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Analysis of Local Government Financial Efficiency in Indonesia Using the Dea Approach

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Abstract

Regional financial efficiency has become an important issue in the implementation of fiscal decentralization in Indonesia because large public expenditures do not always produce optimal development outcomes. Differences in fiscal capacity, infrastructure, and governance quality among provinces create disparities in economic growth, human development, and poverty reduction. This study aims to analyze the level of local government financial efficiency in Indonesia during the 2018–2024 period using the Data Envelopment Analysis (DEA) approach. The research employs a quantitative explanatory design with a longitudinal approach. Secondary panel data were collected from the Central Statistics Agency (BPS) and the Directorate General of Fiscal Balance (DJPK). The input variables consist of education expenditure, health expenditure, road expenditure, and subsidy expenditure, while the output variables include Gross Regional Domestic Product (GDP) per capita, Human Development Index (HDI), and poverty reduction. The study applies an output-oriented DEA model with Variable Return to Scale (VRS) assumptions to measure relative efficiency among provinces. The results show that financial efficiency levels vary significantly across provinces. Several provinces, such as DKI Jakarta, East Kalimantan, Riau, and DI Yogyakarta, consistently achieved full efficiency, while Papua and West Papua remained relatively inefficient. Overall, regional financial efficiency in Indonesia showed gradual improvement during the observation period, although most provinces still experienced inefficiencies in converting public expenditure into optimal development outcomes. These findings indicate the importance of improving budget allocation effectiveness and strengthening regional financial governance to support equitable and sustainable development.

Keywords: data envelopment analysis, fiscal efficiency, local government, public expenditure, regional development

INTRODUCTION

In order to evaluate the efficiency of regional financial management objectively and comprehensively, this study uses the *Data Envelopment Analysis* (DEA) approach. DEA is a non-parametric method based on linear programming introduced by Charnes, Cooper, and Rhodes (1978) to measure the relative efficiency of decision-making units with multiple inputs and outputs. The DEA's advantage lies in its ability to capture the complexity of the public sector without requiring the assumption of a specific form of production function.

This study uses an output-oriented DEA approach assuming *Variable Return to Scale* (VRS). The output-oriented approach is relevant because it focuses on the ability of local governments to maximize development output in the form of GDP, HDI, and poverty reduction without increasing

the allocated expenditure inputs. The VRS assumption was chosen to accommodate differences in fiscal capacity and development scale between regions in Indonesia (Putri & Handayani, 2023).

Thus, this study aims to provide a more comprehensive picture of the level of regional financial efficiency in Indonesia and identify the extent to which education, health, road, and subsidy spending can be converted into optimal development output.

As a first step in analyzing the financial efficiency of a region, it is important to understand how the structure and composition of government spending is allocated to various sectors. The analysis of expenditure realization provides an empirical picture of the priorities of budget use and its potential contribution to the achievement of development output.

A number of empirical studies show that high employee spending has the potential to reduce regional financial efficiency if it is not balanced with an improvement in public service performance. Santoso and Prabowo (2020) found that regions with a high portion of employee spending tend to have a lower level of public spending efficiency. Another study by Halim and Kusufi (2021) also shows that the dominance of employee spending in the APBD causes regional spending to be less responsive to the needs of economic and social development. These findings indicate that employee spending, although important, needs to be managed proportionately so as not to hinder the effectiveness of development spending (Celestin, 2016; Goyal & Nash, 2017; Rounaghi et al., 2021).

In the context of this study, GDP per capita is treated as one of the main outputs in measuring regional financial efficiency using the Data Envelopment Analysis (DEA) approach (Chen & Jia, 2017; Marto et al., 2022). The size of the GDP between regions reflects the difference in the ability of local governments to convert fiscal inputs, especially education spending, health spending, road spending, and subsidy spending, into economic development outputs. Therefore, efficiency analysis is important to identify regions that have been able to make optimal use of their budgets, as well as areas that still have the potential to improve development performance without having to increase spending allocations (Santoso & Anggraini, 2025).

Although GDP is an important indicator to describe regional economic performance, economic growth alone is not enough to reflect the success of development as a whole. Quality development is not only characterized by increasing economic output, but also by improving the quality of life and welfare of the community. Therefore, the analysis of regional development performance needs to be equipped with indicators that are able to capture the social and human dimensions, one of which is through the Human Development Index (HDI) (Ferraz et al., 2020; Gousario & Dharmastuti, 2015; Liu et al., 2023; Mariano et al., 2021).

The Human Development Index (HDI) data per province in 2024 shows that the quality of human development in Indonesia is still experiencing inequality between regions. Some provinces such as DKI Jakarta, DI Yogyakarta, and provinces on the island of Java generally recorded relatively high HDI values, while a number of provinces in eastern Indonesia, such as Papua and West Papua, were still at lower HDI levels. This difference indicates that human development achievements are not evenly distributed, both in terms of education, health, and decent living standards (BPS, 2024).

In this study, HDI is treated as one of the main outputs in the analysis of regional financial efficiency using the Data Envelopment Analysis (DEA) method. The variation in HDI values between regions reflects the differences in the ability of local governments to manage education spending, health spending, road spending, and subsidy spending to improve the quality of life of the community. Areas that are able to achieve high HDI with relatively limited expenditure inputs can be categorized as technically efficient areas, while areas with low HDI despite relatively large expenditure indicate potential inefficiencies in regional financial management (Coelli et al., 2005).

Although the increase in the Human Development Index (HDI) reflects an improvement in the quality of human resources and community welfare, the success of regional development cannot be assessed comprehensively without looking at the ability of the development to reduce poverty levels. In other words, effective economic and human development should not only increase income and quality of life, but also reduce the proportion of the population below the poverty line. Therefore, the poverty level is an important indicator that complements GDP and HDI in assessing the performance of regional development output.

In addition to GDP and HDI, poverty levels are important indicators that illustrate how effective regional development policies are in improving people's welfare directly. Data on the provincial poverty level in 2024 shows that the problem of poverty in Indonesia is still heterogeneous and spatially uneven. Provinces in the eastern region of Indonesia such as Papua, West Papua, and Maluku recorded relatively high poverty rates compared to provinces in the western region, especially Java Island and parts of Sumatra. This condition reflects that the results of economic and social development have not been enjoyed equally by all regions (BPS, 2024).

The high level of poverty in a number of provinces indicates that economic growth and improvement in the quality of human development have not been able to fully reduce the proportion of poor people. In development theory, poverty is seen as an indicator of structural failure of development, which is not only related to low income, but also limited access to education, health, and basic infrastructure (Todaro & Smith, 2020). Therefore, reducing the poverty rate is one of the main outputs that reflects the success of public policies at the regional level.

In the context of regional finance, the poverty level is greatly influenced by the effectiveness of public spending. Education spending and health spending play a role in improving the quality of human resources, thereby expanding job opportunities and people's income. Road spending supports regional connectivity and lowers economic costs, while subsidized spending serves as an instrument of social protection for vulnerable groups. However, the amount of the allocation of expenditure does not automatically guarantee poverty reduction if it is not managed efficiently and on target (Ritonga et al., 2021).

Variations in poverty levels between provinces also reflect differences in fiscal capacity, quality of governance, and regional geographical conditions. Areas with limited accessibility, high logistics costs, and weak institutional capacity tend to have difficulty converting public spending into significant poverty reduction (Lewis, 2023). This explains why some provinces still have high poverty rates despite receiving relatively large budget allocations.

In the framework of fiscal decentralization, this phenomenon shows that the authority to manage the budget given to the regions must be balanced with increasing regional financial efficiency. The study of Safitri and Widarjono (2023) emphasizes that the effectiveness of regional spending in reducing poverty is highly determined by the quality of budget planning, implementation, and supervision, not solely by the amount of spending.

In this study, the poverty level is used as a development output with an inverse nature, where the reduction in poverty rate represents an improvement in the performance and efficiency of local governments. Through the Data Envelopment Analysis (DEA) approach, differences in poverty levels between provinces are analyzed as a reflection of the region's ability to convert inputs of education spending, health spending, road spending, and subsidy spending into better social welfare. Areas that are able to reduce poverty levels with relatively limited expenditure inputs can be categorized as technically efficient areas, while areas with high poverty rates despite large expenditures show potential inefficiencies in regional financial management (Coelli et al., 2005).

Thus, all provinces in Indonesia show a wide diversity in budget management capacity and the quality of public spending. These differences are reflected in the composition of education spending, health spending, road spending, and subsidy spending, which ultimately affect the achievement of development outputs such as GDP, HDI, and poverty levels. This diversity emphasizes the importance of analyzing regional financial efficiency, because the large budget allocation does not automatically produce optimal development performance.

In this case, financial efficiency measurement is relevant to assess the extent to which each province is able to convert budget inputs into maximum development output. The *Data Envelopment Analysis* (DEA) method provides an appropriate analytical framework because it can evaluate the relative efficiency between provinces by considering many inputs and outputs simultaneously. Through this approach, the research can identify efficient and inefficient provinces, as well as test their efficiency determinants.

This research is expected to make a theoretical and empirical contribution to the study of fiscal efficiency in the era of decentralization, as well as a basis for local governments in formulating budget management strategies that are more effective, efficient, and oriented towards improving the welfare of people throughout Indonesia.

Problem Identification

There are still indications of inefficiency in the use of regional fiscal resources, especially in the components of education spending, health spending, road infrastructure spending, and subsidy spending, which have not been fully able to produce optimal development output in the form of increasing the Gross Regional Domestic Product (GDP), increasing the Human Development Index (HDI), and reducing poverty levels. The discrepancy between the amount of regional financial inputs and the achievement of development outputs indicates the potential for technical inefficiencies in regional financial management that need to be measured systematically using *the Data Envelopment Analysis* (DEA) approach.

There is a heterogeneity of financial efficiency between regions in converting education, health, road, and subsidy expenditures into economic and social development outputs. This

difference in efficiency performance reflects that not all local governments are able to optimally utilize public expenditure inputs to achieve the efficiency frontier. This condition has the potential to widen the disparity in development performance between regions, both in terms of economy (GDP), quality of human resources (HDI), and social conditions (poverty level).

There is no adequate empirical evidence on the dynamics of longitudinal regional financial efficiency in the utilization of education, health, road, and subsidy expenditures during the 2018–2024 period. Uncertainty about whether a region experiences an increase in efficiency, a decrease in efficiency, or stagnation over time is an important problem to analyze, in order to understand the development pattern of regional financial management performance in the medium term.

It has not been systematically identified which provinces are consistently in an efficient condition or that continue to experience inefficiency in managing education, health, road, and subsidy expenditures during the research period. The absence of comprehensive efficiency mapping limits the government's ability to formulate *evidence-based* budget management policies aimed at improving regional financial efficiency and strengthening development output achievements in the form of GDP, HDI, and poverty reduction.

Problem Formulation

1. What is the level of regional financial efficiency in Indonesia in the 2018–2024 period based on *the Data Envelopment Analysis* (DEA) approach?
2. How did the level of financial efficiency differ between provinces in Indonesia during the study period?
3. What is the trend of changes in regional financial efficiency from 2018 to 2024?
4. Which regions are consistently in an efficient condition and which provinces are experiencing inefficiency in 2018-2024?

Research Objectives

1. To measure the level of regional financial efficiency in all provinces in Indonesia in the 2018–2024 period, the *Data Envelopment Analysis* (DEA) approach is used.
2. To analyze the difference in the level of financial efficiency between provinces in Indonesia to determine the variation in the performance of public budget management in each region.
3. To identify the trend of changes in regional financial efficiency from 2018 to 2024 so that a pattern of increase, decrease, or stagnation of efficiency throughout the research period can be known.
4. To map regions that are consistently in efficient conditions and provinces that experience repeated inefficiencies, as a basis for the preparation of policy recommendations to improve regional financial performance.

METHOD

Approaches and Types of Research

This study uses a quantitative approach, which aims to test hypotheses and measure regional financial efficiency based on objectively measurable numerical data. The quantitative approach was chosen because it is suitable for explaining the relationships between variables as well as

identifying factors that affect fiscal efficiency in a systematic and data-driven manner. As explained by Sugiyono (2016), the quantitative approach is very appropriate to be used in research that is oriented towards testing theories, measuring relationships between variables, and predicting socio-economic phenomena.

The type of research used is explanatory *research*, which is research that aims to explain the causal relationship between variables and test hypotheses that have been formulated previously (Neuman, 2014). This study also uses *a longitudinal* design, because it observes and analyzes the phenomenon of fiscal efficiency over a certain period of time, namely 2018 to 2024. The *longitudinal* design allows researchers to monitor changes in fiscal efficiency over time, identify long-term trends, as well as evaluate performance consistency between regions. According to Babbie (2010), longitudinal research can provide a more comprehensive understanding of socio-economic dynamics that take place over a period of time, compared to cross-sectional designs that only capture data at a single point in time.

In this context, regional financial efficiency is positioned as a dependent variable measured relatively using *the Data Envelopment Analysis* (DEA) method. DEA is a non-parametric quantitative approach based on linear programs that is commonly used to measure the technical efficiency of *Decision-Making Units* (DMUs), such as local governments, without requiring the assumption of a specific form of production function (Coelli et al., 2005).

With a combination of quantitative approaches, explanatory design, and *longitudinal strategies*, this study is expected to be able to answer the problem formulation empirically and explain the relationship between variables with high statistical accuracy. This approach not only provides a comparative measure of efficiency between provinces, but also reveals the main determinants that have influenced variations in fiscal efficiency between regions in Indonesia over the past seven years.

Location and Research Object

This study uses an analysis unit at the provincial level in Indonesia. The research population is all provinces in Indonesia (34 provinces).

The research can reflect on extreme fiscal disparities between regions, while examining whether certain fiscal characteristics correlate with efficiency in regional financial management. This approach is in line with the principle of *comparative case studies*, which according to Creswell (2013) allows researchers to understand public policy phenomena in varying contexts through cross-regional comparisons with contrasting characteristics.

The object of this research is the provincial government as a fiscal decision-making *unit* (DMU) which is analyzed using *the Data Envelopment Analysis* (DEA) approach. The provincial government is an entity that has full authority in the management of regional revenues and expenditures, and is the main implementer of fiscal policies within the framework of regional autonomy as stipulated in Law Number 23 of 2014 concerning Regional Government.

The focus of the research is on regional financial data and development indicators realized by each province during the period from 2018 to 2024. This data includes education spending,

health spending, road spending, subsidy and development spending such as Gross Regional Domestic Product (GDP) per capita, Human Development Index (HDI), and poverty rate.

With this coverage of regions and objects, this study is expected to provide a sharp and data-driven picture of regional financial efficiency in Indonesia, as well as encourage inter-regional fiscal policy learning with a more contextual and performance-based approach.

Data Types and Sources

This study uses quantitative data that is secondary. Quantitative data was chosen because this study requires numerical information that can be objectively measured and processed using the Data Envelopment Analysis (DEA) approach. Secondary data is used because all research variables come from official government publications that have been standardized, thus ensuring consistency, reliability, and comparability between provinces and between times.

Secondary data in this study was obtained from various government agencies that have authority and authority in providing macroeconomic statistical data, regional financial data, and human development indicators. In more detail, the types of data used in this study include:

Table 1. Data Type

Data Input	Data Output
Education Expenditure from the APBD	Gross Regional Domestic Product (GDP) Per Capita
Health Expenditure from the APBD	Human Development Index (HDI)
Road Spending from the APBD	Percentage of Poor Population
Subsidy Expenditure from the APBD	

All of these variables are the main indicators in assessing the effectiveness of the use of the regional budget in producing economic and social development outputs.

Input data is obtained from the Directorate General of Financial Balance (DJPK) of the Ministry of Finance through the publication of the Regional Expenditure Realization APBD which is available periodically. Output data in the form of GDP, HDI, and poverty levels are obtained from the Central Statistics Agency (BPS) through official publications such as Provinces in Numbers, Indonesian Statistics, Human Development Index, and Poverty Profile in Indonesia.

The type of data used includes panel data (cross-section of 34 provinces and time series for the 2018–2024 period), so that efficiency analysis can be carried out comprehensively both between provinces and between times.

Data Analysis Methods

Data Envelopment Analysis *(DEA)* Method

In the application *of Data Envelopment Analysis* (DEA), the selection of production scale assumptions is an important step because it will determine how the relationship between inputs and outputs is modeled. The two main approaches in DEA are *the Constant Return to Scale* (CRS) developed by Charnes, Cooper, and Rhodes (1978) otherwise known as the CCR Model, and *the Variable Return to Scale* (VRS) introduced by Banker, Charnes, and Cooper (1984) or known as

the BCC Model. These two models have different theoretical foundations and interpretive implications so their selection should be appropriate to the context of the study.

Constant Return to Scale (CRS) – Model CCR

The CCR model assumes that any increase in input in a given proportion will result in an increase in output in equal proportions. In other words, the organization is assumed to operate at an optimal production scale, so the measured efficiency not only reflects technical efficiency, but also reflects the efficiency of scale simultaneously.

In this model, the efficiency value describes the ability of the decision-making unit (DMU) to convert inputs into outputs without considering the imbalance of production capacity or differences in economic structure between regions. The CCR model is generally used when all units have a relatively homogeneous scale of operation or when the researcher wants to obtain a measure of *overall efficiency*.

According to Charnes, Cooper, and Rhodes (1978), this approach is appropriate when it is assumed that there are no structural obstacles or variations that cause changes in the scale of operations, such as the level of economic development, fiscal capacity, or the size of the area.

Variable Return to Scale (VRS) – Model BCC

In contrast to CCR, the BCC model accommodates conditions in which the relationship between the increase in input and output is not always proportional. This approach recognizes that a unit may operate below an increasing return to scale or even operate above optimal capacity (decreasing return to scale). Thus, the efficiency produced by the BCC model represents pure technical efficiency, that is, pure efficiency without being affected by the scale of the operation.

Banker, Charnes, and Cooper (1984) stated that the VRS model is more appropriate to be used when the units analyzed have diverse characteristics in terms of resources, fiscal capacity, or level of economic development, so differences in the scale of operations must be considered.

In the context of regional research, the VRS model is often used because provinces in Indonesia have very heterogeneous economic characteristics, budget management capacity, and spending structures. This allows for fairer comparisons of technical efficiency and can avoid biases that arise due to differences in scale.

RESULTS AND DISCUSSION

DEA Efficiency Calculation Results

In this DEA calculation, the researcher also included the rank category where in the analysis *Data Envelopment Analysis* (DEA) was used to show the order of relative efficiency performance between decision-making *units (*DMU), in this case the province. The ranking is compiled based on technical efficiency (VRS_TE), where the province with the highest efficiency score occupies the top-ranking position.

Provinces that have an efficiency value of 1 are categorized as efficient and generally rank highest together (*tied rank*), because they have the same level of efficiency. Meanwhile, provinces with efficiency values below 1 will be sorted based on their proximity to the maximum efficiency value, so the smaller the efficiency value obtained, the lower the ranking.

Thus, efficiency ratings not only show the relative position of a province compared to other provinces, but also provide an overview of the level of performance of regional resource management. This ranking is important in identifying areas that have been optimized as well as areas that still need improvement in the use of inputs to produce maximum output.

Efficiency Results in 2018

Based on the calculation results, there are 10 provinces that have achieved full efficiency (VRS_TE = 1), namely: DKI Jakarta, East Kalimantan, Riau, North Kalimantan, Riau Islands, Gorontalo, Bangka Belitung, Bengkulu, Bali, and DI Yogyakarta. This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output.

Most provinces are in *the condition of Increasing Return to Scale* (IRS), which is as many as 28 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

Meanwhile, there are 3 provinces that are in *the condition of Decreasing Return to Scale* (DRS), namely DKI Jakarta, West Java, and East Java. This condition indicates that the addition of inputs no longer provides a comparable increase in output, so efficiency is needed in the scale of budget usage.

This shows that the province still has the potential to increase economic output without the need to increase inputs. Meanwhile, the HDI and poverty level variables showed relatively small or zero slack values in most provinces, indicating that the two variables were relatively optimal in the model.

Overall, the results of the analysis show that regional financial efficiency in Indonesia in 2018 is still uneven. Most provinces are still in an inefficient condition, caused by the overuse of inputs and the lack of optimal output achievement, especially GDP. These findings indicate that the increase in efficiency depends not only on the size of the budget, but also on the effectiveness of regional expenditure management and allocation.

Efficiency Results in 2019

The results of data processing using the *Data Envelopment Analysis* (DEA) with an approach *Variable Return to Scale* (VRS) in 2019 presented in Table 4.5, there are 11 provinces that have achieved full efficiency (VRS_TE = 1), namely DKI Jakarta, Riau, Riau Islands, Bangka Belitung, Bengkulu, Lampung, DI Yogyakarta, Bali, Gorontalo, East Kalimantan, and North Kalimantan.

This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output.

Meanwhile, there are 23 provinces that are not efficient, with an efficiency value below 1. The province with the lowest efficiency level is Papua with a score of 0.7837, followed by West Papua (0.8392) and East Nusa Tenggara (0.8539).

The low efficiency value shows that the province still has the potential for improvement in optimizing the use of inputs or increasing the output produced.

The provinces with the best performance are dominated by those that have achieved full efficiency. Several provinces such as DKI Jakarta, East Kalimantan, and Gorontalo are consistently in the top position. In contrast, the lowest-ranked province is Papua, which shows the highest level of inefficiency compared to other provinces.

This difference in ranking shows that there is an efficiency imbalance between regions, which can be caused by differences in fiscal capacity, the quality of human resources, and the effectiveness of regional budget management.

Most provinces are in the *Increasing Return to Scale* (IRS), which is as many as 27 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

Meanwhile, there are 4 provinces that are in the condition of *Decreasing Return to Scale* (DRS), namely West Java, East Java, North Sulawesi, and one other province, which indicates that the addition of inputs no longer results in a proportional increase in output.

In addition, there are 3 provinces that are in the condition of *Constant Return to Scale* (CRS), which indicates that the input usage is already at optimal scale.

This shows that the province still has the potential to increase economic output without the need to increase inputs. Meanwhile, the HDI and poverty level variables showed relatively small or zero *slack* values in most provinces, indicating that the two variables were relatively optimal in the model.

Overall, the results of the analysis show that regional financial efficiency in Indonesia in 2019 is still uneven. Although there was an increase in the number of efficient provinces compared to the previous year, most provinces were still in an inefficient condition. These inefficiencies are generally caused by the overuse of inputs and the achievement of output, especially in the GDP variable. These findings indicate that the increase in efficiency depends not only on the size of the budget, but also on the effectiveness of regional expenditure management and allocation.

Efficiency Results in 2020

The results of data processing using the Data Envelopment Analysis (DEA) method with the *Variable Return to Scale* (VRS) in 2020 presented in Table 4.9, there are 10 provinces that have achieved full efficiency, namely DKI Jakarta, East Kalimantan, Riau, North Kalimantan, Riau Islands, Gorontalo, Bangka Belitung, Bengkulu, Bali, and DI Yogyakarta.

This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output.

Meanwhile, as many as 24 other provinces are still in an inefficient condition. The province with the lowest efficiency level is Papua with a score of 0.7838, followed by West Papua (0.8397) and East Nusa Tenggara (0.8572).

Based on efficiency rankings, the provinces with the highest efficiency scores occupy the top position (small rank), while the provinces with low efficiency scores are in the larger rankings. Provinces such as DKI Jakarta and East Kalimantan rank first because they have achieved full efficiency. In contrast, Papua ranks last, showing the highest level of inefficiency. This ranking provides a comparative overview of the efficiency performance between provinces in regional financial management.

Based on the results of the analysis, most provinces are in the condition of Increasing Return to Scale (IRS), which is as many as 28 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

Meanwhile, there are 3 provinces that are in a condition of Decreasing Return to Scale (DRS), namely DKI Jakarta, West Java, and East Java, which indicates that the scale of input use is too large.

In addition, there are 3 provinces that are in the condition of Constant Return to Scale (CRS), which shows that the use of inputs is at an optimal level.

Overall, the results of the analysis show that regional financial efficiency in Indonesia in 2020 is still uneven. The majority of provinces are still in an inefficient condition. This inefficiency is caused by the fact that in addition to Covid-19, there is an excess use of inputs and the achievement of output, especially in increasing GDP. The results that show that there are still efficient provinces in 2020 actually reflect that efficiency in DEA is relative. This means that despite the COVID-19 pandemic that has suppressed economic performance, there are still regions that are able to manage resources better than other regions.

Efficiency Results in 2021

The results of data processing using the *Data Envelopment Analysis* (DEA) with an approach *Variable Return to Scale* (VRS) in 2021 presented in Table 4.13, there are 11 provinces that have achieved full efficiency, namely DKI Jakarta, East Kalimantan, Riau, North Kalimantan, Riau Islands, Gorontalo, Bangka Belitung, Bengkulu, Bali, DI Yogyakarta, and West Sumatra.

This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output.

Meanwhile, as many as 21 other provinces are still in an inefficient condition. The province with the lowest efficiency level is Papua with a value of 0.7836, followed by West Papua (0.8410) and East Nusa Tenggara (0.8578).

Based on efficiency rankings, provinces with the highest efficiency scores occupy the top positions, while provinces with low efficiency scores are in the larger rankings. Provinces such as DKI Jakarta and East Kalimantan rank first because they have achieved full efficiency. In contrast, Papua is ranked last with the highest level of inefficiency.

Based on the results of the analysis, most provinces are in the *Increasing Return to Scale conditions* (IRS), which is as many as 28 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

Meanwhile, there are several provinces that are in the condition of *Decreasing Return to Scale* (DRS), such as West Java and East Java, which indicates that the scale of input use is relatively large.

In addition, several provinces are in the *Constant Return to Scale* (CRS), which indicates that the input usage is already at an optimal level.

Overall, the results of the analysis show that regional financial efficiency in 2021 began to show improvement compared to the previous year. This is in line with the economic recovery process after the COVID-19 pandemic, where local governments are starting to balance health care spending and economic recovery. However, efficiency is still uneven between provinces, especially in areas with limited fiscal capacity.

Efficiency Results in 2022

The results of data processing using the Data Envelope Analysis (DEA) method with a Variable Return to Scale (VRS) approach in 2022 are presented in Table 4.17, there are 11 provinces that have achieved full efficiency, namely DKI Jakarta, East Kalimantan, Riau, Riau Islands, North Kalimantan, Gorontalo, Bangka Belitung, Bengkulu, Bali, West Sumatra, and DI Yogyakarta.

This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output.

Meanwhile, as many as 23 other provinces are still in an inefficient condition. The province with the lowest efficiency level is Papua with a value of 0.7842, followed by West Papua (0.8421) and East Nusa Tenggara (0.8590).

Based on efficiency rankings, the provinces with the highest efficiency scores occupy the top positions, namely DKI Jakarta and East Kalimantan. Meanwhile, Papua is ranked last with the highest level of inefficiency. This ranking provides a comparative overview of the efficiency performance between provinces in regional financial management.

The results of the analysis show that most provinces are in the condition of Increasing Return to Scale (IRS), namely as many as 27 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

A total of 4 provinces are in the condition of Decreasing Return to Scale (DRS), such as West Java and East Java, which indicates that the scale of input use is too large.

Meanwhile, there are 3 provinces that are in the condition of Constant Return to Scale (CRS), which shows that the use of inputs has been optimal.

In general, the results of the analysis show that regional financial efficiency in Indonesia in 2022 is still uneven. Despite the increase in the number of efficient provinces compared to the previous year, the majority of provinces are still in an inefficient condition. The inefficiency is caused by a combination of excessive use of inputs and suboptimal output achievements, especially in increasing GDP.

Efficiency Results in 2023

The results of data processing using the *Data Envelopment Analysis* (DEA) with an approach *Variable Return to Scale* (VRS) in 2023 presented in Table 4.21, there are 12 provinces that have achieved full efficiency, namely DKI Jakarta, East Java, East Kalimantan, North Kalimantan, Riau, Riau Islands, Gorontalo, Bangka Belitung, Bengkulu, Bali, West Sumatra, and DI Yogyakarta.

This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output.

Meanwhile, as many as 22 other provinces are still in an inefficient condition. The province with the lowest efficiency level is Papua with a value of 0.7860, followed by West Papua (0.8435) and East Nusa Tenggara (0.8609).

Based on efficiency rankings, the provinces with the highest efficiency scores occupy the top positions, namely DKI Jakarta, East Java, East Kalimantan, and North Kalimantan.

Meanwhile, Papua is ranked last with the highest level of inefficiency. This ranking provides a comparative overview of the efficiency performance between provinces in regional financial management.

The results of the analysis show that most provinces are in the condition of Increasing Return to Scale (IRS), which is as many as 25 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

A total of 5 provinces are in the condition of Decreasing Return to Scale (DRS), such as West Java, East Java, South Kalimantan, and North Sulawesi, which indicates that the scale of input use is too large.

Meanwhile, there are 4 provinces that are in the condition of Constant Return to Scale (CRS), which shows that the use of inputs has been optimal.

In general, the results of the analysis show that regional financial efficiency in Indonesia in 2023 has increased slightly compared to the previous year, shown by the increase in the number of efficient provinces. However, the majority of provinces are still in an inefficient condition. The inefficiency is caused by a combination of excessive use of inputs and suboptimal output achievements, especially in increasing GDP. Thus, the results of the DEA analysis in 2023 show that there is still room for improvement in regional financial management, especially in increasing the effectiveness of budget use and encouraging an increase in regional development output.

Efficiency Results in 2024

The results of data processing using the Data Envelopment Analysis (DEA) method with a Variable Return to Scale (VRS) approach in 2024 are presented in Table 4.25, there are 13 provinces that have achieved full efficiency, namely DKI Jakarta, East Kalimantan, East Java, Riau, Riau Islands, Gorontalo, Bangka Belitung, North Kalimantan, Bengkulu, Bali, West Sumatra, DI Yogyakarta, and West Nusa Tenggara. This shows that these provinces have been able to manage the budget optimally so as to produce maximum development output. Meanwhile, as many as 21 other provinces are still in an inefficient condition. The province with the lowest efficiency level is Papua with a score of 0.7886, followed by West Papua (0.8459) and East Nusa Tenggara (0.8624).

Based on efficiency rankings, the provinces with the highest efficiency scores occupy the top positions, namely DKI Jakarta and East Kalimantan. In addition, East Java also shows excellent efficiency performance with perfect efficiency values. On the other hand, Papua is ranked last with the highest level of inefficiency compared to other provinces.

The results of the analysis show that most provinces are in the condition of Increasing Return to Scale (IRS), which is as many as 25 provinces. This shows that the increase in inputs still has the potential to result in a greater increase in output.

A total of 5 provinces is in the condition of Decreasing Return to Scale (DRS), such as West Java, East Java, and DKI Jakarta, which indicates that the scale of input use is relatively large.

Meanwhile, there are 4 provinces that are in the condition of Constant Return to Scale (CRS), which shows that the use of inputs has been optimal.

In general, the results of the analysis show that regional financial efficiency in Indonesia in 2024 has increased compared to the previous year, which is shown by the increase in the number of provinces that have achieved full efficiency.

However, most provinces are still in an inefficient condition, so efforts are needed to improve budget management and improve regional development performance. Thus, the results of the DEA analysis in 2024 show that there is still room for improvement in regional financial management, especially in increasing the effectiveness of budget use and encouraging an increase in regional development output.

Analysis of the Level of Regional Financial Efficiency

Based on the results of the estimation using *the Data Envelope Analysis* (DEA) method with *the Variable Return to Scale* (VRS) approach and output orientation, it was found that the level of regional financial efficiency in Indonesia during the 2018–2024 period showed significant variation between provinces. In the perspective of DEA theory, a *Decision-Making Unit* (DMU) is said to be efficient when it is at the efficient frontier, which is when the efficiency value is equal to one. The results of the study show that several provinces have achieved this condition, which means that they are able to maximize output in the form of GDP, HDI, and labor with the level of inputs owned.

On the other hand, provinces that have an efficiency value below one indicates that the area is below the frontier line, which in Farrell's efficiency concept is defined as a condition of technical inefficiency. This condition reflects that the use of inputs in the form of education, health, road, and subsidy expenditures has not been able to produce output optimally. Thus, the results of this study confirm that regional financial efficiency is not only determined by the size of the budget, but rather by the ability of local governments to manage and allocate the budget effectively.

Differences in efficiency levels between provinces

Based on the results of the analysis during the 2018–2024 period, there are significant differences in the level of efficiency between provinces and between years. In 2022, the number of efficient provinces will be recorded at 11 provinces, while in 2024 it will increase to 13 provinces. This shows an improvement in efficiency performance in aggregate.

Some provinces show consistency in achieving efficiency, such as:

- DKI Jakarta
- East Kalimantan
- Riau
- Riau Islands

This consistency shows that the region has a relatively stable managerial ability and fiscal capacity in managing the budget. Meanwhile, there are also provinces that experience fluctuations in efficiency, which indicates instability in regional financial management.

The differences in the level of efficiency between provinces found in this study show that there are variations in the performance of regional financial management in Indonesia. Provinces with high efficiency generally have greater fiscal capacity, supported by adequate infrastructure

and better-quality human resources. This condition allows the area to optimize the use of inputs in producing development outputs.

On the other hand, provinces with lower levels of efficiency generally face various limitations, such as difficult geographical conditions, limited infrastructure, and suboptimal institutional capacity. This shows that regional financial efficiency is not only influenced by technical factors, but also by structural factors inherent in each region. Thus, the difference in efficiency levels between provinces reflects the inequality of regional development in Indonesia, which is a challenge in the implementation of fiscal decentralization.

Analysis of Regional Financial Efficiency Trends in 2018–2024

The efficiency trend analysis was carried out to see the development of regional financial efficiency performance in Indonesia in the period 2018 to 2024 based on the results of *Data Envelopment Analysis* (DEA) processing with *the Variable Return to Scale* (VRS) approach.

In general, the results of the analysis show that regional financial efficiency in Indonesia has fluctuated, but tends to show an upward trend in recent years, especially in 2022 to 2024. The number of provinces that have achieved full efficiency (efficiency value = 1) has changed from year to year. In the initial period, the number of efficient provinces was relatively smaller, then increased gradually until it reached its peak in 2024 with 13 efficient provinces, an increase compared to 2022 which amounted to 11 provinces.

This increase shows an improvement in regional financial management, especially in optimizing the use of public spending to generate development output. However, the majority of provinces in Indonesia are still in inefficient conditions throughout the observation period. This indicates that the efficiency problem is structural and has not been completely resolved.

In terms of efficiency distribution, it can be seen that provinces that are consistently efficient are generally regions with high fiscal capacity and more advanced economic structures, such as DKI Jakarta, East Kalimantan, and several provinces in the Sumatra and Bali regions. In contrast, provinces with low efficiency levels tend to be in eastern Indonesia, such as Papua and West Papua, which face various limitations in infrastructure, quality of human resources, and economic access.

Consistency, Efficiency, and Slack Analytics

In addition to the efficiency score, the DEA analysis also showed that there was a slack that described the overuse of inputs and the lack of output achievement. The results show that most of the areas that are not yet efficient experience an excess in the use of inputs, which means that the allocated budget has not been used optimally. On the other hand, there are also conditions where the output produced is still not optimal even though the input used is relatively large.

This condition indicates that efficiency improvements can be carried out both through controlling the use of inputs and improving the quality of development outputs. In addition, the results of the Return to Scale analysis show that most regions are in a condition of increasing return to scale, which means that increased inputs still have the potential to result in a greater increase in output. Meanwhile, areas that are in a decreasing return to scale condition show that the addition of inputs no longer provides a significant increase in output, so optimization of the use of existing resources is needed.

Implications of Research Results on Goal Achievement and Hypothesis Testing

The results of the research that have been obtained show a strong relationship with the problem formulation, research objectives, and hypotheses proposed. Based on the results of Data Envelopment Analysis (DEA), this study succeeded in measuring the level of regional financial efficiency in all provinces in Indonesia during the 2018–2024 period. This finding directly answers the formulation of the first problem as well as achieving the research objectives related to the measurement of regional financial efficiency.

Furthermore, the significant difference in efficiency values between provinces shows that each region has different financial management performance. This is in line with the formulation of the second problem and the purpose of the research which aims to analyze the variation in efficiency between provinces. These differences are inseparable from the characteristics of each region, both in terms of fiscal capacity, economic conditions, and the quality of budget management. In addition, the results of the analysis also show that there are dynamics of efficiency changes during the research period, where several regions experience increase, decrease, and stability in efficiency. These findings have answered the formulation of the third problem and fulfilled the research objectives in identifying regional financial efficiency trends over time.

Furthermore, this study also succeeded in identifying areas that are consistently in efficient and inefficient conditions. This condition provides a clear picture of the pattern of regional financial performance, so that it can be used as a basis for the formulation of policies to improve efficiency. Thus, the formulation of the fourth problem and research objectives related to efficient and inefficient mapping of areas have been met.

On the other hand, the results of this study also support the hypothesis proposed, namely that the difference in the combination of regional expenditure inputs affects the level of efficiency produced. Variations in the allocation of education, health, roads, and subsidies have been shown to result in different levels of efficiency between provinces. In addition, not all input increases are followed by proportional output increases, suggesting that the effectiveness of budget use is a major factor in determining efficiency.

Thus, it can be concluded that all the results of the study are not only able to answer the formulation of the problem and achieve the research objectives, but also confirm the hypothesis that the difference in input and output management between regions results in different levels of financial efficiency.

CONCLUSION

The results of this study indicate that the level of local government financial efficiency in Indonesia during the 2018–2024 period remains highly varied among provinces. Using the Data Envelopment Analysis (DEA) approach with a Variable Return to Scale (VRS) assumption, the findings reveal that several provinces, such as DKI Jakarta, East Kalimantan, Riau, and DI Yogyakarta, consistently achieved high efficiency levels, while provinces such as Papua, West Papua, and East Nusa Tenggara tended to experience lower efficiency performance. These differences demonstrate that the effectiveness of public expenditure management is not solely

determined by the size of the budget, but also by the capability of local governments to allocate and utilize education, health, road infrastructure, and subsidy expenditures in producing optimal development outputs, including Gross Regional Domestic Product (GDP) per capita, Human Development Index (HDI), and poverty reduction. In addition, the study confirms that regional financial efficiency in Indonesia has shown a gradual improvement trend in recent years, although the majority of provinces still remain below the efficiency frontier, indicating the persistence of structural and managerial inefficiencies in regional financial governance. Based on these findings, future research is recommended to expand the analytical framework by incorporating additional variables that may influence regional financial efficiency, such as governance quality, institutional capacity, digital public services, investment realization, fiscal transparency, and environmental sustainability indicators. Further studies are also encouraged to employ comparative approaches between countries or between regional government levels to obtain broader insights into public sector efficiency under decentralized fiscal systems. In addition, future researchers may combine DEA with other quantitative approaches, such as Stochastic Frontier Analysis (SFA) or panel regression models, in order to provide deeper explanations regarding the determinants of efficiency and the causal relationships between fiscal policy and development outcomes. Longitudinal studies with longer observation periods are also important to evaluate the long-term impact of regional expenditure policies on economic growth, human development, and social welfare improvement in Indonesia.

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