AKURASI Jurnal Studi Akuntansi dan Keuangan
p-ISSN : 2720-9067
e-ISSN : 2685-1059
Program Studi Magister Akuntansi
Fakultas Ekonomi dan Bisnis
Universitas Mataram

ASSESSING FISCAL EFFICIENCY IN INDONESIAN REGIONAL GOVERNMENT FINANCIAL MANAGEMENT: A SLACK-BASED MEASURE AND MALMQUIST INDEX APPROACH

Hans Victor Sitepu[1], Israfil Munawarah[2], Natanael Waraney Gerald Massie[3]
[12]*Sekolah Tinggi Ilmu Ekonomi GICI*
[3]*University of Indonesia*
[1]Corresponding author: hans.victor.sitepu@stiegici.ac.id

ARTICLE INFORMATION

Article history:
Received: 16/03/2026
First Revision: 23/03/2026
Accepted: 18/06/2026
Available online: 30/06/2026

ABSTRAK

Studi ini mengevaluasi efisiensi fiskal pengelolaan keuangan pemerintah daerah di Indonesia selama 2013–2023 dan menyediakan bukti untuk mendukung reformasi kebijakan. Menggunakan data panel 133 kabupaten/kota di empat provinsi berpenduduk besar, studi ini menerapkan Data Envelopment Analysis (DEA) berorientasi output dengan model Slack-Based Measure (SBM) dan Indeks Malmquist untuk mengukur efisiensi fiskal statis dan dinamis. Penelitian menunjukkan Sumatera Utara mencatat efisiensi fiskal tertinggi meskipun memiliki rata-rata anggaran terkecil, sedangkan Jawa Barat memimpin frontier kinerja fiskal. Studi ini merekomendasikan penguatan kerangka regulasi pusat dan provinsi untuk meningkatkan alokasi, penyerapan, dan efisiensi fiskal daerah secara keseluruhan. Penelitian ini memperkaya literatur desentralisasi melalui bukti empiris untuk mendukung tata kelola daerah yang adaptif dan berkelanjutan.

Kata Kunci: Akuntansi Sektor Publik, Analisis Enveloping Data, Keuangan Publik, Kinerja Kabupaten/Kota, Manajemen Keuangan

ABSTRACT

This study evaluates the fiscal efficiency of regional financial management in Indonesia during 2013–2023 and provides evidence to inform policy reform. Using panel data from 133 regencies/ municipalities in four populous provinces, this study applies output-oriented Data Envelopment Analysis (DEA) with Slack-Based Measure (SBM) and Malmquist Index models to measure static and dynamic fiscal efficiency. The findings show North Sumatra as the highest fiscal efficiency despite having the smallest average budgets, while West Java leads the fiscal performance frontier. The study calls for stronger central and provincial regulatory frameworks to improve spending allocation, absorption, and overall regional fiscal efficiency. It also contributes to the decentralization literature by offering evidence-based insights for adaptive and sustainable regional governance.

Keywords: Data Envelopment Analysis, Financial Management, Public Sector Accounting, Public Finance, Regency/Municipality Performance

 DOI: https://doi.org/10.29303/akurasi.v9i1.910

1. Introduction

Indonesia is a major emerging economy and G20 member with a vast domestic market, rich resources, and strategic geopolitical position. Yet its growth over the past decade has remained comparatively modest. While Vietnam often achieved 6–8% annual growth before the pandemic, and several Southeast Asian peers also expanded faster, Indonesia generally stayed near 5% during 2014–2024. This performance appears especially restrained given the scale of infrastructure investment intended to boost connectivity, investment, and productivity.

Economic growth is a core measure of development performance because it reflects rising output, income, expenditure, and long-term welfare gains (OECD, 2023; Wu, Li, & Li, 2020). BPS data show Indonesia's growth fell from 5.56% in 2013 to 4.88% in 2015, recovered above 5% in 2016–2018, and eased to 5.02% in 2019, as shown in Figure 1. The COVID-19 shock caused a −2.07% contraction in 2020, followed by recovery to 3.70% in 2021 and 5.31% in 2022, before stabilizing near 5% in 2023–2024. This rebound was supported by coordinated fiscal expansion, regional budget interventions, and monetary easing led by Bank Indonesia (Rahmah & Abbas, 2023).

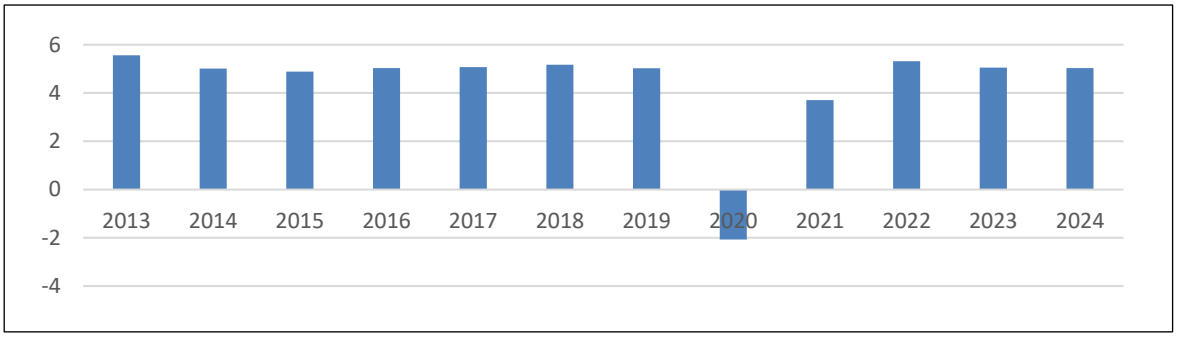

Figure 1. Indonesia's Economic Growth Rate

Java remains Indonesia's economic core, with West Java, East Java, and Central Java driving manufacturing, trade, and services, while North Sumatra anchors growth in western Indonesia. Through the State Budget, coordinated fiscal and monetary policy has supported consumption, business resilience, and macroeconomic stability. West Java illustrates this resilience clearly. Its growth eased from 6.33% in 2013 to around 5% in 2014–2015, strengthened to 5.66% in 2016, remained above 5% through 2019, then contracted by 2.52% during the 2020 pandemic. Recovery followed quickly: 3.74% in 2021, 5.45% in 2022, and near 5% in 2023–2024. The pattern shows that despite severe external shocks, West Java has sustained strong recovery capacity, supported by its diversified industrial, commercial, and service base.

East Java's growth broadly mirrors national trends. GRDP growth eased from 6.08% in 2013 to 5.44% in 2015, recovered to around 5.5% during 2016–2019, then contracted by 2.33% in 2020 during the pandemic. Recovery followed with 3.56% in 2021 and 5.34% in 2022, before moderating to about 4.9% in 2023–2024. Overall, East Java has shown steady resilience, supported by its strong base in trade, manufacturing, and agriculture amid domestic and global pressures.

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

Furthermore, Central Java Province maintained stable growth before the pandemic, with GRDP expanding between 5.11% and 5.47% during 2013–2019. Growth then fell sharply by 2.65% in 2020 as COVID-19 disrupted economic activity. Recovery followed with 3.33% in 2021 and 5.31% in 2022, before moderating to about 4.95% in 2023–2024. Overall, the province shows a clear pattern of pre-pandemic stability, pandemic contraction, strong rebound, and recent normalization of growth.

The final province worth noting is North Sumatra. This province's GRDP growth fluctuated over the decade. After 6.07% growth in 2013, it eased to around 5% during 2014–2019, contracted by 1.07% in 2020, then recovered steadily with 2.61% in 2021, 4.73% in 2022, and just above 5% in 2023–2024. Overall, the province shows moderate resilience and a sustained post-pandemic rebound.

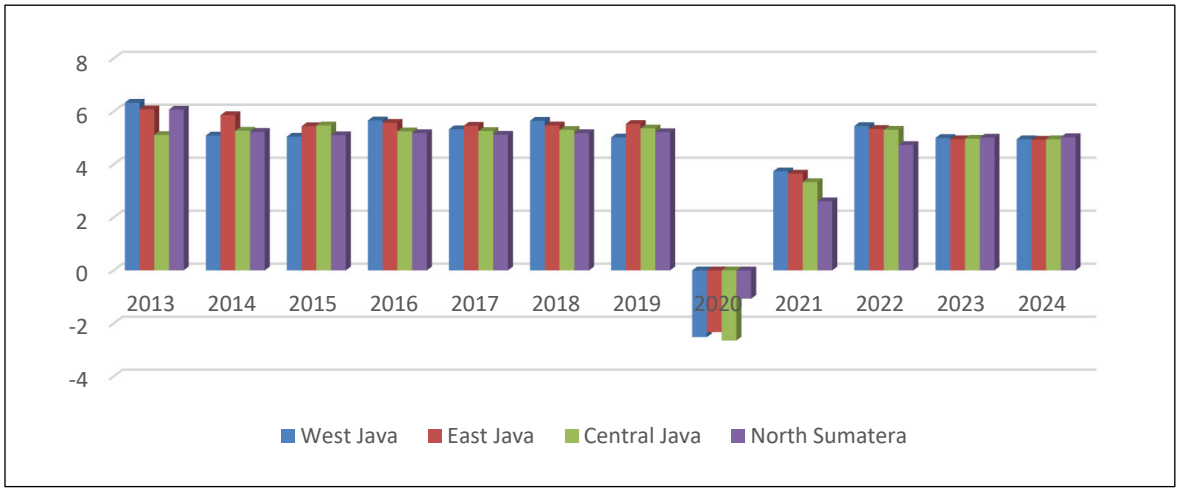

Figure 2. Economic Growth Rate in the Four Largest Provinces

Provincial GRDP trends show that regional performance strongly drives Indonesia's national economy. West Java, East Java, Central Java, and North Sumatra were stable before COVID-19, contracted in 2020, and recovered gradually after 2021, underscoring the importance of regional resilience. Fiscal efficiency in district and city financial management is therefore essential, as regional budgets finance services and stimulate growth through productive spending. When planning, budgeting, execution, oversight, and reporting are transparent, efficient, and accountable, they accelerate recovery, strengthen resilience, and improve development outcomes nationwide (Zamzami & Rakhman, 2023).

Previous studies on fiscal efficiency remain fragmented. Cheng et al. (2025) show that technological progress drives agricultural efficiency in China's Yellow River Basin, though with regional disparities. Lychev et al. (2023) analyze energy efficiency across IEA countries but exclude Indonesia. Other studies focus narrowly on single-country or provincial cases using fiscal ratios (Perugini, 2024) or Tobit models (Xue, Qu, Guo, & Hao, 2024). Overall, existing literature lacks comprehensive, multi-regional public fiscal efficiency analysis, particularly for Indonesia.

Sugiyarto et al. (2025), using DEA and the Färe–Primont index, identify strong regional disparities in Indonesia, with eastern regions such as Papua and Maluku lagging

behind Java and Sumatra. They stress the importance of cost forecasting and coordination in new districts, but do not directly measure fiscal efficiency. Aji and Letizia (2025) find only 20% of Central Java regions are efficient, driven by better planning and oversight, though their analysis covers a limited period. Other Indonesian studies also rely on simple ratios and short panels, typically spanning no more than four years, limiting broader inference (Anas, 2021; Anita & Octavianidori, 2024).

Indonesia's 2024 national leadership transition, alongside frequent subnational political changes, highlights the need to assess fiscal management effectiveness at the district and city level. This study addresses key gaps in prior research by applying Data Envelopment Analysis to measure fiscal efficiency more rigorously than simple ratio methods, using a comprehensive eleven-year panel dataset. It also fills a coverage gap by focusing on Indonesia's four most populous provinces, providing a robust and representative assessment of subnational fiscal efficiency.

The main novelty of this study lies in assessing fiscal efficiency across district and city governments in Indonesia's four most populous provinces using eleven-year panel data and Data Envelopment Analysis. It identifies policy areas requiring improvement to strengthen local contributions to economic growth. Efficient budget use is essential, as weak fiscal management limits infrastructure's impact on national development. With regional transfers reaching 30–40% of the national budget annually, rigorous evaluation is crucial to ensure accountable, effective, and development-oriented local government spending.

2. Theoretical Framework

Recent studies highlight mixed effects of governance and fiscal performance. Li et al. (2023) find leadership turnover can improve development via innovation and active policy. Zhang et al. (2023) show emissions rise with economic scale but are shaped by technology and spatial factors. Rashied et al. (2024) report efficiency and transparency gains from financial reforms, depending on institutional capacity. Afonso et al. (2024) confirm higher spending efficiency increases public trust in government.

Gu (2024) finds a bidirectional link between economic growth and official turnover in Chinese cities, indicating mutual reinforcement between leadership change and performance. Xue et al. (2024) report improved environmental outcomes with growth, though constrained by industrial and urban pressures. Quezada and Oryzazo (2024) identify persistent inefficiencies in Chile's mining municipalities, highlighting weak institutions and poor revenue management.

Efficiency has evolved beyond static cost measures to include dynamic efficiency—adaptation and innovation—and scale efficiency (Ray, 2004; Panwar, Olfati, Pant, & Snasel, 2022; Brzezicki, 2025), which assesses optimal operational size (Wanke & Azad, 2018). In the public sector, especially local government, efficiency is increasingly central due to demands for accountability and service quality (Baciu & Botezat, 2014; Anita & Octavianidori, 2024). Evidence shows it also reflects value creation, effectiveness, and social impact, not just cost reduction (Afonso, Jalles, & Venâncio, 2020; Afonso, Jalles, & Venâncio, 2023; Aminuddin & Winarningsih, 2024). Therefore, evaluating public-sector performance requires robust methods that capture institutional and contextual differences

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

to ensure meaningful and policy-relevant assessment of efficiency outcomes (Agasisti & Porcelli, 2023; Akhtar, Alam, & Ansari, 2022).

Ngonbe et al. (2024) show state fragility reduces public fiscal efficiency, stressing the need for political stability and security. Castro et al. (2025) find weak institutions, especially poor corruption control and rule of law, lower cost efficiency. Mazorodze (2025) reports cities are 17.23% cost-inefficient due to high operating and service contract costs. Overall, fiscal inefficiency reflects structural governance weaknesses, requiring stronger institutions, fiscal reform, and accountability to improve public service delivery.

Recent DEA advances enable more nuanced efficiency analysis. Ren et al. (2024) use a two-stage model to detect and reduce congestion in China's textile industry. Asgari et al. (2024) find broad TFP growth across industries, driven by technological efficiency gains. Liu et al. (2025) show environmental factors significantly reduce efficiency and create regional disparities, highlighting structural heterogeneity in performance.

DEA is widely used in public sector accounting to assess fiscal efficiency in public fund use and government performance (Worthington, 2001; Ting, Villano, & Dollery, 2018; Alinezhad, Mirtaleb, & Khalili, 2021). It supports the sector's goal of transparent (García, López, & Valenciano, 2022), accurate allocation of public resources (Ting, Dollery, & Villano, 2017; Perpiñá & Witte, 2017). Studies apply DEA to evaluate local governments, ministries, and service units, measuring how effectively fiscal inputs are transformed into public services and outcomes (Afonso, Jalles, & Venâncio, 2024).

Despite extensive literature on public fiscal efficiency, no study has comprehensively evaluated Indonesia's regional fiscal efficiency over a long-time horizon. This research addresses that gap by applying Data Envelopment Analysis to assess subnational fiscal management over the past decade and derive policy-relevant insights. Effective budget use at the local level is crucial, as fiscal inefficiency weakens infrastructure's impact on growth. Given that intergovernmental transfers account for 30–40% of the national budget annually, systematic evaluation is essential to identify weaknesses and improve accountability, transparency, and development outcomes at district, regency and city levels.

This study adopts a standard DEA framework with three inputs—Own Revenue, Transfer Revenue, and Total Assets—and three outputs: Operational, Capital, and Transfer Expenditures based on regional financial reports. This specification is widely used in fiscal efficiency analysis. Importantly, using expenditure components as outputs does not merely capture spending capacity, but also reflects the effectiveness of budget allocation and the quality of public service delivery and development implementation at the local government level. There are three significant reasons for this specification.

First, expenditures represent immediate service-delivery outputs, not merely budget absorption. Operational, capital, and transfer spending capture how governments convert fiscal resources into education, health, infrastructure, and support for local units (Lino, Apaza, & Espezua, 2025). Fiscal efficiency therefore reflects actual service provision, not merely spending execution (Indriani & Muhsyaf, 2025). Second, the model assesses how effectively fiscal capacity is translated into development-oriented spending by using own-source and transfer revenues as inputs (Bucci, Ferrara, & Resce, 2024). Regions with similar revenues but stronger infrastructure, services, and investment-related spending

appear more efficient (Lino, Apaza, & Espezua, 2025), linking fiscal efficiency directly to development performance rather than expenditure size alone. Finally, fiscal efficiency captures spending quality and governance performance through comparison across similar resource conditions (Afonso, Jalles, & Venâncio, 2020). Higher fiscal efficiency reflects better planning and execution, while lower fiscal efficiency indicates misallocation or weak implementation (Rahayu & Khoirunurrofik, 2022), making it a proxy for service quality and development effectiveness beyond accounting measures alone.

3. Research Method

This study evaluates how efficiently Indonesian district and city governments use fiscal inputs during 2013–2023, identifying whether outputs remain below optimal levels because of fiscal inefficiencies or slacks. It applies output-oriented Data Envelopment Analysis using a Slack-Based Measure (SBM), which incorporates input and output slacks for more precise fiscal efficiency estimates (Tone & Tsutsui, 2009; Alves & Meza, 2023). Unlike radial methods, SBM allows non-proportional adjustments across variables, capturing heterogeneous inefficiencies (Emrouznejad, Brzezicki, & Lu, 2025). The analysis focuses on fiscal efficiency only, using a two-stage DEA framework without external outcome variables.

This study uses audited financial reports from 133 districts and cities across West Java, Central Java, East Java, and North Sumatra. These four most populous and economically significant provinces consistently rank among Indonesia's largest regional budgets, reaching Rp 115.84 trillion in 2024, and together represent about 51.72% of the national population. The sample covers 25.88% of all local governments, ensuring strong national representation. Using a balanced 2013–2023 panel, the dataset provides reliable, consistent, and representative coverage (Settimi, Vidoli, Fusco, & Ballanti, 2014; Bucci, Ferrara, & Resce, 2022) for robust fiscal efficiency analysis and generalizable policy insights across Indonesia's subnational governments.

Studies in Malaysia (Ting, Dollery, & Villano, 2017) and Greece (Pougkakioti, 2021) typically use cost inputs and revenue outputs, reflecting corporate-style accounting. This study differs due to Indonesia's top-down budgeting system, similar to Kazakhstan (Aubakirova, et al., 2023), where spending is contingent on approved revenues and assets (Faisol, 2017). Therefore, Own Revenue, Transfer Revenue, and Total Assets are used as inputs, while Operational, Capital, and transfer expenditures serve as outputs. This specification avoids bias against high-spending regions and better reflects Indonesia's fiscal structure, ensuring more accurate and institutionally consistent fiscal efficiency measurement across districts and cities.

Fiscal efficiency in this framework depends on input–output proportionality, not expenditure size. Districts and cities are evaluated based on how effectively they transform revenues into operational, capital, and transfer spending rather than on how much they spend in absolute terms (García, López, & Valenciano, 2022). High spending alone does not guarantee higher fiscal efficiency if outputs do not rise proportionally to fiscal capacity. The DEA approach further strengthens this neutrality by benchmarking all governments against the same fiscal efficiency frontier, allowing lower-spending regions to set the standard if they achieve comparable outputs with fewer resources (Pougkakioti,

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

2021). Finally, separating expenditure types captures allocation quality. Fiscal efficiency therefore reflects spending structure and managerial effectiveness, not total budget size, ensuring it avoids systematic bias toward high-expenditure regions (Ngonbe, Tekam, & Massil, 2024).

The analysis proceeds in two stages. First, efficiency scores and slacks for 133 regencies/cities (2013–2023) are estimated using the Slack-Based Measure (Mazrou, 2021). Second, productivity change is assessed through Total Factor Productivity and the Malmquist Index using window DEA (Brzezicki, 2025). All computations are conducted in MaxDEA software (Alinezhad, Mirtaleb, & Khalili, 2021). Results are relative to the sample rather than absolute, consistent with DEA methodology (Ray, 2004).

4. Results and Discussion

This section reports panel DEA window-analysis results for 133 regencies and cities across West Java, Central Java, East Java, and North Sumatra during 2013–2023. Outputs include annual fiscal efficiency scores, technical change, technological change, and Total Factor Productivity between consecutive years. Given the dataset's scale, only the most policy-relevant findings are presented.

First-stage results show only 13 of 1,463 observations reached full technical efficiency (score = 1.0), confirming widespread fiscal inefficiency and substantial room for improvement, as shown in Table 1. Of these efficient cases, 12 were in West Java and only one—Bangkalan Regency (2014)—was in East Java, indicating stronger local fiscal management in West Java than in other sampled provinces. Returns to Scale results further show that most efficient units operated under Increasing Returns to Scale (IRS). This means expanding inputs could generate disproportionately higher outputs, suggesting significant gains remain achievable through better scale and operational expansion.

Table 1. Most Fiscally Efficient Regencies/Cities during 2013–2023

Year	Municipality/City	Fiscal Efficiency Score	RTS Constant
2013	Bandung Municipality	1	-0,080748593
2014	Bangkalan Municipality	1	0,785611711
2015	Banjar City	1	0,000000047
2016	Cimahi City	1	-1
2017	Bogor Municipality	1	0,000000054
2018	Banjar City	1	0,000000476
2020	Cirebon Municipality	1	0,000000078
2020	Depok City	1	-1
2021	Bandung Municipality	1	-0,080748593
2021	Indramayu Municipality	1	0,000000099
2022	Ciamis Municipality	1	0,000000016
2022	Kuningan Municipality	1	0,000000013
2023	Cirebon Municipality	1	0

Four fully efficient units show Decreasing Returns to Scale: Bandung (2013, 2021), Cimahi (2014), and Depok (2020). For these governments, additional inputs generate weaker output gains, implying fiscal efficiency may improve through leaner operations and tighter resource use. One unit—Cirebon (2023)—achieved Constant Returns to Scale, the optimal condition where inputs and outputs rise proportionally. Overall, technical efficiency alone does not guarantee optimal scale; scale efficiency must be assessed alongside it for a complete performance evaluation.

Table 2. Top 10 and Bottom 10 Average Fiscal Efficiency Scores at the Regency/City Level

No	Top 10 of Average Fiscal Efficiency		Bottom 10 of Average Fiscal Efficiency	
	Regency/City	Efficiency Score	Regency/City	Efficiency Score
1	Regency of Bogor	1,00	City of Batu	0,73
2	City of Surabaya	1,00	City of Pasuruan	0,74
3	Regency of West Nias	1,00	City of Magelang	0,74
4	Regency of North Nias	1,00	City of Blitar	0,75
5	Regency of North Pdg.Lawas	1,00	Regency of Kudus	0,75
6	Regency of Tasikmalaya	1,00	City of Salatiga	0,75
7	Regency of South Nias	0,99	City of Surakarta	0,75
8	Regency of Garut	0,99	City of Pekalongan	0,76
9	Regency of West Pakpak	0,98	City of Kediri	0,76
10	Regency of Kuningan	0,98	City of Malang	0,76

Aggregating results over 11 years reveals clear leaders and laggards, as presented in Table 2. Five of the Top 10 average fiscal efficiency scores are in North Sumatra, four in West Java, and one in East Java (Surabaya). By contrast, five of the Bottom 10 are in East Java and Central Java. Banjar City records the lowest mean score at 0.78. Overall, the pattern shows a strong comparative advantage in fiscal efficiency for West Java and North Sumatra relative to the other sampled provinces.

Table 3. Top 5 and Bottom 5 Average Fiscal Efficiency Scores by Province

No	Prov.	Top 5 of Average Fiscal Efficiency		Bottom 5 of Average Fiscal Efficiency	
		Regency/City	Efficiency Score	Regency/City	Efficiency Score
1	West Java	Regency of Bogor	1,00	City of Banjar	0,78
2		Regency of Tasikmalaya	1,00	City of Tasikmalaya	0,78
3		Regency of Garut	0,99	City of Cirebon	0,80
4		Regency of Kuningan	0,98	City of Cimahi	0,82
5		Regency of Karawang	0,97	Regency of Purwakarta	0,82
6	Central Java	Regency of Klaten	0,98	City of Magelang	0,74
7		Regency of Brebes	0,97	Regency of Kudus	0,75
8		Regency of Pati	0,94	City of Salatiga	0,75
9		Regency of Magelang	0,93	City of Surakarta	0,75
10		Regency of Blora	0,92	City of Pekalongan	0,76
11	East Java	City of Surabaya	1,00	City of Batu	0,73
12		Regency of Bojonegoro	0,98	City of Pasuruan	0,74
13		Regency of Sidoarjo	0,94	City of Blitar	0,75
14		Regency of Sumenep	0,93	City of Kediri	0,76

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

No	Prov.	Top 5 of Average Fiscal Efficiency		Bottom 5 of Average Fiscal Efficiency	
		Regency/City	Efficiency Score	Regency/City	Efficiency Score
15		Regency of Jember	0,93	City of Malang	0,76
16	North Sumatera	Regency of West Nias	1,00	Regency of Labuhan Batu	0,77
17		Regency of Nias	1,00	City of Pematang Siantar	0,79
18		Regency of North P.Lawas	1,00	Regency of Dairi	0,80
19		Regency of South Nias	0,99	Regency of Samosir	0,80
20		Regency of West Pakpak	0,98	Regency of Nias	0,83

Provincial rankings further clarify regional patterns. Table 3 further illustrates these regional patterns. No regency or city in the top five within any province scored below 0.90 average fiscal efficiency, while even the weakest performers remained above 0.70. Across 133 local governments over 11 years, the mean fiscal efficiency score reached 0.87 with a standard deviation of 0.07, indicating relatively strong and tightly clustered performance. Although overall fiscal efficiency is not critically low, deeper analysis is still needed to explain the structural and institutional sources of remaining differences.

Descriptive results show regencies outperform cities in fiscal efficiency. Only 14 cities reached the highest fiscal efficiency category, compared with 53 regencies. Although those cities represent 43.57% of all cities sampled, the overall pattern indicates city governments manage public budgets less efficiently than regency governments in the observed provinces.

From a provincial perspective, North Sumatra leads fiscal efficiency performance. It accounts for 22 of the top 66 local governments by average fiscal efficiency, outperforming West Java (17), East Java (15), and Central Java (12). These 22 units represent about 67% of all sampled jurisdictions in the province—the highest share among the four provinces—indicating comparatively stronger local financial management overall.

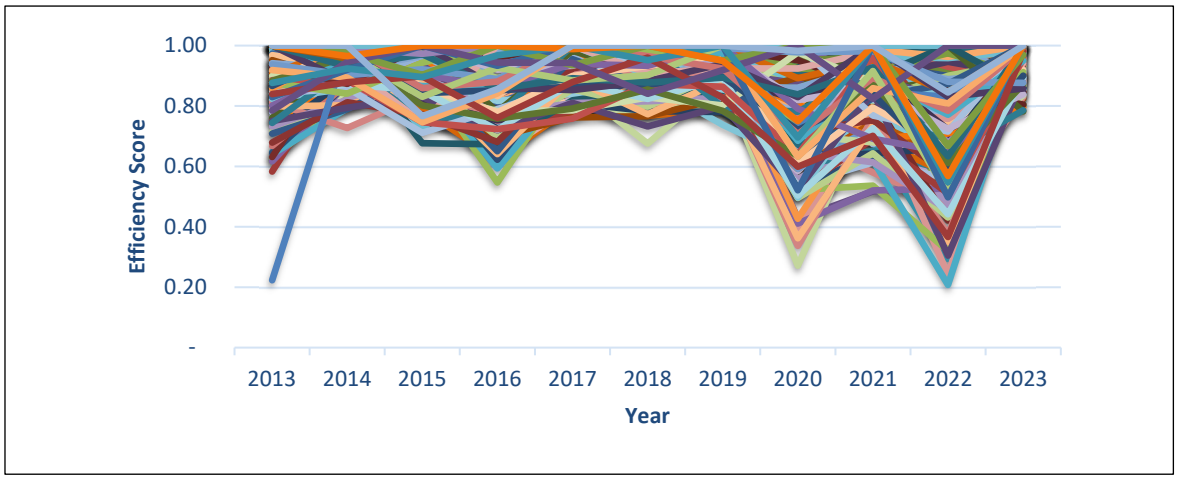

Figure 3. Comparative Fiscal Efficiency Scores for 133 Districts/Cities in Indonesia.

These results warrant closer examination. Although average fiscal efficiency across 133 regencies and cities was generally stable, Simalungun Regency emerged as a major outlier with a score of only 0.22 in 2013. Figure 3 also shows notable contractions in average fiscal efficiency during 2016, 2020, and 2022. Across many jurisdictions, budget

use weakened in those years, suggesting reduced effectiveness in resource allocation. The timing is consistent with major shocks: large-scale simultaneous local elections in 2016, the COVID-19 crisis in 2020, and early recovery adjustments in 2022. Together, the evidence indicates political transitions and external disruptions can materially affect local fiscal efficiency.

Provincial patterns show several jurisdictions consistently lead fiscal efficiency and can serve as benchmarks. In West Java, Bogor and Bandung frequently rank in the top five; in Central Java, Cilacap and Blora; in East Java, Sidoarjo and Surabaya; and in North Sumatra, South Nias and West Nias. Their repeated strong performance suggests durable managerial advantages worth replicating. By contrast, persistent bottom-five rankings indicate deeper structural or governance problems. Banjar City and Purwakarta (West Java), Demak and Boyolali (Central Java), Tuban and Mojokerto (East Java), and Nias and Pematang Siantar (North Sumatra) require closer diagnosis and targeted reform interventions.

Overall, all four provinces demonstrated average fiscal efficiency at the district/city level that generally improved over the eleven-year period. The data also show that fiscal efficiency declined most clearly in three years: 2016, 2020, and 2022, which is consistent with the preceding analysis.

Second-stage results show clear provincial differences in projected expenditure performance, as presented in Table 4. East Java records the highest average potential achievement in operational and capital expenditures, while Central Java leads in transfer expenditures. North Sumatra consistently shows the lowest projected output levels across spending categories. Because projections represent the optimal outputs achievable with existing inputs if local governments adopt frontier best practices, lower projected needs in North Sumatra align with its stronger observed fiscal efficiency. In other words, more efficient governments require smaller output adjustments to reach the frontier. The contrast across provinces underscores how managerial quality and fiscal practices shape both current fiscal efficiency and future improvement potential.

Table 4. Provincial Average Projection for Each Output Variable

Province	Average of Projection (OE)	Average of Projection (CE)	Average of Projection (TE)
West Java	386.224.995.508.178,00	98.531.839.925.536,80	60.479.951.407.372,70
Central Java	450.161.366.295.020,00	100.055.985.164.075,00	84.706.854.431.373,00
East Java	461.340.096.514.849,00	113.395.226.365.444,00	80.860.809.442.065,40
North Sumatera	164.076.726.210.075,00	44.713.358.735.250,10	26.359.773.273.887,70

Addressing these issues requires targeted regulatory reform to improve local fiscal efficiency. Policies should follow returns-to-scale findings: expand operations where increasing returns to scale are observed, and streamline or resize governments facing decreasing returns to scale. Applying this evidence-based approach across Indonesia can strengthen fiscal efficiency, effectiveness, and spending precision.

A second priority is raising average fiscal efficiency in every regency and city to at least 0.90 through focused, results-driven reforms. Provincial governments should target

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

city administrations with tailored support, oversight, and incentives, since cities consistently underperform regencies in budget management. Replicating this approach nationwide can accelerate local fiscal improvement.

The central government and provinces such as West Java, Central Java, and East Java should accelerate revenue realization, budget execution, and spending absorption to close the gap with North Sumatra's stronger fiscal efficiency. This should include studying and replicating policies from benchmark regencies and cities that consistently outperform peers. Broader reforms must also strengthen operational, capital, and transfer spending quality across all local governments. The ultimate objective is to build more productive public finance that supports faster and more inclusive national development.

The analysis reveals three core findings: moderate fiscal inefficiency with a city-regency gap, sensitivity to political and economic shocks, and wide provincial variation. This section interprets these results and outlines key limitations.

The findings advance fiscal decentralization research in three ways. First, the mean fiscal efficiency score of 0.87 suggests Indonesia's third decade of decentralization has produced governments that are functional but still improvable, supporting the view that decentralization is gradual institutional learning rather than sudden transformation (Gadenne & Singhal, 2014). Second, the stronger fiscal efficiency of smaller North Sumatran regencies is consistent with the idea that tighter budgets can strengthen fiscal discipline, though not proof of causality (Rodden, Eskeland, & Litvack, 2003; Bucci, Ferrara, & Resce, 2022). Third, the persistent city-regency gap challenges the assumption that urbanization automatically improves public finance. Administrative complexity and political pressures in cities may offset expected agglomeration advantages in fiscal management.

Fiscal efficiency's sensitivity to political transitions and external shocks has major implications for Indonesia's transfer monitoring system (Sjahrir, Kis-Katos, & Schulze, 2013). Election years can disrupt budgets, staffing, and procurement nationwide, as seen in 2016 and 2022. The 2020 pandemic further exposed how revenue shocks and operational disruptions can quickly weaken local budget execution and fiscal performance.

Within ASEAN, direct fiscal efficiency comparisons are difficult because decentralization systems differ sharply. Indonesia's 2001 "Big Bang" reform transferred unusually broad responsibilities to regencies and cities, unmatched in the region (ADB, 2016). Ting et al. (2017) report lower fiscal efficiency in Malaysia, but its local governments are appointed, manage narrower functions, and operate under tighter central control. These contrasts show that Indonesia's decentralization model is distinctive in scale and scope, so its fiscal efficiency outcomes must be judged within that institutional context.

Several limitations should be noted. First, DEA scores are deterministic estimates and do not capture statistical noise; because bootstrap confidence intervals were not applied, uncertainty cannot be formally measured (Simar & Wilson, 2007). Second, output-oriented SBM evaluates how inputs become expenditures, not whether spending creates the highest social returns. A government may appear efficient yet deliver weak development outcomes. Third, the model does not control for external factors such as geography, poverty, or population density, so management quality is partly mixed with structural

conditions. Fourth, the sample covers only four provinces. Although they represent over half of Indonesia's population, nationwide generalization should remain cautious.

The findings support targeted policy interventions, each tied to specific evidence and designed as concrete mechanisms, not generic fiscal efficiency appeals. First, adjust operational scale using Returns to Scale evidence. Larger cities facing Decreasing Returns to Scale should streamline bureaucracy, reduce overlap, and decentralize functions to kecamatan units where appropriate. Smaller regencies with Increasing Returns to Scale should pursue shared services, joint procurement, and inter-regional cooperation on capital projects. Matching institutional scale to actual operating conditions can generate substantial fiscal efficiency gains (Bucci, Ferrara, & Resce, 2022).

Second, set differentiated fiscal efficiency targets by jurisdiction type. A national benchmark of 0.90 is realistic because top-performing local governments already meet or exceed it. However, cities require tailored strategies, as they consistently underperform regencies. For cities facing Decreasing Returns to Scale, the priority is better allocative fiscal efficiency—shifting marginal spending from routine operations toward capital and transfer programs. Provincial governments should institutionalize annual DEA-based monitoring and benchmarking to track progress, identify lagging jurisdictions, and guide targeted reforms.

Third, strengthen transition protocols and counter-cyclical fiscal flexibility. The significant fiscal efficiency fluctuations observed in 2016 (simultaneous regional head elections (Priyono & Wagner, 2018; Chalil, 2018)), 2020 (COVID-19 (Anas, 2021)), and 2022 (compounded recovery and transition effects (Yenita, 2024) demonstrate that governance continuity and macroeconomic stability are the primary determinants of fiscal efficiency fluctuations. Policy responses should focus on three mechanisms: ensuring budget continuity during political transitions (Gu, 2024), allowing unspent funds to carry forward across fiscal years to avoid wasteful year-end spending, and adopting medium-term expenditure frameworks at regency and city level to improve planning quality (OECD, 2023). The central objective of fiscal management should shift from spending speed to spending quality and continuity.

Fourth, institutionalize cross-provincial benchmarking and knowledge transfer. The repeated top performance of Bogor, Bandung, Cilacap, Blora, Sidoarjo, Surabaya, South Nias, and West Nias suggests durable advantages rather than temporary success. High-performing governments should mentor weaker peers through formal peer-learning programs. However, policymakers must distinguish fiscal efficiency driven by managerial competence from fiscal efficiency driven by fiscal scarcity. Replication should therefore focus on verified practices, not headline scores alone. Special attention should be given to Surabaya, the only large city consistently near the frontier, whose governance model may offer a scalable template for other urban governments nationwide.

The fiscal efficiency model does not reward large budgets or high spending. By treating own revenue and transfers as inputs, and operational, capital, and transfer expenditures as outputs, it measures how effectively governments convert available resources into executed budget functions. Fiscal efficiency depends on the balance between resources obtained and resources used, not absolute spending size. High expenditure

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

without matching fiscal capacity or sound budget execution can still produce low scores (Lychev, Ratner, & Krivonozhko, 2023).

Likewise, the framework does not assume that higher spending automatically means higher fiscal efficiency. Expenditures are treated as immediate fiscal outputs, but they improve scores only when governments convert inputs into budget functions better than peers (Aubakirova, et al., 2023). If another region achieves similar spending outcomes with fewer revenues, it is more efficient. The model therefore captures managerial and allocative fiscal efficiency, not spending volume. Broader performance still requires separate indicators such as service quality, infrastructure, welfare, and human development outcomes.

This specification is fully consistent with the public-sector value-for-money doctrine: economy, fiscal efficiency, and effectiveness. Settimi et al. (2014) indicated that inputs capture resource acquisition through own revenues and transfers, while outputs capture how those resources are deployed across spending functions. The resulting score operationalizes the fiscal efficiency pillar by testing whether governments maximize fiscal outputs from available inputs (Indriani & Muhsyaf, 2025). It does not replace effectiveness measures but complements them by assessing financial management quality before broader development outcomes are evaluated.

5. Conclusion, Implications, and Limitations

This study assesses subnational financial management in Indonesia's four most populous provinces—West Java, Central Java, East Java, and North Sumatra—using output-oriented DEA-SBM and the Malmquist Productivity Index. Covering 133 regencies and cities during 2013–2023 (1,463 observations), the dataset spans elections, the pandemic, and a presidential transition. Because these provinces represent 51.72% of Indonesia's population, the analysis offers a substantial view of local fiscal performance. The findings show that Indonesia's largest provinces still face moderate inefficiency, suggesting broader national challenges in regional fiscal governance. Districts and cities therefore require comprehensive fiscal reforms that strengthen revenue realization and increase returns from operational, capital, and transfer spending, supported by stronger regulatory incentives and accountability. Including North Sumatra alongside three major Java provinces introduces meaningful geographic and socioeconomic heterogeneity, thereby reducing the risk of Java-centric bias. Given their substantial share of national population and fiscal capacity, the observed fiscal structures and efficiency patterns reflect important subnational dynamics across Indonesia rather than purely region-specific idiosyncrasies.

Indonesia needs targeted fiscal-governance reforms, not merely additional rules. Provincial governments should issue governor regulations (Pergub) that link transfers to fiscal efficiency, service outcomes, and reform compliance, while publishing annual rankings, mentoring weaker districts, and adapting relevant best practices from North Sumatra. They should also apply differentiated scale policies: smaller districts can use shared services and pooled procurement, while oversized governments should streamline bureaucracy. Regencies and cities should adopt regent/mayor regulations (Perbup/Perwali) requiring performance-based budgeting, measurable outputs, unit-cost standards, and

annual expenditure reviews that shift spending from low-value administration toward roads, health, and education. With annual DEA monitoring and public dashboards, all regions could more realistically move toward the 0.90 fiscal-efficiency benchmark.

The large potential output gains identified in this study reinforce the need for incentive-based reform. Provincial governments should institutionalize benchmarking, peer learning, spending standards, and integrated fiscal dashboards. Regencies and cities should strengthen performance-based budgeting, annual expenditure reviews, procurement reform, personnel management, and productive asset utilization. Implementation should rely on clear key performance indicators, annual DEA benchmarking, mentoring from frontier regions, and public transparency. The objective is not to multiply regulations but to create stronger incentives that convert existing budgets into better services and development outcomes.

This study advances three strands of literature. First, it strengthens methods in Indonesian public finance by applying DEA-SBM with Malmquist decomposition to one of the largest subnational fiscal panels assembled: 133 governments over 11 years (1,463 observations). Unlike prior studies using smaller samples or radial DEA (Faisol, 2017; Nuraini, 2022; Samadinata, Setiawan, & Kusuma, 2024; Aji & Letizia, 2025), SBM captures input-specific slack, revealing targeted sources of fiscal waste and sharper reform priorities. Second, the finding that fiscal efficiency declines during local election years adds important Indonesian evidence to the literature on political cycles and public-sector performance. While prior studies focus largely on China's centrally appointed cities, evidence from decentralized democracies has been limited (Wu, Li, & Li, 2020; Li, Zhao, Chen, & Liu, 2023; Gu, 2024). Indonesia therefore broadens understanding of how competitive political transitions shape fiscal management in developing economies. Third, the persistent city–regency efficiency gap reveals a previously undocumented pattern that challenges the assumption that urban, administratively concentrated governments manage resources better. This finding advances debates on fiscal decentralization design (Settimi, Vidoli, Fusco, & Ballanti, 2014; Bucci, Ferrara, & Resce, 2024) and suggests differentiated fiscal frameworks may be needed for urban and rural local governments in Indonesia and comparable countries worldwide today.

Several limitations qualify these findings. First, DEA benchmarks relative fiscal efficiency within a sample but cannot establish causality. Thus, election-year declines should be interpreted as correlational; without designs such as regression discontinuity or instrumental variables, political turnover effects cannot be separated from confounding influences. Second, the results depend on model specification. The three-input, three-output framework captures fiscal flows—revenue, assets, and expenditures—but excludes service outcomes such as school enrollment, health coverage, and infrastructure quality. A regency may therefore appear fiscally efficient while delivering weak development results. Third, although the sample covers provinces representing 51.72% of Indonesia's population, it remains heavily concentrated in Java, which limits generalization to outer-island regions with different capacities and endowments. Fourth, variation in BPK audit quality may introduce measurement error. Rather than undermining the study, these constraints position it as a strong descriptive foundation for future causal and outcome-based research.

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

These findings open clear paths for future research grounded in this study's strengths and limitations. First, covering all 38 provinces would test whether the city–regency gap and North Sumatra's frontier status persist under different fiscal and geographic conditions. Second, applying Simar–Wilson double-bootstrap truncated regression to DEA scores would help identify how autonomy, elections, incumbency, density, and bureaucratic capacity shape fiscal efficiency. Third, adding service outcomes such as school enrollment, immunization, and road quality as outputs would test whether fiscal efficiency translates into development performance. Fourth, staggered Pilkada timing enables difference-in-differences and event-study designs to estimate political-cycle effects causally. Fifth, ASEAN comparisons with the Philippines, Vietnam, and Thailand using harmonized DEA would reveal whether the observed patterns are uniquely Indonesian or more broadly structural across developing economies with decentralized governance systems.

Subnational fiscal efficiency is not merely an administrative score but a development-relevant indicator. Indonesia's regencies and cities average 0.87 against a frontier of 1.00, leaving a 0.13 gap that signals public resources absorbed by the fiscal system but not transformed into expenditure outputs at best-practice rates. Closing this gap depends less on new money than on using existing budgets better—an especially credible strategy amid mounting pressure on the national budget. The benchmark regencies and cities in this study show that strong fiscal management is already attainable under current intergovernmental rules. The next decade of decentralization therefore hinges not on proving that fiscal efficiency is possible, but on redesigning institutions so that high performance becomes the norm rather than an exception nationwide.

Acknowledgements

The authors sincerely thank the Ministry of Higher Education, Science, and Technology of the Government of the Republic of Indonesia for financial support under the Beginner Lecturer Research scheme of the 2025 Research Grant program. The implementation and completion of this research were made possible by this support. The authors also acknowledge the Central and Provincial Audit Boards of West Java, Central Java, East Java, and North Sumatra for providing the information required to conduct this study. The authors further thank all parties who supported and contributed to the research process. The findings are expected to advance scientific understanding and support initiatives aimed at accelerating economic development toward Golden Indonesia 2045.

Conflict of Interest Statement

We, the authors of this article, declare that there is no conflict of interest regarding the publication of this article.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The authors have explicitly identified, credited, or referenced the sources of any data or material used verbatim from another person's work. The authors have also referenced other authors' work or ideas, including their own, even

when such work or ideas are not quoted verbatim or paraphrased. Permission has been obtained for any copyrighted material used in this work, including unpublished material and any graphs or images that are not in the public domain.

Author Contributions

The specific roles and responsibilities of each author in the research process and manuscript preparation:

Hans Victor Sitepu (First Author): Research team leader, manuscript writer, and corresponding author.

Israfil Munawarah (Second Author): Data collector and manuscript co-writer.

Natanael Waraney Gerald Massie (Third Author): Data analysis and manuscript co-writer.

ORCID iDs

First Author : https://orcid.org/0000-0002-1785-7882
Second Author : https://orcid.org/0009-0008-9737-2121
Third Author : https://orcid.org/0000-0002-2007-7959

References

ADB. (2016). Achieving results through intergovernmental fiscal reforms: Looking beyond revenue sharing. Manila: Asian Development Bank.

Afonso, A., Jalles, J. T., & Venâncio, A. (2020). Government spending efficiency, measurement and applications: A cross-country efficiency dataset. EconPol Working Paper, 4(50), 1-28. doi:https://doi.org/10.2139/ssrn.3734216

Afonso, A., Jalles, J. T., & Venâncio, A. (2023). Handbook on Public Sector Efficiency (1 ed.). Massachusetts: Edward Elgar Publishing Limited. doi:https://doi.org/10.4337/9781839109164

Afonso, A., Jalles, J. T., & Venâncio, A. (2024). A tale of government spending efficiency and trust in the state. *Public Choice*, 200, 89-118. doi:https://doi.org/10.1007/s11127-024-01144-6

Agasisti, T., & Porcelli, F. (2023). Local governments' efficiency and its heterogeneity – empirical evidence from a stochastic frontier analysis of Italian municipalities 2010-2018. *Applied Economics, 55*(25), 2902-2927. doi:https://doi.org/10.1080/00036846.2022.2107988

Aji, M. R., & Letizia, E. (2025). Assessing the efficiency of Central Java's Regional budget realization using data envelopment analysis. *Equity: Jurnal Ekonomi, 13.* doi:https://doi.org/10.33019/equity.v%vi%i.434

Akhtar, S., Alam, M., & Ansari, M. S. (2022, November 24). Measuring the performance of the Indian banking industry: Data envelopment window analysis approach. benchmarking, *An International Journal, 29*(9), 2842–2857. doi:https://doi.org/10.1108/BIJ-03-2021-0115

Alinezhad, A., Mirtaleb, S. H., & Khalili, J. (2021). *Introduction and Comparison of Data Envelopment Analysis Software Packages* (1 ed.). New York: Nova Science Publishers, Inc.

Alves, C. G., & Meza, L. A. (2023). A review of network DEA models based on slacks-based measure: Evolution of literature, applications, and further research direction.

International Transactions in Operational Research, 30(6), 2729–2760. doi:https://doi.org/10.1111/itor.13284

Aminuddin, N., & Winarningsih, S. (2024). Financial performance measurement and regional financial capability levels in the era of regional autonomy. *Journal of Economics and Business UBS, 13*(1), 404-427. doi:https://doi.org/10.52644/joeb.v13i1.1416

Anas, M. (2021). Impact of pandemic COVID-19 on local government's financial performance in Indonesia. *Journal of Southwest Jiaotong University, 5*6(3), 196-206. doi:10.35741/issn.0258-2724.56.3.16

Anita, D., & Octavianidori, I. (2024). Financial ratio analysis to measure regional government financial performance (A case study of the West Java Provincial Government). *Jurnal Ekonomi, Manajemen, dan Akuntansi, 10*(3), 1790-1802. doi:https://doi.org/10.35870/jemsi.v10i3.2448

Asgari, B., Majumdar, S., & Amoah , C. (2024). Efficiency analysis of manufacturing industries in Singapore using the DEA-Malmquist productivity index. *Journal of Infrastructure, Policy and Development, 8*(10), 1-19. doi:https://doi.org/10.24294/jipd.v8i10.5746

Aubakirova, Z., Zhidkoblinova, O., Komekbayeva, L., Khishauyeva, Z., Spanova, B., & Zhaparova, R. (2023). Economic efficiency and priorities of public administration regulation: The case of Kazakhstan. *Montenegrin Journal of Economics, 19*(3), 191-200. doi:https://doi.org/10.14254/1800-5845/2023.19-3.15

Baciu, L., & Botezat, A. (2014). A comparative analysis of the public spending efficiency of the New EU member states: A DEA approach. *Emerging Markets Finance and Trade, 50*(sup4), 31-46. doi:https://doi.org/10.2753/REE1540-496X5004S402

Brzezicki, Ł. (2025). Origin and evolution of Malmquist productivity index review of the literature. *Central European Economic Journal, 12*(59), 102 - 119. doi:https://doi.org/10.2478/ceej-2025-0007

Bucci, V., Ferrara, G., & Resce, G. (2022). Fiscal decentralization and efficiency empirical evidence from Italian municipalities. *SOSE Working Paper, 1*(2), 1-24. Diambil kembali dari https://mpra.ub.uni-muenchen.de/id/eprint/111515

Bucci, V., Ferrara, G., & Resce, G. (2024). Local government spending efficiency and fiscal decentralization: Evidence from Italian municipalities. *Applied Economics, 56*(5), 599-614. doi:https://doi.org/10.1080/00036846.2023.2169241

Castro, M. F., Guccio, C., Romeo, D., & Vidoli, F. (2025). How does institutional quality affect the efficiency of local government? An assessment of Italian municipalities. *Economia Politica, 42,* 569–597. doi:https://doi.org/10.1007/s40888-025-00359-0

Chalil, T. M. (2018). Political cycles, government spending, and efficiency of Indonesia's local governments. *MPRA Paper(88082)*, 1-21. https://mpra.ub.uni-muenchen.de/88082/

Cheng, X., Bian, J., He, D., & Tang , D. (2025). An analysis of agricultural production efficiency of Yellow River Basin based on a three-stage DEA Malmquist model. *Humanities & Social Sciences Communications, 12*(1343). doi:https://doi.org/10.1057/s41599-025-05541-0

Emrouznejad, A., Brzezicki, Ł., & Lu, C. (2025). Development and evolution of slacks-based measure models in data envelopment analysis: A comprehensive review of the literature. *Journal of Economic Surveys,* 1–28. doi:https://doi.org/10.1111/joes.12682

Faisol. (2017). The analysis of local government expenditure efficiency and its impact on economic growth. *International Conference on Economics, Business, and Accounting Studies* (hal. 30-41). Jember: UPT Penerbitan Universitas Jember.

Gadenne, L., & Singhal, M. (2014). Decentralization in developing economies. *Annual Review of Economics, 6*(1), 581–604. doi:https://doi.org/10.1146/annurev-economics-080213-040833

García, J. M., López, N. R., & Valenciano, J. D. (2022). Local government efficiency: Reviewing determinants and setting new trends. *International Transactions in Operational Research, 29*(5), 2871-2898. doi:https://doi.org/10.1111/itor.13032

Gu, J. (2024). Official turnovers and economic growth: Evidence from China. R*esearch Square*, 1-18. doi:https://doi.org/10.21203/rs.3.rs-4560491/v1

Indriani, A. U., & Muhsyaf, S. A. (2025). Efficiency analysis of government expenditure in districts/cities of West Nusa Tenggara Province: A DEA approach (2021-2023). *JPEK (Jurnal Pendidikan Ekonomi dan Kewirausahaan), 9*(2), 896–907. doi:https://doi.org/10.29408/jpek.v9i2.30250

Li, X., Zhao, C., Chen, B., & Liu, Z. (2023). Political uncertainty and highquality economic development: Evidence from China. *Science Progress, 106*(2), 1-21. doi:https://doi.org/10.1177/00368504231183583

Lino, C. N., Apaza, R. R., & Espezua, M. d. (2025). Efficiency of public spending at the municipal level: Evidence for the Peruvian case 2017–2023. *Frontiers in Political Science, 7,* 1614884. doi:https://doi.org/10.3389/fpos.2025.1614884

Liu, X., Zhuang, X., Wang, Y., Li, S., & Zhang, H. (2025). Assessing the internationalization efficiency of China's higher vocational education: a DEA-Malmquist and three-stage DEA analysis. *Cogent Education, 12*(1), 1-25. doi:https://doi.org/10.1080/2331186X.2025.2478275

Lychev, A. V., Ratner, S. V., & Krivonozhko, V. E. (2023). Two-stage data envelopment analysis models with negative system outputs for the efficiency evaluation of government Financial Policies. *Mathematics, 11*(24), 4873. doi:https://doi.org/10.3390/math11244873

Mazorodze, B. T. (2025). Modelling municipal cost inefficiencies in the Frances Baard District of South Africa and their impact on service delivery. A*dministrative Sciences, 15*(6), 1-27. doi:https://doi.org/10.3390/admsci15060229

Mazrou, Y. (2021). Assessing agricultural Malmquist total factor productivity and environmental efficiency for some Arab countries via data envelope analysis (A Non Parametric approach). *Journal of Agricultural Economics and Social Sciences, 12*(4), 311-324. doi:https://doi.org/10.21608/jaess.2021.169537

Ngonbe, O. D., Tekam, J. E., & Massil, J. K. (2024). Does states fragility influence the efficiency of public spending in developing countries? *Research Square,* 1-16. doi:https://doi.org/10.21203/rs.3.rs-5485686/v1

Nuraini, I. (2022). Regency and city industrial sector efficiency in East Java Province. *MediaTrend, 17*(1), 227-235. doi:https://doi.org/10.21107/mediatrend.v17i1.9375

OECD. (2023). *Government at a Glance 2023* (1 ed.). Paris: OECD Publishing. doi:https://doi.org/10.1787/3d5c5d31-en

Panwar, A., Olfati, M., Pant, M., & Snasel, V. (2022). A Review on the 40 years of existence of data envelopment analysis models: Historic development and current trends. *Archives of Computational Methods in Engineering, 29*, 5397–5426. doi:https://doi.org/10.1007/s11831-022-09770-3

Perpiñá, I. N., & Witte, K. D. (2017). Local governments' efficiency: A systematic literature review – Part I. *International Transactions in Operational Research, 25*(2), 431-468. doi:https://doi.org/10.1111/itor.12364

Perugini, F. (2024). Local government efficiency and economic growth: The Italian case. *Socio-Economic Planning Sciences, 91,* 101775. doi:https://doi.org/10.1016/j.seps.2023.101775

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id

Pougkakioti, I. D. (2021). Measuring the efficiency and productivity change of municipalities with an output oriented model: Empirical evidence across Greek municipalities over the time period 2012-2016. *Romanian Journal of Regional Science, 15*(1), 98-125.

Priyono, S., & Wagner, N. (2018). Political budget cycles at subnational level: Evidence from the Indonesian simultaneous regional election in 2015. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning, 2*(3), 203-218. doi:https://doi.org/10.36574/jpp.v2i3.38

Quezada, C. V., & Oryazo, M. (2024). Spatiotemporal analysis of technical efficiency in the provision of local public goods: The case of Chilean mining municipalities. *Socio-Economic Planning Sciences, 96*(102075). doi:https://doi.org/10.2139/ssrn.4325970

Rahayu, W. S., & Khoirunurrofik, K. (2022). The effect of accountability on the efficiency of local government expenditures. *Jurnal Tata Kelola dan Akuntabilitas Keuangan Negara, 8*(2), 177–198. doi:https://doi.org/10.28986/jtaken.v8i2.647

Rahmah, D. S., & Abbas, Y. (2023). Political turnover and business decision: A study of Indonesian public companies. *Journal of Accounting and Investment, 24*(3), 634-653. doi:https://doi.org/10.18196/jai.v24i3.17565

Rashied, A. S., Cyhad, A. K., Qasem, W., & Abbas, N. H. (2024). The impact of financial management reforms on budget efficiency, transparency, and wastage reduction across diverse regions. *Journal of Ecohumanism, 3*(5), 743-762. doi:https://doi.org/10.62754/joe.v3i5.3935

Ray, S. C. (2004). D*ata Envelopment Analysis: Theory and Techniques for Economics and Operations Research* (1st ed.). New York: Cambridge University Press.

Ren, X. T., Song, Y.-Y., & Yang, G. (2024). Measuring the degree of congestion in two-stage DEA: A case of Chinese textile, wearing apparel, and accessories industry. *Research Square*, 1-46. doi:https://doi.org/10.21203/rs.3.rs-4133409/v1

Rodden, J. A., Eskeland, G. S., & Litvack, J. (2003). *Fiscal decentralization and the challenge of hard budget constraints.* Cambridge: The MIT Press.

Samadinata, F., Setiawan, A. B., & Kusuma, I. C. (2024). Analysis of financial performance measurement using value for money in the regional governments of Bogor, Cianjur, and Sukabumi districts in 2014-2018. *Innovative: Journal of Social Science Research, 4*(3), 5857-5874. doi:https://doi.org/10.31004/innovative.v4i3.10831

Settimi, C., Vidoli, F., Fusco, E., & Ballanti, D. (2014). Estimating technical efficiency in the Italian Municipalities. *Procedia Economics and Finance, 17*, 131–137. doi:https://doi.org/10.1016/S2212-5671(14)00887-9

Simar, L., & Wilson, P. W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. J*ournal of Econometrics, 136*(1), 31-64. doi:https://doi.org/10.1016/j.jeconom.2005.07.009

Sjahrir, B. S., Kis-Katos, K., & Schulze, G. G. (2013). Political budget cycles in Indonesia at the district level. *Economics Letters, 120*(2), 342-345. doi:https://doi.org/10.1016/j.econlet.2013.05.007

Sugiyarto, A., Lee, B. L., & Wilson, C. (2025). Narrowing the gap: Dynamics of Indonesia's public expenditure performance in economically lagging districts. *Economic Analysis and Policy, 85*, 2299-2318. doi:https://doi.org/10.1016/j.eap.2025.03.014

Ting, S. K., Dollery, B., & Villano, R. (2017). An Empirical Analysis of Administrative economic efficiency in Sabah local government: A DEA application, *International*

Journal of Service Management and Sustainability, 2(2), 74-91. doi:https://doi.org/10.24191/ijsms.v2i2.8043

Ting, S. K., Villano, R., & Dollery, B. (2018). Economies of scale in local government dervices: A meta analysis. *International Journal of Service Management and Sustainability 3*(1), 1-27. doi:https://doi.org/10.24191/ijsms.v3i1.8042

Tone, K., & Tsutsui, M. (2009). Network DEA: A slacks-based measure approach. *European Journal of, 197*(1), 243–252. doi:https://doi.org/10.1016/j.ejor.2008.05.027

Wanke, P., & Azad, M. A. (2018). Efficiency in Asian railways: A comparison between data envelopment analysis approaches. *Transportation Planning and Technology, 41*(6), 573-599. doi:https://doi.org/10.1080/03081060.2018.1488928

Worthington, A. (2001). The empirical measure of local government efficiency. The Political Economy of Local Government (hal. 71-113). United Kingdom: Cheltenham.

Wu, J., Li, H., & Li, K. (2020). Local political chief turnover and economic growth: Evidence from China. *Economics of Transition and Institutional Change, 28*(3), 441-466. doi:https://doi.org/10.1111/ecot.12245

Xue, L., Qu, A., Guo, X., & Hao, C. (2024). Research on environmental performance measurement and influencing factors of key cities in China based on super-efficiency SBM-Tobit model. *Sustainability, 16*(4792), 1-20. doi:https://doi.org/10.3390/su16114792

Yenita, Y. (2024). Simultaneous elections for budget efficiency: Advancing fair and inclusive democracy. *Jurnal Perspektif Pembiayaan dan Pembangunan Daerah, 12*(5), 443–458. doi:https://doi.org/10.22437/ppd.v12i5.36598

Zamzami, F., & Rakhman, F. (2023). Determinants of local government financial perform in Indonesia. *Academic Journal of Interdisciplinary Studies, 12*(5), 332-347. doi:https://doi.org/10.36941/ajis-2023-0148

Zhang, J., Zhang, Y., Chen, Y., Wang, J., Zhao, L., & Chen, M. (2023). Evaluation of carbon emission efficiency in the construction industry based on the super-efficient slacks-based measure model: A case study at the provincial level in China. *Buildings, 13*(2207), 1-22. doi:https://doi.org/10.3390/buildings13092207

2720-9067 (ISSN), **2685-1059** (E-ISSN)
open access at: https://akurasi.unram.ac.id