



INDONESIAN TREASURY REVIEW

JURNAL PERBENDAHARAAN, KEUANGAN NEGARA DAN KEBIJAKAN PUBLIK

EFFICIENCY OR WASTE? RETHINKING INDONESIA'S MANDATORY PUBLIC SPENDING ON EDUCATION AND HEALTH

Farhan Hadianoro¹, Puji Wibowo^{2*}

¹Directorate General of Budget, Ministry of Finance, Jakarta, Indonesia

²Polytechnic of State Finance STAN, Ministry of Finance, Jakarta, Indonesia

*Corresponding author: puji.wibowo@pknstan.ac.id

ABSTRACT

Research Originality — Existing studies on public spending efficiency in the education and health sectors largely rely on aggregated measures, failing to distinguish between fundings sourced from the national budget (APBN) or regional budgets (APBD), or to account for variations in detailed expenditure composition. This study addresses these gaps by offering a disaggregated assessment of mandatory public spending across Indonesian provinces, explicitly incorporating funding source differentiation and expenditure types through the application of Data Envelopment Analysis (DEA) and the Malmquist Index.

Research Objective — This study assesses the efficiency and productivity of mandatory public spending in Indonesia's education and health sectors by distinguishing funding sources (APBN or APBD) and expenditure types across provinces.

Research Methods — This study utilizes DEA using the BCC model under Variable Returns to Scale (VRS) with an output-oriented specification. This approach is suitable in the context of mandatory public spending where budget allocations cannot be minimized and efficiency must be accomplished. In addition, the Malmquist Productivity Index is also employed to analyze productivity volatility during observed periods.

Empirical Results — The results indicate that only two provinces consistently maintain efficiency in both sectors. Health spending is found to be relatively less efficient than education spending, with considerable variation across regions. Provinces in Java record the highest efficiency levels, while those in Sulawesi, Maluku, and Papua exhibit comparatively lower efficiency. Inefficiencies are more pronounced in regional budgets (APBD), indicating governance and allocation issues at the provincial level. The Malmquist index demonstrates varying productivity trajectories between sectors, and only a few provinces achieve both high efficiency and positive productivity growth.

Implications — These findings suggest that improving the effectiveness of mandatory spending requires more stable fiscal governance and better collaboration between the central budget (APBN) and regional budgets (APBD). Aligning intergovernmental spending through performance-based budgeting could help ensure that large public allocations in education and health translate into better service outcomes. Academically, this study extends the literature on public sector efficiency by integrating DEA and the Malmquist Index within the context of mandatory spending and fiscal decentralization, providing empirical evidence on how various funding sources may shape efficiency variations among regions.

Keywords: Data Envelopment Analysis; Efficiency; Malmquist Index; Mandatory Spending; Productivity

ARTICLE INFO

Article History

Received : March 24, 2025

Revised : October 31, 2025

Accepted : December 4, 2025

Published : March 31, 2026

JEL Classification: H51, H52, H75, I18, I25

How to Cite: Hadianoro, F. & Wibowo, P. (2026). Efficiency or waste? Rethinking Indonesia's mandatory public spending on education and health. *Indonesian Treasury Review: Jurnal Perbendaharaan, Keuangan Negara dan Kebijakan Publik*, 11(1), 14–30.

<https://doi.org/10.33105/itrev.v11i1.1346>

INTRODUCTION

Education and health are globally recognized as pillars of human capital and inclusive growth (Gatti, 2020). These sectors are also central to the Sustainable Development Goals (SDGs), particularly SDG 4 on quality education and SDG 3 on health. Comparative evidence across countries indicates substantial differences in how effectively public spending is converted into measurable outcomes. Frontier-based approaches, including data envelopment analysis (DEA), are frequently used to evaluate spending efficiency, while the Malmquist productivity index is increasingly applied to capture changes in efficiency and productivity over time. Studies focusing on advanced economies reveal persistent efficiency gaps across health systems in OECD countries over multiple periods (Gavurova et al., 2021). In contrast, research on emerging and developing economies highlights considerable potential to improve outcomes without increasing expenditure, suggesting that efficiency gains remain achievable through better resource management (Grigoli & Kapsoli, 2017).

In the Indonesian context, education and health spending are shaped by constitutional mandates requiring a minimum allocation for education and health of 20 percent and 5 percent respectively. The objective of two provisions is to improve human development and ensure that these essential public services become equitable to access. Nevertheless, the fiscal allocations expansion has not consistently resulted in development indicators improvements, therefore they have not always followed the expected trajectory. Indonesia's Human Development Index (HDI) scored 72.91 in 2022, still below the expected number at national level, which is 75.54 set for 2024. At the provincial level, performance variations remain visible, partly reflecting some challenges such as weak planning processes, low budget absorption rates, and poor administrative capacity (Mardiasmo, 2009). Because of these conditions, the efficiency in providing outcomes derived from public sector budgets becomes public concerns.

Education and health have long been strategic prioritized within Indonesia's development agenda. Their important roles are reflected both in constitutional provisions and in national policy frameworks such as the National Long-Term Development Plan (2005–2025) and the National Medium-Term Development Plan (2020–2024). Budget rules further mandate these priorities by requiring a minimum allocation of 20 percent of both the national budget (APBN) and regional budgets (APBD) for education. Likewise, health spending previously followed a similar rule, 5 percent of the central budget (APBN) and 10 percent of the regional budgets (APBD), before the introduction of Law No. 17 of 2023. Even with these sizeable policies, however, service quality improvements and outcomes development have been uneven, as reflected in stagnation in HDI growth and other international education and health performance indicators.

Based on evaluations from the Audit Results Report (LHP) and the Government Work Plan (2024) indicate instances of budget misallocation, where substantial share of mandatory spending is dedicated mostly for administrative and bureaucratic expenditures rather than by activities directly linked to service delivery. When such patterns present, fiscal discretion becomes more constrained. Consequently, assessing the efficiency of mandatory spending is essential to ensure that public resources are used in a way that maximizes their social impact.

There are numerous international studies have assessed the efficiency of public spending in education and health, such as those conducted in China (Tu et al., 2018), Africa (Sikayena et al., 2022), OECD countries (Dutu & Sicari, 2020), and developed economies (Afonso & Schuknecht, 2019). Those studies provide valuable insights into how public spending performance can be assessed using frontier methods. Likewise, in Indonesia, a number of researches have also explored education spending efficiency, such as at across districts (Sajiah & Saputra, 2019; Tsani et al., 2018), in East Java (Aditama et al., 2022; Mauludhiana & Wahed, 2022; Utami et al., 2021), in the health sector at the provincial level (Sajiah & Saputra, 2019), and in Papua (Qomarayanti & Solikin, 2019). In addition, some studies have incorporated economic and social protection expenditures into efficiency analysis, such as study by Rambe (2020). However, there is a significant gap in differentiating government spending by funding source namely central government spending through APBN and regional spending through APBD or by composition of expenditure such as personnel, goods, and capital spending.

APPLICATIONS FOR PRACTICE

- Strengthen Performance-Based Budgeting (PBB) implementation so that spending on education and health is more closely linked to measurable service outcomes rather than merely fulfilling allocation requirements.
- Improve financial management practices, including audits, and capacity-building in order to minimize inefficiencies.
- Prioritize strategic investments that directly support service delivery, particularly in teacher development, healthcare facilities, and the expansion of qualified personnel in both sectors.
- Reinforce the effectiveness of fiscal decentralization by introducing performance-oriented incentives that reward efficient provinces while encouraging institutional reforms in regions with persistently low efficiency levels.

This study seeks to address these gaps by examining both efficiency and productivity trends in Indonesia's education and health spending across Indonesian provinces. This study uses data envelopment analysis (DEA) and the Malmquist Index, and incorporates funding sources and expenditure types. This method enables a more rigid assessment of resource allocation of how public resources are allocated and utilized across various layers of government. In doing so, this research aims to propose budget policy recommendations to enhance the level of mandatory spending efficiency.

From an academic perspective, the study expands the literature on public sector inefficiency by proposing a more disaggregated perspective on government spending. While prior researches have largely focused on the efficiency of education and health spending at a macro level, this study differentiates efficiency based on funding origin and types of expenditure. This approach is expected to create a brighter picture of how fiscal policy is applied across numerous government layers, leaving a critical gap in the literature.

This research is also closely related to the new public management (NPM) principle, which emphasizes efficiency, accountability, and performance-based budgeting in public sector spending. Within this scheme, efficiency evaluation is not only matter of compliance of budget allocation rules but also a way to assess whether public expenditures generate valuable improvements in service delivery. The analysis therefore contributes to discussions on fiscal decentralization, as they highlight differences in efficiency between central and regional government budgets.

Moreover, this study also contributes to efficiency measurement methodologies by employing a multi-year approach, allowing an assessment of long-term trends in productivity changes. Evidence on differences between APBN-funded and APBD-funded expenditures may help government officials refine budget allocation strategies and improve the effectiveness of spending programs. Strengthening the link between budget allocations and measurable outcomes is particularly important, especially in regions where efficiency levels remain relatively low.

In this regard, the findings of this research provide valuable insights for policymakers at both the central and regional levels. In a number of provinces, particularly Sulawesi, Maluku, and Papua regions, poor capacity in budget planning and execution appear to play a role in shaping inefficiency outcomes. Identifying inefficiencies in APBN vs. APBD-funded expenditures may lead government officials in optimizing budget allocations to ensure that public funds generate maximum benefits for societies.

One substantial implication is the need to improve budget planning mechanisms by aligning spending categories to measurable outcome indicators. The research portrays inefficiencies in regional budgets (APBD), suggesting that decentralization solely does not guarantee to lead a better efficiency. This evidence underscores the importance of enhancing local government capacity in budget execution, particularly in unlucky regions such as Sulawesi, Maluku, and Papua.

Another policy issue concerns the composition of government spending. Allocations heavily concentrated on personnel expenditure do not necessarily result in a better service delivery if they are not accompanied by suitable investment in goods and capital expenditures. To ensure that spending generates stronger impacts on education and health outcome, the balance adjustment among these expenditure categories is needed.

Furthermore, this study provides performance-based budgeting initiatives. It emphasizes the need for efficiency audits and benchmarking best practices across subnational governments. If certain regions consistently achieve better efficiency scores, their budget management strategies can be analyzed and implemented in lower-performing regions.

More broadly, the results provide ongoing discussions on sustainability of mandatory spending policy in Indonesia. With increasing demands on the state budget, ensuring the efficient use of health and education funds is paramount to sustaining long-term fiscal stability. Future government policies should integrate efficiency considerations into mandatory spending regulations to ensure that public funds translate into tangible improvements in human development. By addressing these theoretical and practical aspects, this study therefore helps ensure that mandatory spending contributes more effectively to long-term improvements in human development.

LITERATURE REVIEW

The idea of new public management (NPM) emerged during the agenda of government bureaucracy reform in several countries from the late 1970s onward. The main objective of the reform was to reduce or eliminate the gap between public sector organizations and private sector organizations in order to strengthen accountability and improve the performance of public sector entities. Under this scheme, public sector organizations started to adopt results-oriented concepts that had been implemented by private sector organizations, with the expectation of increasing effectiveness and efficiency, particularly under conditions of limited fiscal capacity (Lapueente & Van de Walle, 2020).

One of the defining features of NPM is the emphasis placed on performance measurement and the efficient use of public resources. These features drive the adoption of performance measurement and evaluation systems in the public sector (Kawasaki et al., 2019). Performance evaluation serves a number of important functions such as a tool for improving public service delivery (Agostino & Arnaboldi, 2015) and for enhancing

transparency level and accountability. This measurement provides the public with clearer insights into budget utilization. By adopting structured performance evaluations, public sector organizations can formulate long-term planning, allocate resources more effectively, and contribute value for money.

While many public sector reforms have adopted a number of best practices from private sector, measuring performance in the public sector remains particularly challenging. Private entities mainly focus on profitability, while on the other hand, public sector organizations are considered to be successful in terms of public goods and services provision for social sustainability. As a result, assessing public sector evaluation requires a multidimensional perspective (Arnaboldi et al., 2015; Manes-Rossi et al., 2020). Thus, public sector performance is often assessed based on the three pillars of public administration, namely efficiency, effectiveness, and economy. These principles consistent with efficiency measurement frameworks used in economic policy analysis. One such approach is data envelopment analysis (DEA), which measures the relative efficiency of decision-making units without taking profit-based indicators into account.

Numerous empirical studies have adopted NPM principles in analyzing the efficiency of public sector expenditures. For instance, Afonso & Schuknecht (2019) examined public sector performance efficiency across European countries and found that institutional quality is favorable in shaping fiscal effectiveness. Likewise, Narbón-Perpiñá et al. (2020) evaluated the performance of Spanish local government, revealing how financial autonomy and governance structures affect efficiency level. Research in the education sector, also suggests that decentralization can produce various results: while it may improve efficiency in some contexts, it can also lead to inefficiencies where institutional capacity remains uneven. In the health sector, Joumard Melián-González (2021) found that improved public spending without governance reforms does not necessarily result in favorable health outcomes. Therefore, these studies suggest that NPM-driven reforms need to be accompanied by strong institutional designs to achieve expected efficiency gains.

Guided by this conceptual framework, the current study evaluates whether public sector expenditure, particularly in education and health, has been effectively allocated. By adopting DEA together with the Malmquist Index, this research analyzes how fiscal resources are allocated and absorbed across various level of governments. These two approaches allow for a more systematic evaluation of public sector performance while supporting evidence-based policymaking that aligns with NPM's main objectives of accountability and performance-driven governance.

Many argue that efficiency in the public sector is measured by comparing outputs with the resources used to produce them. In other words, efficiency can be interpreted as the ability of institutions to deliver more services using the same level of inputs, or to maintain service levels while minimizing resource use (Marsondang et al., 2020). Although the magnitude of absolute efficiency maybe desirable in theory, achieving it in practice is quite hard due to operational constraints and institutional weaknesses. Consequently, most prevailing studies adopt a relative efficiency method, where organizations are evaluated in comparison with other similar organizations rather than against an idealized benchmark.

Following above ideas, DEA becomes one of the most widely used approaches for measuring public sector spending efficiency. The technique enables for the evaluation of numerous input-output relationships, making it well-suited for assessing complex government spending such as education and health sectors. Unlike traditional ratio-based efficiency models, DEA can integrate a number of types of inputs—such as budget allocations—and multiple outputs. This flexibility allows us to do a more comprehensive assessment of efficiency in several government programs (Coelli et al., 2005).

Empirical of DEA adoptions in public sector frequently reveal inefficiencies in government spending. For instance, Dutu & Sicari (2020) evaluated education and health expenditures in OECD countries and found that higher input does not always lead to better outcomes. Bureaucratic inefficiencies and fragmented administrative systems often jeopardize the effectiveness of public expenditure. Likewise, Sikayena et al. (2022) found inefficiencies in African public expenditures and linked them to governance constraints and ineffective resource allocation. These results suggest that increasing fiscal allocations alone is unlikely to improve social outcomes unless accompanied by improvements in spending efficiency.

In Indonesia, efficiency analyses of public sector have been conducted at several administrative levels. For instance, Saputra & Khoirunurrofik (2022) who analyzed education spending efficiency at the district level, reveal disparities in regional budget utilization. In health spending, Sajiah & Saputra (2019) evaluated provincial efficiency, revealing issues in resource misallocation. However, most of these studies focus primarily on aggregate spending rather than differentiating between funding sources (central APBN vs. regional APBD) and various types of expenditure, including personnel, goods, capital investments.

The present research builds upon these earlier studies by introducing a more disaggregated perspective in analyzing Indonesia's education and health spending. By using DEA and the Malmquist Index over a multi-year period, this study explores both efficiency levels and productivity changes across provinces. This approach makes it possible to identify best practices and policy interventions that can enhance fiscal performance in critical public service sectors.

This research also contributes to the ongoing debate on fiscal decentralization and governance quality in public spending. Prior studies, such as Färe et al. (2017) and Pritchett (2018), found that decentralization solely does not guarantee efficient outcomes unless accompanied by effective institutional oversight. In this regard, the purpose of this study is to empirically evaluate whether Indonesia's decentralized education and health budgets contribute to improved efficiency or instead result in performance disparities across regions.

Overall, this research proposes a comprehensive framework for assessing public sector efficiency, by integrating NPM principles, DEA methodology, and fiscal decentralization theories. Through this approach, the analysis provides essential policy recommendations for optimizing mandatory spending allocations, and subsequently it will be ensuring that public sector investments translate into more valuable social outcomes.

METHODS

Government spending analyzed in this study consists of allocations from the state budget (APBN) absorbed within each province, as well as spending finances disbursed from provincial regional budget (APBD). To investigate the efficiency of these expenditures, the study employs DEA. In addition, productivity changes over time are analyzed using the Malmquist index (MQI) which enables the study to assess performance dynamics over multiple periods.

This study employs secondary data which is obtained from official government sources, including statistical publications from the Central Bureau of Statistics (BPS), financial reports published by the Ministry of Finance, and provincial budget reports. The dataset covers annual expenditure records and education and health performance indicators over the 2018 – 2022 period. The study adopts a saturated sampling method, using all 34 provinces in Indonesia as the sample to ensure comprehensive coverage of regional variations in government spending efficiency. This method ensures that regional disparities in spending efficiency can be observed comprehensively, as each province plays a direct role in managing public budgets and performing education and health services.

In applying the DEA method, this research adopts the Banker Charnes and Cooper (BCC) model with an output orientation. The BCC model is chosen over the Charles Cooper and Rhodes (CCR) model as it allows for Variable Returns to Scale (VRS). Under this assumption, production relationships across Decision-Making Units (DMUs) are not restricted to constant returns, thereby accommodating situations where returns may decrease, increase, or remain unchanged across provinces (Ramanathan, 2003).

An output-oriented design is adopted to align with Indonesia's performance-based budgeting (PBB) framework, as stipulated in the Ministry of Finance Regulation Number 62 of 2023, which governs budget planning, implementation, and financial reporting. Within the PBB framework, emphasis is placed on achieving measurable outputs rather than focusing solely on the volume of funds spent. Because education and health represent mandatory spending categories, decreasing inputs is generally not feasible. Consequently, evaluating how effectively government spending translates into improved service delivery becomes a more appropriate measure of efficiency. In this context, increasing education and health outputs relative to available fiscal resources reflects improvements in public sector performance and human development outcomes.

Efficiency analysis is conducted by comparing input variables (government spending) with output variables (education and health outcomes). Government spending is categorized into APBN-funded and APBD-funded expenditures and further categorized including personnel, goods, and capital expenditures. The output variables consistent with key target indicators in the 2020-2024 National Medium-Term Development Plan (RPJMN) and contribute to the Human Development Index (HDI). Table 1 shows the input and output variables in both the education and health sectors.

Table 1 Input and Output Variables

Sector	Input Variable	Output Variable
Education	Central Government Personnel Expenditure in the Education Sector per Capita	Average years of schooling Expected years of schooling School enrollment ratio
	Central Government Goods Expenditure in the Education Sector per Capita	
	Central Government Capital Expenditure in the Education Sector per Capita	
	Provincial Government Personnel Expenditure in the Education Sector per Capita	
	Provincial Government Goods Expenditure in the Education Sector per Capita	
	Provincial Government Capital Expenditure in the Education Sector per Capita	
Health	Central Government Personnel Expenditure in the Health Sector per Capita	Life expectancy
	Central Government Goods Expenditure in the Health Sector per Capita	
	Central Government Capital Expenditure in the Education Health ion Sector per Capita	
	Provincial Government Personnel Expenditure in the Health Sector per Capita	
	Provincial Government Goods Expenditure in the Health Sector per Capita	
	Provincial Government Capital Expenditure in the Health Sector per Capita	

Source: Processed by the authors

The data was collected from 34 provinces between 2018 and 2022 and used to assess both efficiency and productivity in education and health expenditures. Efficiency levels are estimated using DEA. In this framework, provinces that achieve a score of 1 are considered efficient, indicating that available resources are utilized optimally relative to other provinces. Scores that fall within the interval $0 \leq \text{score} < 1$ suggest that a province is operating below the efficiency frontier and therefore has the potential to improve resource utilization. Subsequently, a slack analysis is conducted to identify specific areas where adjustments in spending could improve efficiency levels. This is carried out to further evaluate possible improvements.

Meanwhile, productivity variations are evaluated using the Malmquist productivity index, which measures total factor productivity change (TFPCH) over time. Within this approach, a TFPCH value greater than 1 represents productivity improvement, whereas a value below 1 indicates a decline in productivity. A value equal to 1 suggests that productivity remains relatively stable during the observed period. To provide a brighter picture of regional performance, provinces are subsequently categorised into four quadrants according to their relative efficiency and productivity levels compared with the national average. This classification helps us to illustrate performance variations across provinces.

Although DEA and the Malmquist index are useful analytical tools for evaluating public sector performance, there are several shortcomings related to data and measurement should be noticed. One concern relates to the availability and quality of regional data. Differences in data collection practices and reporting standards across provinces sometimes lead to inconsistencies in the dataset. In some cases, variations in administrative capacity could affect the reported expenditures accuracy and outcome indicators.

A second limitation involves qualitative factors that are not directly portrayed in the analysis. Elements such as governance quality, policy implementation effectiveness, and institutional capacity may play important roles in creating the outcomes of public spending but cannot be fully calculated within the current quantitative framework. Furthermore, external socioeconomic conditions may also affect efficiency results. Differences in regional economic structure, population distribution, and infrastructure availability may influence service delivery outcomes independently of fiscal allocation decisions.

This research seeks to provide evidence that can support budget management improvements within Indonesia's education and health sectors by adopting a disaggregated perspective on public expenditure. The analysis is expected to provide policymakers with efficiency gaps identification across provinces and develop strategies to enhance service delivery while operating within existing fiscal regimes.

RESULT AND DISCUSSION

The input and output variables for the education and health sectors were evaluated using DEA to identify the relative efficiency of each province. Within this design, provinces that obtained an efficiency score of 100 percent were classified as efficient, reflecting that they operate on the efficiency frontier. By contrast, provinces with scores below 100 percent were classified into inefficient regions, indicating that their resource utilization could still be improved. Detailed results of the efficiency evaluation for the education sector during the 2018–2022 period is reported in Appendix 1, while the corresponding outcomes for the health sector are presented in Appendix 2.

The results indicate that efficiency levels varied across subnational governments for the observed period. Overall, the education sector seems to be more favorable than the health sector in terms of efficiency scores when averaged across years. Variations in efficiency can also be examined from year to year, reflecting differences in regional performance in managing public spending. A summary of the average efficiency scores for each sector by year is presented in Table 2.

Table 2 Efficiency Scores Average

Year	Education Sector (%)	Health Sector (%)
2018	97.96	95.13
2019	97.25	95.94
2020	97.85	96.32
2021	97.62	95.63
2022	97.97	95.66
Mean	97.73	95.66

Source: Processed by the authors

Table 3 Efficiency Scores by Region

Region	Education Sector (%)	Health Sector (%)
Sumatera	98.37	96.33
Jawa	99.95	99.47
Bali Nusa Tenggara	99.36	94.59
Kalimantan	96.75	97.45
Sulawesi	94.59	93.59
Maluku dan Papua	97.53	89.95

Source: Processed by the authors

A further analysis was conducted by classifying provinces into six major regions based on their island location, namely Sumatra, Java, Bali–Nusa Tenggara, Kalimantan, Sulawesi, and Maluku–Papua. By using the average efficiency scores for the 2018–2022 period, the results indicate that Javanese Provinces consistently recorded the highest efficiency levels in both the education and health sectors. Despite this performance, notable disparities remain across regions. The findings suggest that the distribution of efficiency still varies, with a number of regions performing considerably below the national average. A summary of the regional average efficiency scores for the 2018–2022 period is displayed in Table 3.

During the 2018–2022 period, efficiency in the education sector was not uniformly achieved across provinces. Only four provinces, including Riau Islands, DKI Jakarta, Central Java, and DI Yogyakarta, consistently recorded efficiency scores throughout the five-year period. This sustained performance suggests that these provinces have relatively stronger capabilities in translating education spending into measurable outcomes. Meanwhile, in the health sector, there were only 3 provinces that remained efficient for five consecutive years. These provinces are Central Java Province, West Java Province, and DI Yogyakarta Province. On the other hand, West Sulawesi Province had the lowest average efficiency scores in both education (91.92%) and health sectors (88.49%). Only Central Java Province and DI Yogyakarta Province were considered efficient in both education and health sectors for five consecutive years, positioning them benchmarks for other provinces to improve their efficiency scores. Provinces with higher health efficiency should perform higher or faster-improving life expectancy (LE). The observed LE declined during COVID-19 was consistent with LE slowdowns where routine services suffered larger backlogs (such as maternal/child care, immunizations, NCD control)

An increase in TFP education score was consistent with rises in mean years of schooling (MYS) and expected years of schooling (EYS). Provinces in Quadrant I (above-average efficiency and TFP) are expected to post faster improvements in MYS/EYS. Because HDI aggregates LE, MYS/EYS, and income, cross-sector efficiency contributes to HDI mainly through the LE and education channels. In other words, efficient spending leads to better sector output and eventually contributes to higher HDI. From 2018–2022, education capital expenditure showed the largest improvement gap, while in health, personnel expenditure dominated. Table 4 presents average slack values for observed variables.

Table 4 Slack by Variable

Variable	Education Sector (%)	Health Sector (%)
Central Government Personnel Expenditure	-4.10%	-10.49%
Central Government Goods Expenditure	-2.58%	-11.58%
Central Government Capital Expenditure	-8.54%	-14.97%
Provincial Government Personnel Expenditure	-6.01%	-47.20%
Provincial Government Goods Expenditure	-7.72%	-33.33%
Provincial Government Capital Expenditure	-14.79%	-38.61%

Source: Processed by the authors

The findings represent persistent variations in efficiency across Indonesian regions. Provinces located on Java Island generally demonstrate stronger performance compared with other areas, particularly those in Sulawesi, Maluku, and Papua. From the NPM framework perspective, decentralization and performance-oriented governance are expected to tackle inefficiencies by allowing regional governments to adapt spending decisions to local conditions. In practice, however, the results suggest that regional disparities remain present despite Indonesia's decentralized fiscal system.

The study also finds the presence of consistent efficiency gaps among provinces, with Java outperforming other regions, particularly Sulawesi, Maluku, and Papua. Under NPM framework, decentralization and performance-based management are expected to minimize inefficiencies by enabling regional governments to tailor spending decisions to their society needs. However, the findings suggest that despite the existence of fiscal decentralization in Indonesia, regional disparities in efficiency persist due to a couple of strategic issues. The first issue is institutional capacity differences. Java, as an economic hub, has relative better governance structures, administrative expertise, and financial management systems, allowing for more efficient budget utilization (Lapuenta & Van de Walle, 2020). In other cases, remote regions may face disadvantages related to weaker institutional capacity, leading to inefficiencies in spending (Sikayena et al., 2022). The second is infrastructure and access gaps. Regions in eastern Indonesia, including Maluku and Papua are facing geographical barriers, making service delivery costly and logistically challenging. While NPM principles encourages performance-based funding, such regions may need more adaptive budget allocations to offset structural limitations.

Turning to the education sector, the average total factor productivity change (TFPCH) for each province from 2018 to 2022 was 1.212. This figure reflects that, at the national level, there was an average national increase in provincial productivity in achieving development program outputs in the education sector by approximately 21.2% $((1.212-1) \times 100\%)$. This productivity improvement was mainly driven by a technological progress (TECHCH) which went up by 22.2% $((1.222-1) \times 100\%)$, while there was a decrease in

efficiency (EFFCH) by -0.8% $((0.992-1) \times 100\%)$. At the provincial level, the largest productivity increase was observed in West Sulawesi with an increase of 68.7% $((1.687-1) \times 100\%)$. On the other hand, the largest productivity decline was in North Maluku with a falling of -28.1% $((0.719-1) \times 100\%)$.

A contrasting pattern emerges in the health sector. During the same period, the average TFPCH value was 0.912, reflecting a national productivity contraction of around 8.8 percent. In this case, productivity trends were shaped by a small increase in efficiency (EFFCH) of 0.5 percent, accompanied by a decline in technological change (TECHCH) of 9.2 percent. Provincial performance also varied considerably. Riau Province recorded the strongest productivity growth, by about 93.1 percent, while Central Java experienced the most significant decline, with productivity decreasing of 39 percent.

Detailed results of the productivity analysis for both sectors are displayed in Appendix 3, while Table 5 summarizes the average productivity dynamics for the education and health sectors during the study period.

Table 5 Productivity Change Average

Sector	EFFCH	TECHCH	TFPCH
Education	0.992	1.222	1.212
Health	1.005	0.908	0.912

Source: Processed by the authors

The findings reflect there is a contrast productivity patterns between the education and health sectors, suggesting that the efficiency determinants with respect to mandatory spending efficiency differ substantially across these two areas. In the education sector, productivity improved during the observation period, with TFPCH reaching 1.212, even though there was a slight decline in efficiency (EFFCH = 0.992, or -0.8%). The improvement appears to be driven largely by technological progress (TECHCH = 1.222). A number of developments such as the wider adoption of digital learning platforms, improved school facilities, and the integration of information technology in the learning process likely contributed to this favorable shift. From the NPM standpoint, these developments are consistent with the growing emphasis on outcome-oriented public policies, where technological innovation plays key role in improving service delivery and enhancing the productivity of public spending (Coelli et al., 2005).

A different pattern can be observed in the health sector. Although there was a modest improvement in efficiency (EFFCH = 1.005), overall productivity declined as indicated by TFPCH score of 0.912. This result suggests that although resources may have been allocated somewhat more efficiently, the broader capacity of the health system to generate outputs appears to have slowed down during the study period. Few factors may help explain this trend. Previous study has shown that shortages of healthcare personnel and limited funding for certain public health programs can adversely influence healthcare outcomes (Dutu & Sicari, 2020). Moreover, weaknesses in service delivery systems may create situations in which financial efficiency increases while the quality or accessibility of healthcare services decreases, a situation that runs counter to the objectives of public sector reforms emphasizing improved service outcomes (Manes-Rossi et al., 2020). Governance-related constraints at the provincial level may also contribute to misalignment between health programs and the performance targets expected under NPM-inspired management systems (Arnaboldi et al., 2015). These findings indicate that improving financial efficiency solely is not sufficient. Rather, institutional capacity, workforce availability, and service delivery systems must also be enhanced to support productivity growth in the health sector.

It should be noticeable that the 2018–2022 period coincided with the COVID-19 pandemic, which significantly disrupted to healthcare systems globally. In this context, the health sector's TFPCH value of below one (around -8.8%) occurred even though efficiency increased slightly (EFFCH \approx +0.5%). The decline in productivity was largely linked to technological regression (TECHCH < 1), which fell by about 9.2 percent. Several factors may explain this shift. First, many routine health services, such as primary care, immunization programs, and the management of chronic diseases, were partially deprioritized by COVID-19-related services. Second, global dan domestic disruptions in medical supply chains and delays in elective care created service backlogs. Third, human resource constraints, including uneven staff distribution, increased workloads, and infections among health workers, turned down effective service capacity. These developments effectively shifted the provincial productivity frontier downward, meaning that productivity went up even as some improvements in operational efficiency were observed.

A different trajectory can be portrayed in the education sector productivity. The TFPCH value was above one by about +21.2%, supported largely by strong technological progress (TECHCH \approx +22.2%), although there was a slightly decline in efficiency aspect (EFFCH \approx -0.8%). This pattern indicates the rapid expansion of technology-supported learning systems, covering learning management platforms, digital educational content, and hybrid learning models that became more popular and prominent during the pandemic. Improvements in school infrastructure and digital access also appear to be favourable factors in expanding the education sector's productivity frontier. Taken together, while the education sector benefited from technology-driven productivity gains, the health sector faced disruptions that limited its ability to maintain productivity during the same period.

From the perspective of NPM, these contrasting trends underline the importance of adopting sector-specific policy responses. The education sector appears to gain considerable benefit from technological innovation and relatively coherent policy direction. Meanwhile, the health sector may require greater investments in service delivery systems and more effective performance-based resource allocation schemes. Without such adjustments, improvements in budget efficiency alone may not translate into meaningful health outcomes.

The slack analysis derived from the DEA results suggests that many provinces currently operating below the efficiency frontier still have opportunities to reach an improved performance. Inefficient provinces may achieve higher efficiency either by enhancing service outputs or by optimizing the use of existing inputs. On the input side, the results indicate discrepancies between actual expenditure levels and the required spending levels to achieve the same outputs more efficiently. By considering these gaps, provinces could move closer to the efficiency frontier while maintain current service outcomes. Therefore, government expenditure can be more efficiently absorbed. This efficiency in expenditure can be reached for expenditures from both the central government budget (APBN) and the provincial government budget (APBD). Table 6 shows the potential for improvement on the input side so that the realized expenditure can be more efficient in supporting development programs.

Table 6 Improvement Potential of Input by Funding Source

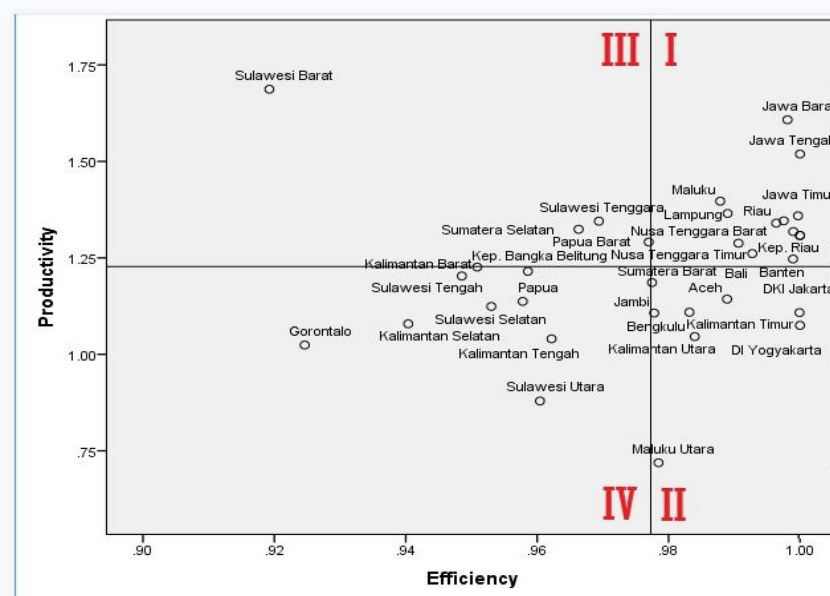
Source	Education Sector (%)	Health Sector (%)
APBN	-3.80%	-11.67%
APBD Provinces	-7.82%	-38.18%

Source: Processed by the authors

The analysis of improvement potential shows that expenditures sourced from provincial budgets (APBD) have a higher potential for efficiency improvement compared to expenditures from the national budget (APBN), both in the education and health sectors. This indicates that provincial governments play a larger role in achieving efficiency in government spending in education and health sectors.

Efficiency and productivity of each province were analyzed using quadrants. Quadrant I indicate that the province has efficiency scores and productivity improvements above the national average. Quadrant II indicates that the province has efficiency scores above average but the productivity improvements are below average. Quadrant III indicates that the province has efficiency scores below average but the productivity improvements are above average. Meanwhile, Quadrant IV shows that the province has efficiency scores and productivity changes below average. Figure 1 illustrates the mapping of provinces into these four quadrants in the education sector. Figure 2, on the other hand, depicts the quadrant mapping in the health sector.

Figure 1 Efficiency and Productivity in Education Sector



Source: Processed by the authors

Based on the quadrant analysis in the education sector, there are 13 provinces (38.24%) in Quadrant I, 8 provinces (23.53%) in Quadrant II, 4 provinces (11.76%) in Quadrant III, and 9 provinces (26.47%) in Quadrant IV. Meanwhile, in the health sector, there are 5 provinces (14.71%) in Quadrant I, 13 provinces (38.24%) in Quadrant II, 7 provinces (20.59%) in Quadrant III, and 9 provinces (26.47%) in Quadrant IV. Riau, DKI Jakarta, West Java, and Banten Provinces are in Quadrant I in both the education and health sectors. On the

other hand, South Kalimantan, Central Sulawesi, South Sulawesi, and Gorontalo Provinces are in Quadrant IV in both sectors.

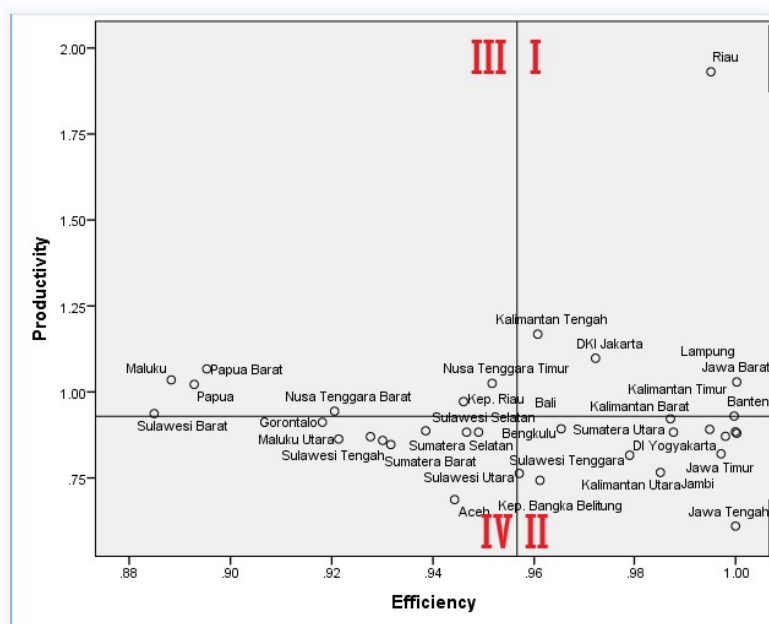
Regions grouped in Quadrant IV, which are characterized by efficiency scores and productivity levels below the national average, require essential improvements in both areas. For these provinces, strengthening the implementation of development programs and improving the management of public spending are critical steps in order to enhance their overall performance.

Meanwhile, provinces located in Quadrant III demonstrate productivity growth that exceeds the national average, although their efficiency levels remain relatively poor. For these provinces, policy efforts should focus on sustaining productivity gains while at the same time, improving the efficiency of budget utilization.

In Quadrant II, provinces demonstrate have relative excellent efficiency but record productivity growth that lags behind the national benchmark. In this case, these regions would benefit from policies aimed at increasing productivity without compromising their existing efficiency levels.

Finally, provinces classified in Quadrant I record both efficiency and productivity scores above the national average. Sustaining this level of performance is therefore becoming essential. These provinces can also serve as useful benchmarks for other regions by providing examples of effective strategies in managing government spending to support development initiatives in the education and health sectors.

Figure 2 Efficiency and Productivity in Health Sector



Source: Processed by the authors

One of important findings of this study is that expenditures financed through APBD tend to be less efficient than those funded through APBN in both the education and health sectors. From the standpoint of NPM, fiscal decentralization is generally expected to improve efficiency because regional governments are assumed to possess better knowledge of local conditions and service needs. However, the expectation has not been fully achieved in practice, suggesting to a number of governance-related challenges in regional spending.

First, one possible explanation bureaucratic inefficiencies at the regional level appear to play an important role. According to NPM principles, performance-based budgeting should integrate government expenditures to clearly defined service outcomes. In reality, many regional administrations still rely on incremental or historically based budgeting practices, where allocations are determined largely by past spending patterns rather than by performance indicators. As a result, a portion of the budget may be absorbed by administrative processes instead of directly supporting improvements in education and healthcare services.

Second, accountability schemes at the regional level remain relatively poor. NPM reforms emphasize transparency and accountability as essential elements of effective public financial management (Agostino & Arnaboldi, 2015). Nevertheless, several studies suggest that regional governments often face greater challenges in maintaining financial transparency and reporting quality, which can contribute to inefficiencies in spending (Kawasaki et al., 2019). In contrast, expenditures financed through the APBN are generally subject to tighter central oversight and monitoring systems. This stronger supervisory framework increases the likelihood that national-level spending follows performance-based criteria, whereas regional expenditures may be more vulnerable to misallocation.

As shown in Figures 1–2, the quadrant mapping points to consistent regional patterns, indicating that the observed performance differences are not simply the result of temporary fluctuations. Several provinces that

consistently have score high, such as DKI Jakarta, Central Java, DI Yogyakarta, West Java, Riau, and Banten – pair above-average efficiency with sustained (or resilient) productivity. In contrast, Provinces with a persistent low cluster – West Sulawesi, Gorontalo, Central/South Sulawesi, and several in Maluku – Papua – sits in Quadrant III-IV.

With these results are examined alongside with the slack diagnostics (Tables 4-6), two structural factors become particularly evident. First, the relative advantage observed in Java may be associated with bureaucratic and managerial capacity, including tighter budget execution and PBB routines and dense service infrastructure and market access (shorter referral chains; lower logistics frictions). In addition, the region benefits from denser service infrastructure and better market access, which reduce logistical barriers and shorten service delivery chains.

Second, the weaker performance observed in Papua/Maluku appears to be closely related to structural limitations. These include geographical challenges and scale disadvantages—such as dispersed populations and high transportation costs—along with human resource drawbacks, particularly the uneven distribution of teachers and healthcare personnel. Integrated with relatively weaker fiscal management and accountability designs, these conditions enhance the level of inputs required to achieve desirable service outputs.

From a policy perspective, provinces classified in Quadrant I should serve as benchmarks for other regions, while those in Quadrant II require technology and innovation bundles to enhance their performance and push the frontiers outward. On the other hand, Quadrant III requires operational discipline by cutting APBD slack and standardizing delivery pathway. Meanwhile, Quadrant IV warrants intensive assistance plus performance-based conditional grants tied to measurable slack-reduction plans. These inferences consistent with our core findings that APBD-financed items carry the largest efficiency gaps, implying reforms should prioritize subnational expenditure reviews, capacity building, and incentive-compatible transfers to offset structural disadvantages while tightening accountability.

Another issue arising from the analysis concerns fragmentation in regional policy implementation. Although Javanese Provinces generally demonstrate better efficiency level, several regions outside Java continue to suffer inefficiencies that appear to be associated with fragmented policy implementation. Within the NPM framework, performance-based management requires clear alignment between national policy objectives and regional implementation designs. The relatively lower efficiency observed in APBD-funded expenditures indicates that regional policy priorities may not always be coherent with national development strategies. Thus, public resources may not be allocated in ways that maximize their potential impact on education and health outcomes.

These findings underscore the importance of strengthening public spending efficiency through NPM Principles-based reforms. These reforms emphasize performance-based budgeting, stronger governance mechanisms, targeted investment strategies, and improvements in fiscal decentralization frameworks. The NPM approach encourages governments to shift from input-oriented financial management toward outcome-oriented resource allocation. This method ensures that public spending contribute directly to improved service delivery (Lapiente & Van de Walle, 2020).

The lower efficiency evaluated in expenditures finance through APBD reflects that the performance-based budgeting (PBB) implementation has not yet been fully embedded in various provinces. Established literatures suggest that PBB can improve fiscal efficiency by ensuring budget allocations are closely related to measurable outputs and outcomes (Agostino & Arnaboldi, 2015). In light of this, enhancing fiscal accountability therefore becomes an essential policy priority. One possible step is to require lower-level governments to report APBD expenditures using performance-based indicators that clearly link budget allocations to service delivery outcomes in those two fundamental sectors. Furthermore, incentive designs could be introduced to promote more efficient budget allocation. For instance, provinces that consistently demonstrate efficient spending could be rewarded by additional fiscal support. This policy therefore created incentives for provincial governments to present resource allocation improvement and more focus on service delivery outcomes (Dutu & Sicari, 2020).

Efficiency variations across provinces also indicates differences in governance capacity, which shape how effectively subnational governments manage public funds (Afonso & Schuknecht, 2019). From the NPM standpoint, administrative capacity improvement at the regional level becomes crucial. Some efforts to build capacity targeting regional financial management officers could enhance the quality of budget planning and the effectiveness of budget execution (Kawasaki et al., 2019). Another supplement initiative involves the use of benchmarking mechanisms, whereby unlucky regions in terms of efficiency levels adopt best practices from higher-performing provinces such as those in Java. Such policy learning can help standardize financial management practices and improve the performance of public sector entities as a whole (Sikayena et al., 2022). Simultaneously, stronger audit and evaluations remain essential to prevent budget misallocation and ensure that public resources are directed toward programs that promote education and health services improvement (Manes-Rossi et al., 2020).

The study also suggests that diverging productivity figures between the education and health sectors, confirming that policy interventions should be adapted to the specific characteristics of each sector (Coelli et

al., 2005). In the education sector, continued investment in technology-based learning systems alongside with teacher quality enhancement may help maintain the productivity gains observed during the study period (Tu et al., 2018). On the other hand, combating the decline in health-sector productivity calls for greater attention to service delivery capacity. A number of actions include improving hospital infrastructure, addressing shortages of healthcare personnel, and expanding community-based healthcare programs may help restore productivity growth (Dutu & Sicari, 2020). Aligning these investments with performance-oriented governance principles would create a greater opportunity that higher spending translates into improved service outcomes (Arnaboldi et al., 2015).

The findings further indicate that fiscal decentralization solely does not automatically result in an improved efficiency (Rambe, 2020). To enhance the performance of decentralized fiscal systems, policymakers could consider proposing a tiered funding scheme. Within this approach, provinces with higher efficiency levels could receive additional financial support, while provinces with persistently low efficiency would be required to adopt governance reforms or targeted improvement programs (Sikayena et al., 2022). Another policy option involves requiring periodic efficiency assessments before approving new APBD allocations. Such assessments could help ensure that spending decisions are guided by performance considerations rather than purely political or administrative considerations (Afonso & Schuknecht, 2019). These reforms, therefore in a longer time horizon, could create stronger fiscal discipline and better management of regional public finances (Lapuente & Van de Walle, 2020).

The implementation of these reforms has potential to optimize public spending in Indonesia, especially in the education and health sectors. These initiatives ensure that fiscal resources promote more effectively to service delivery and long-term human capital development. Within this design, the application of NPM principles reinforces the importance of performance-oriented budgeting, accountability, and efficiency in public financial management. This study provides several issues, such as regional disparities, differences in efficiency between APBN and APBD spending, and sectoral productivity challenges. These issues can be managed through targeted governance reforms (Dutu & Sicari, 2020). Strengthening performance-based budgeting, enhancing institutional capacity, and refining fiscal decentralization arrangements may therefore induce the effectiveness of government expenditure to support education and health outcomes.

To tackle the decrease in total factor productivity (TFP) in the health sector also calls for more targeted policy measures. One approach is reallocating a budget portion of health spending from administrative functions toward impactful activities, such as frontline service delivery, particularly through strengthening primary healthcare facilities. Priority areas might include the management of non-communicable diseases, maternal and child health services, and immunization programs, alongside the expansion of community-based and home-based care services. Moreover, outcome-oriented contracts for public hospitals may also be introduced to improve service performance, such as service coverage, hypertension and diabetes control rates, and full immunization levels.

Addressing human resource limitations remains a critical reform component. Government policies such as performance-based compensation, hardship postings for underserved regions, task shifting, and continuous professional training could help improve workforce distribution and service capacity. At the same time, enhancing referral pathways, integrating telemedicine services, and improving medical supply chains may result in a more efficient service delivery. Given the presence of budget slack in many regional allocations, periodic reviews of APBD spending are favourable to minimize administrative expenditures and reallocate to more cost-effective service packages. These steps are consistent with provincial and district health agendas.

From a government technology standpoint, improving the integration of governance infrastructure may further improve public spending efficiency. Developing an integrated performance dashboard that links inputs, outputs, and outcomes—disaggregated by funding source (APBN or APBD) and expenditure category (personnel, goods, or capital)—would provide policymakers with brighter insights into budget performance. Ensuring interoperability across planning, budgeting, and reporting systems is also essential. Supplement reforms could include strengthening program classification, expanding end-to-end electronic procurement platforms, and utilizing digital monitoring and evaluation tools capable of identifying inconsistencies between inputs and outputs.

To sum up, the design of conditional intergovernmental transfer schemes could also incorporate performance-based elements. In the health sector, relevant indicators may include screening and control rates of hypertension and diabetes, immunization coverage, tuberculosis management, and hospital utilization metrics such as length of stay or bed occupancy rates. In the education sector, indicators such as transition rates between school levels, attendance rates, and proxies for learning-adjusted years of schooling could be adopted. Resource allocations may initially be determined based on regional needs, while performance improvements could be rewarded afterward. Transparency mechanisms include publishing performance results and moderate claw-back provisions for underperformance may further enhance accountability level. Linking a portion of transfers to clear plans for reducing budget slack could also encourage more efficient resource management across regions.

CONCLUSION

This study investigates the efficiency and productivity of government expenditures in the education and health sectors in Indonesia during the 2018–2022 period using DEA. The findings suggest that spending in education was more efficient (97.73%) than those disbursed in health (95.66%). Despite these relatively high scores, regional variations remain. Javanese provinces generally exhibit stronger efficiency performance. Meanwhile, numerous provinces in Sulawesi, Maluku, and Papua are relatively unlucky with lower efficiency scores. Only two regions, Central Java and DI Yogyakarta, which maintained efficiency across both sectors throughout the observation period, implying that their governance models could serve as benchmarks for other regions.

By using the Malmquist Index (MQI) to test productivity performance, it is revealed that contrasting developments between the two sectors are present. In education, total factor productivity went up by a 21.2%, mainly driven by technological progress (22.2%), even though efficiency decline slightly (-0.8%). These figures are likely associated with the expansion of digital learning initiatives, investments in educational infrastructure, and also policy adjustments. By contrast, health sector productivity went down by approximately 8.8%, largely as a result of negative technical change (-9.2%), even a slight improvement in efficiency (0.5%). Factors such as shortages of medical personnel, constraints in healthcare facilities, and governance-related challenges may have limited-service quality even as budget utilization improved.

The study also reveals that APBD present greater potential for efficiency gains compared to APBN. This finding underscores the importance of fiscal management strengthening at regional level. This study is also mapping four quadrants to provide performance variations in efficiency and productivity scores. There are high-performing provinces such as Riau, DKI Jakarta, West Java, and Banten that outperformed national averages in both efficiency and productivity. These results contribute to valuable lessons for other regions.

While there are some important insights in this study, we acknowledge that this research has shortcomings. Output variables used in this study mainly reflect long-term outcomes rather than immediate impacts. Therefore, the variables may not fully reflect short-term policy impacts. Future research should pay attention to intermediate indicators, such as teacher-student ratios, doctor availability, hospital beds, and immunization rates, to obtain a more comprehensive understanding of efficiency dynamics. Furthermore, combining DEA with econometric or regression approaches may also be favorable to identify underlying determinants of efficiency, not only institutional capacity and governance quality, but also demographic conditions.

In terms of policy contribution, the findings suggest that stronger and continuous collaboration between the APBN and APBD to avoid overlap, as well as the adoption of performance-based budgeting and evidence-based planning are substantial for policy makers. Unlucky regions with lower efficiency levels should focus on spending optimization in order to maximize outcomes, while high performers should maintain efficiency level and share best practices. By implementing NPM-oriented fiscal reforms, Indonesia can strengthen education and health efficiency, enhance its Human Development Index, and foster sustainable development.

This study also contributes to new empirical evidences into public spending efficiency by differentiating APBN and APBD absorptions across 34 provinces, focusing on the education and health sectors. While fiscal decentralization is expected to improve efficiency by linking spending to local needs, this study challenges that assumption. The empirical results suggest that provincial governments, on average, manage resources less efficiently than the central government. This finding reflects that decentralization stand alone does not guarantee to create a favorable fiscal performance.

Some reasons may help explain this outcome. The first is governance capacity variations across regions. Provinces with stronger institutions (e.g., Java) perform better, consistent with the findings of Lapuente & Van de Walle (2020). By contrast, weaker regions (e.g., Papua) is still facing fund management problems. The second is the implementation of performance-based budgeting (PBB) is not adequate. Many regions have not fully adopted PBB, echoing concerns raised by Agostino & Arnaboldi (2015) concerning inefficiencies in budget allocation without performance metrics. Third, is fragmentation and overlap in policies and programs. Decentralization has led to duplicated or uncoordinated programs, as discussed in Dutu & Sicari (2020), implying that limited intergovernmental coordination present.

The study suggests that fiscal autonomy must be supplemented by institutional strengthening, including stronger oversight and local capacity-building. In addition, it reveals sector-specific efficiency gaps. In education, spending led to a 21.2% productivity increase, likely due to investments in infrastructure and digital learning. This supports the findings of Tu et al. (2018). However, health sector productivity declined by 8.8%, despite minor efficiency gains. This mirrors the results of Coelli et al. (2005), who emphasized the need for structural health sector reforms, such as human resource and facility investments.

In conclusion, the study refines current understanding of the relationship between decentralization and public sector efficiency. Consistent with the arguments of Afonso & Schuknecht (2019), the results analyze the importance of context-specific factors in shaping efficiency outcomes. The evidence suggests that decentralization solely is insufficient to improve performance unless it is supported by effective governance

arrangements, broader adoption of performance-based budgeting, and sector-specific reform strategies adapted to regional conditions.

REFERENCES

- Aditama, W., Haryanto, T., & Wibowo, W. (2022). Efisiensi belanja pendidikan di Jawa Timur (penerapan data envelopment analysis). *Jurnal Ekonomi, Keuangan & Manajemen*, 18(2). <https://doi.org/10.30872/jinv.v18i2.11096>
- Afonso, A., & Schuknecht, L. (2019). How “big” should government be? *Econpol Working Paper*, 3(23), 1–18.
- Agostino, D., & Arnaboldi, M. (2015). The new public management in hybrid settings: New challenges for performance measures. *International Review of Public Administration*, 20(4), 353–369. <https://doi.org/10.1080/12294659.2015.1088686>
- Arnaboldi, M., Lapsley, I., & Steccolini, I. (2015). Performance Management in the Public Sector: The Ultimate Challenge. *Financial Accountability and Management*, 31(1), 1–22. <https://doi.org/10.1111/faam.12049>
- Coelli, T. J., Rao, D. S. P., O’donnell, C. J., & Battese, G. E. (2005). *An Introduction to Efficiency and Productivity Analysis*. Springer.
- Dutu, R., & Sicari, P. (2020). Public spending efficiency in the oecd: Benchmarking health care, education, and general administration. *Review of Economic Perspectives*, 20(3), 253–280. <https://doi.org/10.2478/revecp-2020-0013>
- Färe, R., Grosskopf, S., Karagiannis, G., & Dimitris, M. (2017). Data Envelopment Analysis and Its Related Linear Programming Models. *Annals of Operations Research*, 250, 37–43. <https://doi.org/10.1007/s10479-015-2042-y>
- Gatti, R. (2020). *The Human Capital Index 2020 update: human capital in the time of COVID-19*. (A Kraay (Ed.) (ed.)). World Bank Group.
- Gavurova, B., Kocisova, K., & Sopko, J. (2021). Health system efficiency in OECD countries: dynamic network DEA approach. *Health Economics Review*, 11(1), 1–25. <https://doi.org/10.1186/s13561-021-00337-9>
- Grigoli, F., & Kapsoli, J. (2017). Waste not, want not: The efficiency of health expenditure in emerging and developing economies. *Review of Development Economics*, 22(1), 384–403. <https://doi.org/10.1111/rode.12346>
- Kawasaki, B. C., Giannini, R., Lancman, S., & Sznclwar, L. I. (2019). New Public Management, Performance Measurement, and Reconfiguration of Work in the Public Sector. *Advances in Intelligent Systems and Computing*, 821, 486–493. https://doi.org/10.1007/978-3-319-96080-7_59
- Lapuente, V., & Van de Walle, S. (2020). The effects of new public management on the quality of public services. *Governance*, 33(3), 461–475. <https://doi.org/10.1111/gove.12502>
- Manes-Rossi, F., Nicolò, G., & Argento, D. (2020). Non-financial reporting formats in public sector organizations: a structured literature review. *Journal of Public Budgeting, Accounting and Financial Management*, 32(4), 639–669. <https://doi.org/10.1108/JPBAFM-03-2020-0037>
- Mardiasmo. (2009). Akuntansi Sektor Publik. *Yogyakarta: ANDI*.
- Marsondang, A., Purwanto, B., & Mulyati, H. (2020). Pengukuran Efisiensi Serta Analisis Faktor Internal dan Eksternal Bank yang Memengaruhinya. *Jurnal Manajemen Dan Organisasi*, 10(1), 48–62. <https://doi.org/10.29244/jmo.v10i1.28860>
- Mauludhiana, F., & Wahed, M. (2022). Efficiency of Government Spending in Education Sector in East Java 2015-2021. *Jurnal REP (Riset Ekonomi Pembangunan)*, 7(2). <https://doi.org/https://doi.org/10.31002/rep.v7i2.310>
- Melián-González, A. (2021). The Expenditure Rule in the Spanish Organic Law on Budgetary Stability and Financial Sustainability and its Impact on the Autonomous Communities. *Hacienda Publica Espanola*, 237(2), 57–84. <https://doi.org/10.7866/HPE-RPE.21.2.3>
- Narbón-Perpiñá, I., Arribas, I., Balaguer-Coll, M. T., & Tortosa-Ausina, E. (2020). Explaining local governments’ cost efficiency: Controllable and uncontrollable factors. *Cities*, 100(July 2019), 102665. <https://doi.org/10.1016/j.cities.2020.102665>
- Pritchett, L. (2018). Alleviating Global Poverty: Labor Mobility, Direct Assistance, and Economic Growth. *Working Paper 479, March*(March 2018), 1–28.
- Qomarayanti, F. & Solikin, A. (2019). International Conference On Public Sector Accounting (ICOPSA) 2019. *International Conference On Public Sector Accounting (ICOPSA) 2019, October*, 47. <http://pknstan.ac.id/article/icopsa-2019>
- Rambe, R. A. (2020). Inefisiensi Belanja Pemerintah Daerah di Indonesia: Pendekatan DEA dan Regresi Logit. *Indonesian Treasury Review: Jurnal Perbendaharaan, Keuangan Negara Dan Kebijakan Publik*, 5(4), 311–324. <https://doi.org/10.33105/itrev.v5i4.175>
- Sajiah, F. S., & Saputra, D. (2019). The Efficiency of Health Expenditure in Indonesia: Two-stage Network DEA Approach. *Jurnal Anggaran Dan Keuangan Negara Indonesia (AKURASI)*, 1(2), 97–113. <https://anggaran.ejournal.id/akurasi>
- Saputra, A., & Khoirunurrofik, K. (2022). Bagaimana Meningkatkan Efisiensi Belanja Daerah? Studi Kasus

- Bidang Pendidikan. *Jurnal Pajak Dan Keuangan Negara (PKN)*, 4(1S), 266–274. <https://doi.org/10.31092/jpkn.v4i1s.1910>
- Sikayena, I., Bentum-Ennin, I., Andoh, F. K., & Asravor, R. (2022). Efficiency of public spending on human capital in Africa. *Cogent Economics and Finance*, 10(1). <https://doi.org/10.1080/23322039.2022.2140905>
- Tsani, T., & Rivai Febriantono, A. (2018). The Efficiency of Government Expenditure on Vocational High School and Its Influence Towards Acces to Secondary Education in Indonesia. *Jurnal Sistem Penganggaran Sektor Publik*, 2(1), 89–111.
- Tu, B., Lin, Y. X., & Zhang, Y. M. (2018). Efficiency evaluation and influencing factors analysis of governmental expenditure on preschool education. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(6), 2533–2543. <https://doi.org/10.29333/ejmste/89775>
- Utami, B. S. A., Basya, M. M., & Anindhita, A. Y. (2021). Efisiensi Anggaran Belanja Bidang Pendidikan Kabupaten/Kota Di Jawa Timur Tahun 2018. *Equilibrium: Jurnal Ekonomi-Manajemen-Akuntansi*, 17(2), 98–104.

Appendix 1 Efficiency Score in Education Sector

Province	2018	2019	2020	2021	2022	Mean
Aceh	0,9893	0,9893	0,9912	0,9906	0,9840	0,9889
North Sumatera	1	0,9949	1	1	1	0,9990
West Sumatera	0,9694	0,9681	0,9772	0,9727	1	0,9775
Riau	0,9937	1	0,9973	1	0,9909	0,9964
Jambi	0,9775	0,9791	0,9743	0,9809	0,9773	0,9778
South Sumatera	0,9632	0,9686	0,9642	0,9676	0,9679	0,9663
Bengkulu	0,9812	0,9780	0,9914	0,9811	0,9841	0,9832
Lampung	0,9790	0,9806	0,9853	1	1	0,9890
Bangka Belitung	1	0,9600	0,9449	0,9438	0,9441	0,9586
Kep. Riau	1	1	1	1	1	1
DKI Jakarta	1	1	1	1	1	1
West Java	1	0,9905	1	1	1	0,9981
Central Java	1	1	1	1	1	1
DI Yogyakarta	1	1	1	1	1	1
East Java	1	0,9985	1	1	1	0,9997
Banten	1	1	0,9947	1	1	0,9989
Bali	0,9960	0,9909	1	0,9891	0,9877	0,9927
West Nusa Tenggara	0,9935	0,9956	0,9985	1	1	0,9975
East Nusa Tenggara	1	1	0,9866	0,9779	0,9887	0,9906
West Kalimantan	0,9513	0,9469	0,9483	0,9509	0,9570	0,9509
Central Kalimantan	0,9578	0,9563	0,9629	0,9615	0,9724	0,9622
South Kalimantan	0,9342	0,9368	0,9384	0,9440	0,9484	0,9404
East Kalimantan	1	0,9996	1	1	1	0,9999
North Kalimantan	1	0,9813	0,9849	0,9738	0,9799	0,9840
North Sulawesi	0,9595	0,9575	0,9595	0,9659	0,9598	0,9604
Central Sulawesi	0,9608	0,9448	0,9491	0,9406	0,9475	0,9485
South Sulawesi	0,9488	0,9507	0,9527	0,9557	0,9573	0,9530
Southeast Sulawesi	0,9726	0,9703	0,9702	0,9657	0,9682	0,9694
Gorontalo	0,9200	0,9223	0,9300	0,9263	0,9245	0,9246
West Sulawesi	0,9240	0,9264	0,9235	0,9101	0,9122	0,9192
Maluku	0,9773	0,9810	0,9868	1	0,9942	0,9879
North Maluku	0,9814	0,9747	0,9788	0,9756	0,9818	0,9785
West Papua	0,9769	0,9729	0,9767	0,9765	0,9820	0,9770
Papua	1	0,8493	1	0,9397	1	0,9578
Mean	0,9796	0,9725	0,9785	0,9762	0,9797	0,9773

Source: Processed by the authors

Appendix 2 Efficiency Score in Health Sector

Province	2018	2019	2020	2021	2022	Mean
Aceh	0,9449	0,9525	0,9409	0,9409	0,9421	0,9443
North Sumatera	1	1	1	0,9980	0,9394	0,9875
West Sumatera	0,9269	0,9303	0,9299	0,9368	0,9344	0,9317
Riau	0,9925	1	1	1	0,9832	0,9951
Jambi	0,9873	0,9841	0,9958	0,9868	0,9706	0,9849
South Sumatera	0,9349	0,9375	0,9385	0,9388	0,9431	0,9386
Bengkulu	0,9376	0,9476	0,9652	0,9431	0,9515	0,9490
Lampung	1	1	1	1	0,9732	0,9946
Bangka Belitung	0,9500	0,9616	0,9883	0,9542	0,9515	0,9611
Kep. Riau	0,9379	0,9432	0,9542	0,9504	0,9446	0,9460
DKI Jakarta	0,9708	0,9695	0,9711	0,9726	0,9766	0,9721
West Java	1	1	1	1	1	1
Central Java	1	1	1	1	1	1
DI Yogyakarta	1	1	1	1	1	1
East Java	1	1	1	1	0,9844	0,9969
Banten	1	1	0,9995	1	0,9979	0,9995
Bali	0,9624	0,9654	0,9641	0,9656	0,9691	0,9653
West Nusa Tenggara	0,9209	0,9224	0,9256	0,9202	0,9136	0,9206
East Nusa Tenggara	0,9079	1	1	0,9206	0,9299	0,9517
West Kalimantan	0,9702	1	1	0,9894	0,9749	0,9869
Central Kalimantan	0,9472	0,9578	0,9728	0,9695	0,9562	0,9607
South Kalimantan	0,9242	0,9382	0,9261	0,9229	0,9270	0,9277
East Kalimantan	0,9986	1	1	1	1	0,9997
North Kalimantan	1	1	1	1	0,9888	0,9978
North Sulawesi	0,9520	0,9552	0,9560	0,9619	0,9602	0,9570

Appendix 2 Efficiency Score in Health Sector (Con't)

Province	2018	2019	2020	2021	2022	Mean
Central Sulawesi	0,9213	0,9367	0,9355	0,9255	0,9312	0,9301
South Sulawesi	0,9423	0,9474	0,9456	0,9490	0,9489	0,9466
Southeast Sulawesi	0,9633	0,9823	0,9970	0,9830	0,9686	0,9789
Gorontalo	0,9085	0,9162	0,9155	0,9193	0,9312	0,9182
West Sulawesi	0,8777	0,8878	0,8860	0,8804	0,8927	0,8849
Maluku	0,8866	0,8938	0,8864	0,8855	0,8892	0,8883
North Maluku	0,9122	0,9183	0,9321	0,9216	0,9226	0,9214
West Papua	0,8809	0,8856	0,9156	0,8885	0,9060	0,8953
Papua	0,8854	0,8863	0,9057	0,8895	0,8973	0,8928
Mean	0,9513	0,9594	0,9632	0,9563	0,9529	0,9566

Source: Processed by the authors

Appendix 3 Average Productivity Change

Province	Education			Health		
	EFFCH	TECHCH	TFPCH	EFFCH	TECHCH	TFPCH
Aceh	0,989	1,156	1,143	0,760	0,905	0,687
North Sumatera	1	1,318	1,318	0,894	0,987	0,883
West Sumatera	1	1,186	1,186	1,007	0,841	0,847
Riau	1,004	1,335	1,340	1,574	1,227	1,931
Jambi	0,921	1,202	1,107	0,979	0,782	0,766
South Sumatera	1,019	1,300	1,324	0,963	0,921	0,887
Bengkulu	0,967	1,147	1,109	1,162	0,760	0,883
Lampung	1	1,365	1,365	0,923	0,966	0,891
Bangka Belitung	1	1,215	1,215	0,997	0,745	0,743
Kep. Riau	1	1,308	1,308	0,932	1,043	0,972
DKI Jakarta	1	1,308	1,308	1	1,098	1,098
West Java	1	1,608	1,608	1	1,029	1,029
Central Java	1	1,519	1,519	0,871	0,700	0,610
DI Yogyakarta	1,025	1,048	1,075	1	0,880	0,880
East Java	1	1,359	1,359	0,912	0,899	0,820
Banten	1	1,247	1,247	0,973	0,956	0,930
Bali	1	1,261	1,261	1,065	0,839	0,893
West Nusa Tenggara	1	1,346	1,346	1,110	0,850	0,944
East Nusa Tenggara	1	1,288	1,288	1	1,025	1,025
West Kalimantan	0,975	1,258	1,226	1,033	0,892	0,922
Central Kalimantan	0,907	1,146	1,040	1,110	1,052	1,168
South Kalimantan	1	1,079	1,079	1,051	0,828	0,870
East Kalimantan	0,997	1,111	1,108	1	0,884	0,884
North Kalimantan	1	1,046	1,046	1,046	0,833	0,871
North Sulawesi	0,953	0,921	0,879	0,969	0,788	0,763
Central Sulawesi	1	1,203	1,203	1,037	0,829	0,859
South Sulawesi	1	1,124	1,124	1	0,883	0,883
Southeast Sulawesi	1	1,345	1,345	1	0,816	0,816
Gorontalo	1	1,024	1,024	1	0,912	0,912
West Sulawesi	1	1,687	1,687	1	0,937	0,937
Maluku	1,020	1,369	1,397	0,993	1,043	1,035
North Maluku	0,973	0,739	0,719	1,004	0,859	0,863
West Papua	1	1,291	1,291	1	1,067	1,067
Papua	1	1,137	1,137	1	1,022	1,022
Mean	0,992	1,222	1,212	1,005	0,908	0,912

Source: Processed by the authors