprehensive understanding of the operational factors associated with regional competitiveness. At the same time, logistics efficiency should be considered as a separate factor because distribution costs, delivery times, and supply chain reliability can influence economic activities (Dewa et al., 2018). Therefore, research examining both variables simultaneously can provide broader insights into the relationship between maritime infrastructure, distribution efficiency, and regional economic competitiveness.

Based on this background, this study aims to analyze the effects of port performance and logistics efficiency on regional economic competitiveness in the context of Indonesia's maritime logistics sector. Port performance and logistics efficiency are treated as independent variables, while regional economic competitiveness serves as the dependent variable. Using a quantitative approach, this study examines the individual effects of each independent variable on regional economic competitiveness, as well as their joint effect. The findings are expected to contribute to the literature on maritime transport economics and provide empirical insights for stakeholders in developing strategies to improve port productivity, distribution efficiency, and sustainable regional economic competitiveness.

2. | LITERATURE REVIEW

Port Performance and Regional Economic Competitiveness

Port performance is a key factor supporting the smooth flow of trade and enhancing the effectiveness of maritime logistics systems. Ports with efficient operational management can accelerate loading and unloading processes, reduce vessel queuing times, and minimize bottlenecks in cargo handling. Such conditions help lower transportation costs and facilitate the distribution of commodities to various markets.

For companies and industries in the surrounding region, improved port service quality supports productivity and seamless business operations. Munim and Schramm (2018) highlight the importance of port infrastructure and market access in bolstering regional economic competitiveness, particularly by facilitating the smooth flow of domestic and international trade.

Beyond supporting the distribution of goods, strong port performance has the potential to drive industrial growth in the surrounding area. Reliable port services enable companies to procure raw materials and distribute products to consumers with greater control over time and costs (Liang & Liu, 2020). Adequate port infrastructure and services also serve as key considerations for investors when selecting business locations. Consequently, port performance contributes to regional economic competitiveness by boosting business productivity, expanding trade, and fostering a more favorable investment climate (Amin et al., 2021). Based on the foregoing, the research hypothesis is formulated as follows:

H1: Port performance has a positive effect on regional economic competitiveness.

Logistics Efficiency and Regional Economic Competitiveness

Logistics efficiency refers to a logistics system's ability to move and distribute goods while optimizing the use of time, costs, and resources. This efficiency is a crucial factor in supporting regional economic competitiveness, as it influences corporate operating costs, the smoothness of distribution, and the reliability of goods supply (Munim & Schramm, 2018). An efficient logistics system enables companies to allocate resources more productively, reduce transportation expenses, and meet market demands with more predictable delivery times. Such conditions enhance a company's ability to compete in both domestic and international markets (Li et al., 2024).

In a regional context, logistics efficiency also fosters a business environment conducive to industrial growth and trade activities. Controlled logistics costs help businesses maintain price competitiveness, while reliable distribution allows companies to respond more effectively to fluctuations in market demand (Al-Shboul, 2022). Furthermore, a smooth supply chain can expand market reach, boost productivity, and support investment decisions. UNCTAD (2022) highlights the importance of maritime transport and logistics performance in supporting trade and supply chain resilience.

Consequently, logistics efficiency is positioned as an independent variable expected to have a direct impact on regional economic competitiveness. The more efficient a region's logistics system, the greater its potential to reduce distribution bottlenecks, enhance business operational effectiveness, and strengthen its economic competitiveness. Based on this reasoning, the research hypothesis is formulated as follows:

H2: Logistics efficiency has a positive effect on regional economic competitiveness.

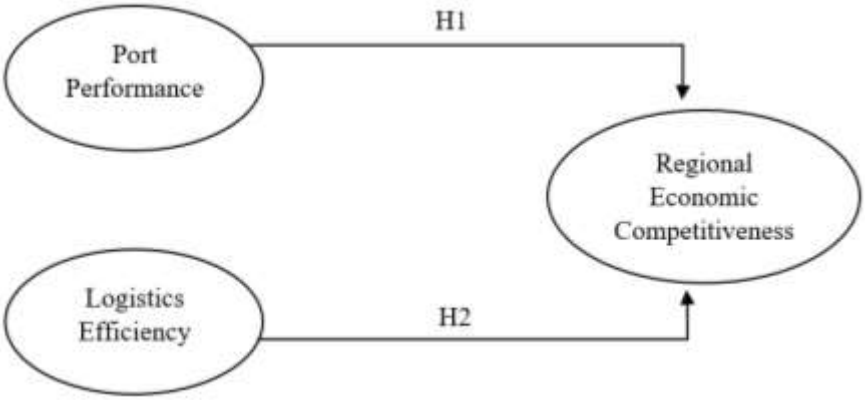


Figure 1. Research Framework

3. | RESEARCH METHOD

This study employs a quantitative approach to examine the effects of port performance and logistics efficiency on regional economic competitiveness in Indonesia's maritime logistics sector. The data used are secondary data obtained from various sources, including government statistical publications, official port authority reports, and international logistics databases covering the period from 2018 to 2025. The study focuses on major commercial ports in Indonesia as the units of analysis, considering their roles in supporting goods distribution, trade, and economic activities in surrounding regions.

This study comprises three variables: port performance and logistics efficiency as independent variables, and regional economic competitiveness as the dependent variable. Port performance is measured using indicators such as cargo throughput, vessel turnaround time, and terminal productivity. Logistics efficiency is measured using indicators reflecting the effectiveness of distribution processes, including logistics costs, goods distribution time, cargo handling efficiency, and supply chain reliability, subject to data availability. Meanwhile, regional economic competitiveness is measured using indicators such as trade volume, investment realization, and economic growth in the regions associated with the ports under study.

Data analysis is conducted using descriptive statistics and multiple linear regression to examine the individual effects of each independent variable on regional economic competitiveness, as well as their joint effect. The regression model is formulated as follows:

$$\mathrm{REC_i} = \beta_0 + \beta_1 \mathrm{PP_i} + \beta_2 \mathrm{LE_i} + \varepsilon_i$$

Information:

- REC_i: Regional economic competitiveness at the i-th observation.
- PP_i: Port performance at the i-th observation.
- LE_i: Logistics efficiency at the i-th observation.
- β_0: Regression constant.
- β_1 : Port performance regression coefficient.

- β_2: Logistic efficiency regression coefficient.
- ε_i: The error term for the i-th observation.

Hypothesis testing was conducted using the t-test to assess the partial effect of each independent variable and the F-test to evaluate their simultaneous effect. The coefficient of determination (R^2) was used to determine the proportion of the variation in regional economic competitiveness that can be explained by the two independent variables in the research model.

4. | RESULTS

Descriptive Overview of Research Variables

Descriptive statistics are used to provide an overview of the characteristics of the research data, covering port performance, logistics efficiency, and regional economic competitiveness. This analysis encompasses the number of observations, minimum and maximum values, mean, and standard deviation for major commercial ports in Indonesia during the 2018–2025 period.

Table 1. Descriptive Statistics of Research Variables

Variable	N	Min	Max	Mean	Std. Deviation
Port Performance	40	64.3	91.2	77.26	6.85
Logistics Efficiency	40	60.1	89.4	74.18	6.52
Regional Economic Competitiveness	40	62.7	92.3	77.85	7.16

Descriptive statistics indicate that regional economic competitiveness has the highest mean value at 77.85, followed by port performance at 77.26 and logistics efficiency at 74.18. The mean value for port performance reflects the observed operational characteristics of the ports, while the mean value for logistics efficiency illustrates the state of distribution efficiency, cargo handling, and supply chain management. Meanwhile, the mean value for regional economic competitiveness indicates the region's level of economic competitiveness based on the indicators used in the study.

Regarding data dispersion, logistics efficiency exhibits the lowest standard deviation at 6.52, whereas regional economic competitiveness shows the highest at 7.16. This suggests that logistics efficiency values are relatively more concentrated around the mean, while regional economic competitiveness displays greater value variation. Overall, the descriptive statistics provide an initial overview of the characteristics of the three research variables. To determine the impact of port performance and logistics efficiency on regional economic competitiveness, the analysis proceeds with multiple linear regression to test the partial effect of each independent variable as well as their simultaneous effect on the dependent variable.

Results of Regression Analysis and Hypothesis Testing

Multiple linear regression analysis was conducted to examine the impact of port performance and logistics efficiency on regional economic competitiveness. The regression estimation results are presented in Table 2, while a summary of the model's goodness-of-fit is shown in Table 3.

Table 2. Regression Analysis Results

Variable	Coefficient (β)	Std. Error	t-value	Sig.
Constant	13.024	3.487	3.74	0.002
Port Performance	0.462	0.127	3.64	0.001
Logistics Efficiency	0.398	0.134	2.97	0.005

The regression analysis results in Table 2 show that port performance has a positive regression coefficient of 0.462 with a significance value of 0.001, which is less than 0.05. These results indicate that port performance has a positive and significant impact on regional economic competitiveness. Thus, H1 is supported based on these test results. These findings suggest that improvements in port operational performance—such as faster loading and unloading processes, reduced vessel waiting times, and increased terminal productivity are associated with enhanced regional economic competitiveness.

Logistics efficiency also shows a positive regression coefficient of 0.398 with a significance value of 0.005, which is less than 0.05. These results indicate that logistics efficiency has a positive and significant impact on regional economic competitiveness. Therefore, H2 is supported based on these test results. These findings suggest that controlling logistics costs, ensuring timely distribution, and maintaining supply chain reliability can facilitate smooth trade activities, boost business productivity, and strengthen regional economic competitiveness.

Table 3. Model Summary

R	R^2	Adjusted R^2	F-value	Sig.
0.769	0.591	0.567	24.18	0.000

Based on Table 3, the R^2 value of 0.591 indicates that 59.1% of the variation in regional economic competitiveness can be jointly explained by port performance and logistics efficiency within the research model. Meanwhile, the remaining 40.9% is attributable to factors outside the model, such as industrial investment, trade policies, the quality of transportation infrastructure, and regional economic conditions. The Adjusted R^2 value of 0.567 indicates that, after adjusting for the number of independent variables in the model, the model's explanatory power is 56.7%.

Furthermore, an F-value of 24.18 with a significance level of 0.000 ($p < 0.001$) indicates that the regression model is simultaneously significant at the 5% level. Thus,

port performance and logistics efficiency jointly exert a statistically significant influence on regional economic competitiveness. Overall, these results support both research hypotheses, H1 and H2.

5. | DISCUSSION

The findings indicate that port performance and logistics efficiency have positive and significant effects on regional economic competitiveness in Indonesia's maritime logistics sector. The positive relationship between port performance and regional economic competitiveness highlights the importance of operational productivity, cargo handling capacity, and vessel turnaround time in supporting regional economic activities. This finding is consistent with Munim and Schramm (2018), who emphasize the role of port infrastructure and market accessibility in strengthening regional competitiveness. Efficient port operations can reduce transportation delays, facilitate trade flows, and improve business productivity, thereby creating favorable conditions for regional economic development.

Similarly, logistics efficiency demonstrates a positive and significant relationship with regional economic competitiveness. This finding suggests that controlling logistics costs, improving delivery time, and strengthening supply chain reliability are important for supporting business productivity and trade performance. The result aligns with UNCTAD (2022), which highlights the importance of maritime transport and logistics performance in maintaining efficient trade and resilient supply chains. In Indonesia, improving logistics efficiency is particularly relevant because geographical conditions create substantial challenges for interregional distribution.

The regression model also explains 59.1% of the variation in regional economic competitiveness, indicating that port performance and logistics efficiency jointly provide meaningful explanatory contributions. However, the remaining 40.9% suggests that other factors, including industrial investment, trade policies, and broader transport infrastructure, may also influence regional competitiveness. These findings underline the importance of integrating port modernization with wider logistics development strategies. Therefore, strengthening port operations and improving logistics systems should be considered complementary efforts to support sustainable regional economic competitiveness in Indonesia.

6. | CONCLUSION

This study concludes that port performance and logistics efficiency have positive and significant effects on regional economic competitiveness in Indonesia's maritime logistics sector. The regression results demonstrate that port performance has a positive coefficient of 0.462 with a significance value of 0.001, while logistics efficiency has a coefficient of 0.398 with a significance value of 0.005. These findings support both research hypotheses and highlight the importance of improving port operations and logistics systems to strengthen regional economic competitiveness.

Furthermore, the coefficient of determination (R^2) of 0.591 indicates that port performance and logistics efficiency jointly explain 59.1% of the variation in regional economic competitiveness. The remaining 40.9% may be associated with other factors, including industrial investment, trade policies, and transportation infrastructure. These results emphasize that regional economic competitiveness is influenced by multiple interconnected factors beyond maritime logistics.

From a practical perspective, port authorities and policymakers should prioritize port infrastructure modernization, operational productivity, logistics cost reduction, and supply chain reliability. Integrating port development with broader regional economic strategies may further improve trade connectivity and business productivity. Nevertheless, this study is limited by its focus on selected commercial ports and the availability of secondary data. Future research could incorporate additional variables, broader geographical coverage, and longer observation periods to provide a more comprehensive understanding of the relationship between maritime logistics and sustainable regional economic competitiveness.

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Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

Ethical Approval and Originality Statement

Ethical approval was obtained for this study. The manuscript represents original work and has not been previously published, nor is it under consideration by another journal.

Data Disclosure Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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