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SPECIAL ALLOCATION FUNDS AND POVERTY ALLEVIATION: EVIDENCE FROM LAGGING AND NON-LAGGING REGIONS IN INDONESIA

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ABSTRACT

Research Originality – This study offers a novel contribution by examining the poverty impact of Physical and Non-Physical Special Allocation Funds (DAK) within a multisectoral national framework. Unlike previous studies focusing on specific sectors or regions, this study compares DAK effectiveness across lagging and non-lagging regions, thereby revealing spatial heterogeneity in fiscal transfer outcomes. The findings provide an empirical basis for designing poverty alleviation strategies that differentiate fiscal interventions according to regional development status and geographical characteristics.

Research Objectives – This study analyzes DAK disbursement from 2015 to 2023 and assesses the differential impacts of Physical and Non-Physical DAK on poverty in Indonesia. It also evaluates region-based fiscal policy effectiveness by examining DAK's contribution to poverty alleviation, particularly in lagging regions.

Research Methods – The analysis is based on a panel dataset of 380 regencies and municipalities over the period 2015–2023, estimated using a fixed effects model (FEM).

Empirical Results – The results show that Non-Physical DAK significantly reduces poverty at the national level and in non-lagging regions, while Physical DAK is effective only in lagging archipelagic regions. These findings indicate that DAK effectiveness is spatially heterogeneous and depends on both regional development status and geographical characteristics.

Implications – These results underscore that fiscal transfer effectiveness depends on recipients' spatial and sectoral contexts. DAK allocation should therefore be spatially differentiated by regional development status and geography, prioritizing Physical DAK in lagging archipelagic regions and strengthening Non-Physical DAK in non-lagging areas to enhance human capital and accelerate poverty reduction.

Keywords: DAK; Fiscal Decentralization; Lagging Regions; Non-Physical DAK; Physical DAK; Poverty Alleviation.

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INTRODUCTION

Indonesia's national development agenda emphasizes poverty reduction, and in the context of multi-level government adopted in Indonesia, this objective of poverty reduction is considered a concurrent function for both central and lower-level government as stated in Law No. 23/2014 (Undang-Undang (UU) Nomor 23 Tahun 2014 tentang Pemerintahan Daerah, (2014). This framework is supported by fiscal decentralization. Within this system, the Special Allocation Fund (DAK) serves as a key fiscal transfer instrument that is designed to support national priority programs, particularly in education, health, and infrastructure. The fund also considers regions with constrained fiscal capacity. The DAK is thus strategically directed toward promoting equitable access to basic services and accelerating poverty reduction, especially in lagging regions.

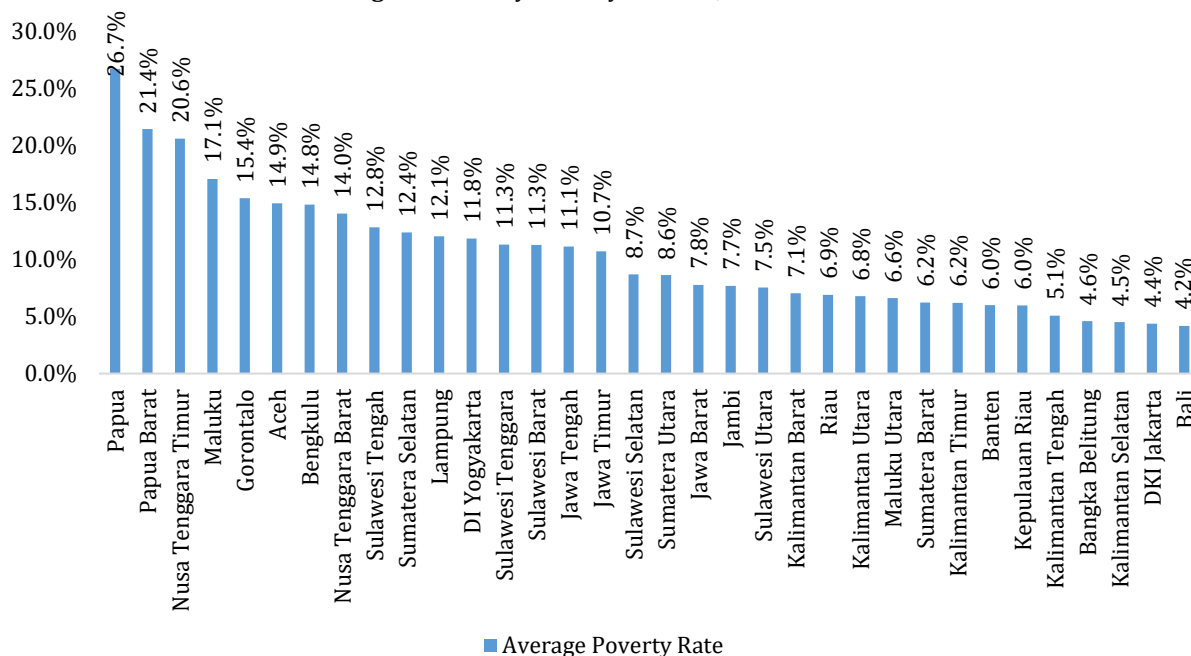
Within the framework of fiscal decentralization, DAK refers to a conditional and sector-targeted intergovernmental transfer designed to improve allocative efficiency (Martinez-Vazquez & McNab, 2003; Oates, 2011). Unconditional transfers, such as the General Allocation Fund (DAU), functions as a block grant to equalize fiscal capacity across regions to solve horizontal imbalances, but DAK is earmarked for specific priority sectors and tied to predetermined national objectives. Similarly, the Revenue Sharing Fund (DBH) aims to mitigate vertical imbalances. In this type of transfer, there are no explicit service-delivery targets. In contrast, earmarked grants such as DAK are intended to align local expenditures with nationally prioritized sectors, thereby strengthening service delivery in areas such as infrastructure, education, and health. Theoretically, improving these sectors can help reduce poverty, by overcoming structural barriers in lagging regions, particularly where local funding and institutional quality differ (Baskaran et al., 2016).

APPLICATIONS FOR PRACTICE

- This study reveals that the effectiveness of DAK in reducing poverty varies across allocation types, regional development status, and geographic characteristics. Non-Physical DAK proves significantly effective nationally and in non-lagging regions, while aggregate DAK is effective in lagging regions. Furthermore, physical DAK demonstrates stronger impacts in island regions.
- This study recommends that DAK policies should be made more adaptive to regional contexts by strengthening affirmative schemes in lagging regions, prioritizing Non-Physical DAK in non-lagging areas, and enhancing Physical DAK allocations in island regions in lagging area to effectively reduce poverty.

Allocations of DAK have increased substantially in the last decade. According to Statistics Indonesia (BPS), Transfers to Regions (TKD), including DAK, have steadily risen through 2024, with Non-Physical DAK being the largest component since 2014. However, development gaps remain high in provinces such as Papua, West Papua, and East Nusa Tenggara, where poverty rates continue to exceed 20%. According to BPS data, the highest recorded average poverty rate in Papua is 26.7%, while in Nusa Tenggara Timur and several other provinces, the rates are reported around 20% (Figure 1). These figures suggest that poverty alleviation efforts through fiscal transfers targeting basic infrastructure, social services, and economic sectors have yet to achieve optimal outcomes, particularly in predominantly lagging regions.

Figure 1 Poverty Rates by Province, 2019–2023



Source: BPS-Statistics Indonesia

Furthermore, the DAK scheme is designed to stimulate growth in lagging regions by directing strategic resources to priority sectors, including basic infrastructure, education, health, transportation, and telecommunications as part of place-based affirmative policies (Hadi, 2010). Through this multisectoral approach, DAK is positioned as a strategic fiscal instrument to improve access to public services, strengthen regional development capacity, and support poverty reduction. In line with Wang et al. (2023), poverty-oriented fiscal allocations and public spending tend to be more effective when they are directed toward

locally relevant sectors, supported by health-service improvements, and differentiated according to regional conditions. Accordingly, integrating DAK into medium-term regional development planning and aligning its allocation with local sectoral needs are essential to enhance its contribution to sustainable poverty alleviation.

DAK does not directly target poverty. Its targeted support for basic services may reduce poverty over time, but its empirical effectiveness remains contested. Several studies have reported significant contributions of DAK to reducing poverty and enhancing public services (Ratnawati & Sari, 2023; Wibowo & Oktivalerina, 2022), whereas others found no meaningful impact (Gunawan et al., 2024). Some studies also confirm DAK's positive influence on education and health outcomes (Hadi & Mahi, 2024; Sulaeman & Andriyanto, 2021); however, its direct role in poverty reduction remains ambiguous. In regions such as Papua and East Nusa Tenggara, DAK appears to be less effective in addressing poverty (Gunawan et al., 2024; Manek & Badrudin, 2017). These mixed findings suggest that although DAK may stimulate economic growth and poverty reduction, its effectiveness is highly contingent on regional fiscal capacity and governance quality. Moreover, the conditionality embedded in DAK, intended to align national development priorities with local needs (Undang-Undang (UU) Nomor 1 Tahun 2022 Tentang Hubungan Keuangan Antara Pemerintah Pusat Dan Pemerintahan Daerah, 2022), has consistently reduce poverty.

Previous studies have examined the relationship between intergovernmental fiscal transfers and disparities in development outcomes in Indonesia, including poverty and its dynamics. However, they showed mixed findings. Existing research mostly focuses on aggregate fiscal decentralization measures and analyzes DAK only partially by sector or region. It has not compared lagging and non-lagging regions within a unified national framework. Therefore, a research gap remains regarding how Physical and Non-Physical DAK affect poverty across different regions and geographic characteristics. Unlike earlier studies that analyzed the impact of DAK partially by sector or region, this study adopts a comprehensive approach to capture interregional variations at the national level. In this context, we treat DAK as a multisectoral fiscal stimulus, which reflects the notion that poverty alleviation requires integrated, multisectoral interventions that simultaneously affect the socio-economic well-being of communities. Therefore, improvements are not confined to a single sector. Our study addresses this gap by providing a comprehensive panel analysis of 380 districts and municipalities from 2015 to 2023. We both compare lagging and non-lagging regions and incorporate geographical distinctions. We chose this timeframe to capture a consistent phase of Indonesia's fiscal decentralization framework following the strengthening of intergovernmental fiscal transfer arrangements under the post-2014 regional governance reforms. Beginning in 2015, the DAK became increasingly thematic and aligned with nationally prioritized sectors. This enables a more coherent evaluation of its sector-targeted impact. The objective of this research is to assess whether DAK, both in aggregate and disaggregated schemes, has different impacts on poverty across regional development status and spatial characteristics, thereby contributing to a more context-sensitive evaluation of fiscal decentralization policy in Indonesia. This is guided by the following research problem: to what extent does DAK, both in aggregate and disaggregated into physical and non-physical components, influence poverty levels across heterogeneous regional contexts in Indonesia? More specifically, this study seeks to answer whether the impact of DAK differs between lagging and non-lagging regions and whether geographical characteristics, particularly archipelagic versus mainland settings, moderate its effectiveness in affecting poverty outcomes.

LITERATURE REVIEW

Fiscal decentralization involves the transfer of fiscal authority from the central government to subnational governments to enhance allocative efficiency and to better align public service provision with local preferences (Oates, 2011). In Indonesia, this framework operates through locally generated revenue (Pendapatan Asli Daerah or PAD) and intergovernmental transfers. Unlike transfers used to address vertical and horizontal fiscal imbalances across regions, PAD demonstrates local fiscal autonomy (Martinez-Vazquez & McNab, 2003). Fiscal decentralization can address regional disparities when supported by adequate transfers and effective governance (Martinez-Vazquez & McNab, 2003). Institutionally, the transfer system in Indonesia consists of DAU, DAK, and DBH. DAU functions as a block grant to equalize fiscal capacity, and DBH follows the revenue-origin principle, particularly from natural resources. However, Law No. 1/2022 has introduced conditional elements within DAU and certain DBH components, which indicates a shift toward performance-based transfers. Despite these changes, DAK remains the most explicitly sector-targeted instrument, structured to finance nationally prioritized activities in designated sectors.

DAK is regulated under Law No. 1/2022 on Intergovernmental Fiscal Relations within this fiscal architecture. It is further operationalized through annual Ministry of Finance regulations that govern sectoral allocation and disbursement mechanisms. DAK is divided into two principal components: Physical DAK and Non-Physical DAK. Physical DAK funds tangible infrastructure development, including

transportation networks, sanitation facilities, school buildings, health centers, and housing infrastructure. Its disbursement follows detailed technical guidelines and output verification requirements, such as PMK No. 198/PMK.07/2021 and its subsequent amendments. In contrast, Non-Physical DAK finances operational and service-delivery expenditures, including School Operational Assistance (BOS), teacher professional allowances and certified incentives (TPG), and health service funding. These expenditures are not used to fund asset construction but to improve service quality and human capital. Although both Physical and Non-Physical DAK aim to strengthen public service provision, they differ fundamentally in expenditure composition, implementation mechanisms, and timeline. Findings from studies in multiple countries further demonstrate that infrastructure spending and intergovernmental transfers often show delayed impacts on income and welfare indicators, with measurable poverty reduction emerging in the medium- to long-term (Bom & Ligthart, 2014). Through infrastructure accumulation and accessibility improvements, Physical DAK generally delivers medium to long-term development. Non-Physical DAK, by contrast, may provide immediate welfare by directly enhancing service utilization and human capital.

By formally classifying lagging regions, the Indonesian policy framework further reinforces the spatial dimension of fiscal intervention. Grounded in the 2015–2019 National Medium-Term Development Plan (RPJMN), this designation is regulated by Presidential Regulation No. 131/2015 and its 2020 amendments on the Determination of Lagging Regions. It establishes several criteria encompassing economic performance, human development indicators, infrastructure availability, fiscal capacity, accessibility, and regional characteristics. Lagging regions are characterized by structural development constraints, limited public service capacity, and heightened vulnerability to economic shocks, whereas non-lagging regions generally have stronger institutional and fiscal foundations. These differences provide a normative and analytical basis for expecting heterogeneous policy outcomes across regions.

Given the institutional differences between lagging and non-lagging regions, DAK serves as an affirmative fiscal instrument within Indonesia's place-based development strategy. Place-based policy theory suggests that territorially targeted interventions can accelerate convergence by addressing region-specific structural constraints (Neumark & Simpson, 2015). In this context, the effectiveness of conditional transfers is likely to depend on local absorptive capacity, governance quality, and baseline development conditions. The same fiscal instrument may therefore generate different welfare effects in lagging and non-lagging regions, particularly due to unequal infrastructure and institutional capacity.

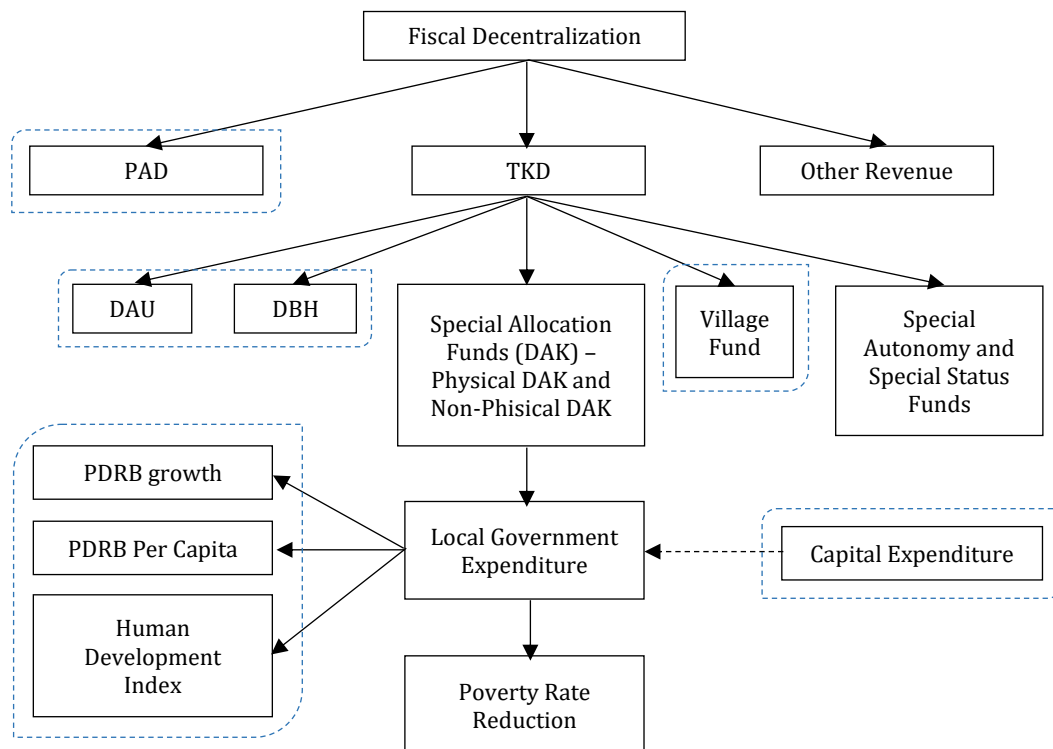
These differences are even more pronounced when we consider differences in territorial connectivity and geographical configuration. Mainland regions, such as those in Java or Sumatra, are territorially contiguous. This enables labor mobility, trade integration, and the diffusion of public investment benefits across regions. In contrast, mainland-archipelago regions combine connected land with peripheral islands, while fully archipelagic regions, such as many districts in Maluku, are spatially fragmented and separated by sea. As a result, transportation costs are higher, and there is little connection between regions. Literature on spatial development suggests that infrastructure investment in connected territories generates stronger spillover effects through network externalities and market integration (Crescenzi & Giua, 2020). Meanwhile, geographically isolated regions face structural accessibility constraints that require more localized infrastructure provision (Redding & Turner, 2015). The effectiveness of infrastructure-oriented fiscal transfers will ultimately depend on territorial connectivity.

These spatial and institutional differences matter because poverty is multidimensional and shaped by variations in access to services, infrastructure, and economic opportunities. Poverty encompasses income deprivation, limited access to basic services, and restricted economic participation (Smith & Todaro, 2025; Townsend, 1979). From a welfare economics perspective, public finance plays a central role in influencing poverty dynamics through both allocative and redistributive channels (Musgrave, 1959). Improvements in education, healthcare, and infrastructure expand human capital accumulation and reduce transaction costs, thereby enhancing household productivity and welfare. However, achieving these outcomes depends on the implementation quality and the broader institutional environment, as government interventions may encounter inefficiencies and second-best constraints (Lipsey & Lancaster, 1956). While DAK is not specifically designed to reduce poverty, its sector-targeted approach creates enabling conditions that may influence poverty outcomes by improving service delivery and structural development capacity.

This study aims to examine the impact of DAK on poverty alleviation in Indonesia within the broader framework of fiscal decentralization. DAK reduces poverty through infrastructure development and human capital enhancement. Sectoral evidence indicates that DAK allocations for road infrastructure reduce poverty (Wahyuni et al., 2021). DAK allocations in education and health have been found to have significant negative effects on poverty by improving human capital outcomes (D. F. Nugroho et al., 2021). To ensure accurate estimate of DAK's effect, we incorporate several control variables grounded in fiscal federalism and development theory into the analysis. These include PAD, which reflects regional fiscal capacity and economic dynamism (Manek & Badrudin, 2017), as well as other intergovernmental transfers (DAU, DBH,

and Village Fund). They jointly finance regional development activities and require monitoring (Sigit & Kosasih, 2020; Soraya & Qibthiyah, 2021). Local government expenditure, particularly capital expenditure, is used as a proxy for the availability of physical infrastructure and sectoral investment (Sigit & Kosasih, 2020). The Human Development Index (HDI), real Gross Regional Domestic Product (GRDP) per capita, and GRDP growth are incorporated to capture variations in social welfare and economic performance that directly influence poverty dynamics (Smith & Todaro, 2025). By integrating these variables, we construct a comprehensive empirical model that accounts for fiscal capacity, public spending, and socioeconomic conditions in assessing how DAK affects poverty. The relationship between DAK and poverty alleviation is illustrated in Figure 2.

Figure 2 Conceptual Framework



Source: Processed by the authors

METHODS

The empirical analysis of this study builds upon the framework of Wibowo and Oktivalerina (2022). They examined the impact of fiscal decentralization on poverty alleviation in Indonesia using a fixed-effects model (FEM). The equation is as follows.

$$Y_{it} = \alpha + \beta_1 \cdot X_{it} + \beta_2 \cdot X_{2it} + \beta_n \cdot X_{...it} + \epsilon_{it} \dots (1)$$

where, Y_{it} denotes the poverty headcount ratio for district or municipality i in year t , X_{it} represents the fiscal decentralization, the main explanatory variable of interest, for district or municipality i in year t , X_{2it} $X_{...it}$ correspond to additional control variables, including socioeconomic and fiscal indicators, for district or municipality i in year t , α is a constant term, β_1 β_2 β_n are the estimated coefficients of the independent variables, ϵ_{it} is the idiosyncratic error term, i indexes cross-sectional units (districts or municipalities), and t indexes the time dimension.

Adapting their approach, we investigate the influence of DAK on poverty levels across Indonesian districts and municipalities. Within the framework of FEM, each district and municipality in this study is assumed to have a distinct intercept that captures fixed effects. This specification plays a crucial role in disentangling the influence of independent variables on the dependent outcome (Baltagi, 2021; Wooldridge, 2010). This approach is effective for evaluating subnational fiscal policies, such as DAK, whose outcomes are shaped by region-specific structural characteristics that remain unobservable. FEM is applied to account for unobserved heterogeneity across regions, thereby producing more consistent and reliable estimates. We can express the model as follows.

$$Y_{it} = \alpha + \beta_1 \cdot X_{1it} + \beta_2 \cdot X_{2it} + \beta_3 \cdot X_{3it} + \beta_4 \cdot X_{4it} + \beta_5 \cdot X_{5it} + \beta_6 \cdot X_{6it} + \beta_7 \cdot X_{7it} + \beta_8 \cdot X_{8it} + \beta_9 \cdot X_{9it} + \beta_{10} \cdot X_{10it} + \beta_{11} \cdot X_{11it} + \epsilon_{it} \dots (2)$$

where, X_1 , X_2 and X_3 represent the main explanatory variables of interest that refer to the logarithm of total DAK, Physical and Non-Physical DAK, respectively. transferred to districts and municipalities. Given that X_1 is mechanically constructed as the sum of X_2 and X_3 , a high degree of multicollinearity is expected. However, multicollinearity was assessed using the variance inflation factor (VIF). The results indicate no serious multicollinearity concerns, with an average VIF of 3.85 and most variables exhibiting VIF values below 10, except for DAK, which is marginally above the conventional threshold at 10.68. Although DAK is correlated with its components, the correlation remains within acceptable limits. Nevertheless, to avoid potential estimation distortion due to multicollinearity, DAK is estimated separately in alternative model specifications.

The control variables, X_4 , X_5 , X_6 , X_7 , X_8 , X_9 , X_{10} and X_{11} are HDI, GRDP per capita at constant prices (PDRB per capita), GRDP growth at constant prices (PDRB growth), the realized PAD in a fiscal year, Village Funds allocated to districts and municipalities (DD), total realized capital expenditure (Modal), DAU, and DBH, respectively. We included control variables X_4 through X_{11} to isolate the net effect of DAK on poverty by accounting for other factors like fiscal capacity, alternative funding sources, public investment, and socioeconomic conditions. These factors may simultaneously influence poverty outcomes. PAD shows a region's fiscal autonomy and economic dynamism. By contrast, DAU and DBH are non-earmarked transfers that expand fiscal space but whose poverty effects depend on local allocation decisions. Village Fund is a rural-targeted fiscal instrument that directly finances village-level infrastructure and community empowerment. Capital expenditure is a proxy for infrastructure provision and long-term public investment capacity. Finally, HDI, GRDP per capita, and GRDP growth capture human capital conditions and economic performance. These are structurally linked to poverty dynamics.

RESULTS AND DISCUSSION

Regional income in Indonesia comes from PAD and central government transfers, including DAU, DBH, DAK, Village Fund, and other revenues. These funds help finance regional development while promoting equity across jurisdictions, with a particular emphasis on lagging areas. On average, non-lagging regions have consistently received larger allocations than their lagging counterparts, particularly in DAU, DBH, DAK, and Village Funds. This discrepancy reflects the high number of non-lagging regions and municipalities.

Table 1 Average Distribution of the Special Allocation Fund (DAK) to Districts and Municipalities in Lagging and Non-Lagging Regions, 2015–2023 (in Billion Rupiah)

Group of Area	Policy Period	Average DAK Allocation
Lagging	2015-2019	967.23
	2020-2024*	714.56
Non-Lagging	2015-2019	935.69
	2020-2024*	914.85

Note: *) Panel data available only until 2023
Source: Processed by the authors

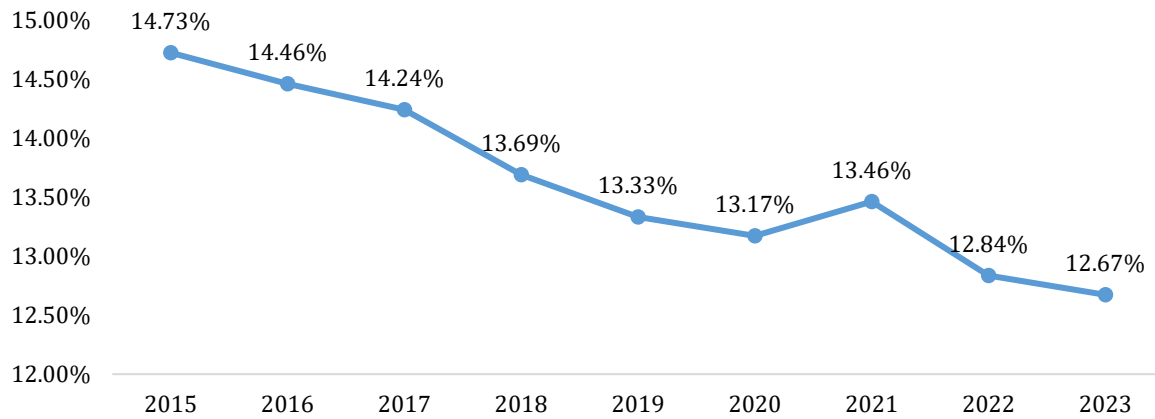
Table 1 shows the average DAK allocations for lagging and non-lagging regions across two policy periods: 2015–2019 and 2020–2024. During the first period, average DAK allocations were relatively comparable across both groups. However, in the second period the allocations for lagging regions declined, while those to non-lagging regions rose. This reduction was caused by budget restructuring measures in response to the COVID-19 pandemic, which curtailed affirmative physical DAK allocations for lagging regions. If unmitigated by alternative fiscal instruments, such dynamics risk widening interregional development disparities. For instance, resource-rich regions such as Kutai Kartanegara that benefit from substantial DBH revenues may accelerate infrastructure expansion and income growth, while geographically isolated lagging regions such as Intan Jaya, with limited own-source revenue and weaker fiscal capacity, risk falling further behind unless compensated by targeted fiscal instruments specifically DAK.

Poverty reduction continues to be a central policy priority in Indonesia, particularly in regions exhibiting persistently high poverty incidence. Figure 3 depicts the trajectory of poverty rates across districts and municipalities between 2015 and 2023. The poverty headcount ratio stood at 14.73% in 2015 and steadily declined to 13.33% by 2019. The onset of the COVID-19 pandemic, however, disrupted this downward trend: poverty marginally decreased to 13.17% in 2020 but rebounded to 13.46% in 2021. In the post-pandemic period, the declining trend resumed, with the poverty rate reaching 12.67% in 2023, the lowest level recorded over the nine-year span.

The disparity in poverty levels between lagging and non-lagging regions remains striking. As depicted in Figure 4, the poverty rate in lagging regions stood at 21.82% in 2015, almost double that of non-lagging regions, which recorded only 11.33%. This inequality became more pronounced during the COVID-19 pandemic: in 2020, poverty incidence in lagging regions surged to 26.43%, compared to 10.59% in non-

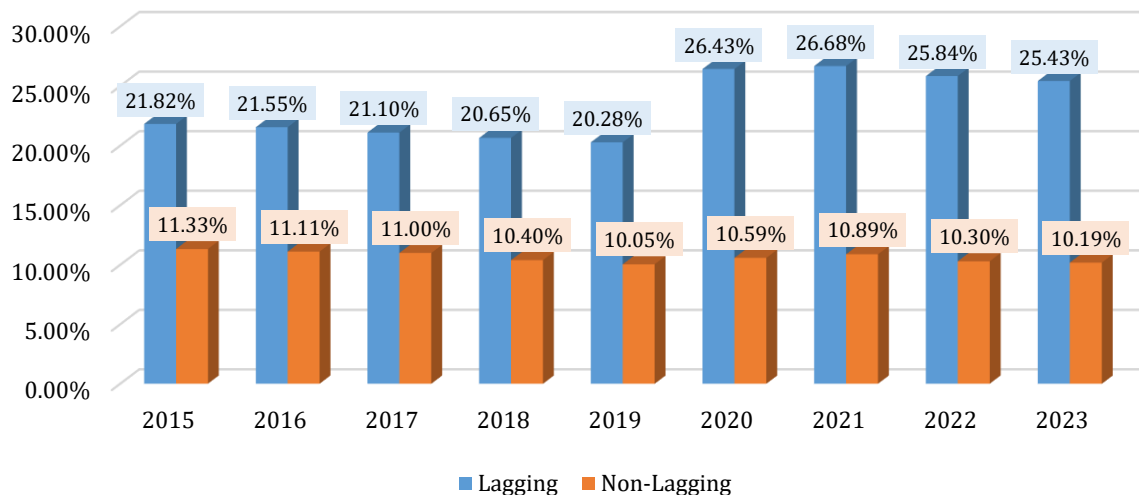
lagging areas. The divergence further intensified in 2021, with poverty in lagging regions rising to 26.68%, while non-lagging regions experienced only a modest increase to 10.89%. Although a gradual decline occurred in lagging regions after 2021, poverty levels remained elevated at 25.43% in 2023, whereas non-lagging regions continued their downward trajectory to 10.19%. These figures highlight the persistent structural poverty in lagging regions, making them highly vulnerable to external shocks. Therefore, more affirmative and asymmetric interventions are needed to accelerate recovery.

Figure 3 Average Poverty Incidence Across Districts and Municipalities in Indonesia, 2015–2023



Source: Processed by the authors

Figure 4 Average Poverty Incidence by Lagging and Non-Lagging Regional Classification in Indonesia, 2015–2023



Source: Processed by the authors

Table 2 reports the descriptive statistics of the study variables, including the number of observations, mean, standard deviation, and minimum–maximum values. The results reveal considerable interregional heterogeneity, with the average poverty rate reaching 13.62% and a standard deviation of 8.3% across districts and municipalities. The minimum poverty rate is 1.67%, indicating very low poverty incidence. The maximum poverty rate peaks at 45.74%, highlighting areas with extreme poverty. Districts and municipalities with the lowest poverty levels are predominantly located in western Indonesia, such as South Tangerang City, Sawahlunto City, Balikpapan City, Banjar Regency, and Ternate City. The highest poverty rates are observed in some regencies in Papua, including Deiyai, Intan Jaya, Lanny Jaya, Yahukimo, and Supiori. These differences underscore the need for spatially differentiated and context-specific policies.

Our findings further confirmed wide variation not only in poverty levels but also in the distribution of lagging versus non-lagging regions and fiscal capacity. Fiscal indicators, including DAK, PAD, DAU, and DBH, highlight the importance of designing adaptive and affirmative fiscal strategies, particularly in regions with high poverty and lagging status. These findings provide a solid basis for examining the causal effects of DAK on poverty reduction while adequately controlling for alternative revenue sources.

To address skewness and extreme variability in the fiscal and economic variables, we applied natural logarithmic (ln) transformations to DAK, DAU, DBH, Village Funds, and PAD. We used these transformations

to stabilize variance, mitigate heteroskedasticity, approximate normality, and easily interpret regression coefficients as elasticities or relative changes. To address the large dispersion in GRDP per capita, we applied a log transformation. For variables with zero values, such as Total DAK and Physical DAK, we used $\ln(x)$ to preserve the elasticity interpretation, while for variables with multiple zero entries, such as Village Funds, we used $\ln(x + 1)$ to maintain data integrity and ensure model stability. This approach balances interpretability and data completeness to yield more robust and credible estimates.

Table 2 Descriptive Statistics of Variables Employed in the Analysis

Variable	Unit	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variable:						
Poverty Rate (headcount index)	%	3417	13.62	8.30	1.67	45.74
Independent Variables:						
DAK (ln)	IDR billion	3420	203.11	104.97	0	844.85
Physical DAK (ln)	IDR billion	3040	104.16	52.53	0	353.83
Non-Physical DAK (ln)	IDR billion	3040	110.92	89.14	0.86	768.24
Control Variable:						
IPM	Index	3420	68.12	6.86	25.47	86.69
PDRB Per Capita (ln)	IDR million	3094	35.18	39.72	3.97	498.62
PDRB growth	%	3420	4.44	5.54	-38.52	161.85
Capital expenditure (ln)	IDR billion	3420	290.47	233.34	32.74	3,513.61
PAD (ln)	IDR billion	3420	176.11	368.10	1.27	5,771.82
Village Fund (ln)	IDR billion	3420	114.04	95.47	0	639.062
DAU (ln)	IDR billion	3420	623.73	237.49	0	1,783.08
DBH (ln)	IDR billion	3420	149.85	406.77	4.09	8,827.04
Observations		3420				

Source: Processed by the authors

In regional economic analysis, region-specific characteristics are typically time-invariant; however, they are difficult to observe directly. If left uncontrolled, they can bias the econometric estimations. We used FEM to address this issue because it provides an appropriate panel regression framework. Furthermore, it explicitly accounts for unobserved heterogeneity across units by allowing each district or municipality to have its own intercept. Table 3 shows the results of the FEM-based panel regressions.

Table 3 shows that in the baseline specification without control variables (Model 1), the coefficient of \ln Non-PhysicalDAK is negative and highly significant at the 1% level, indicating that non-physical DAK is associated with lower poverty levels. Conversely, physical DAK exhibits a positive and significant relationship at the 1% level, suggesting that physical DAK allocations are correlated with higher poverty incidence in the absence of additional controls. When control variables are introduced in Model 2, the coefficient of \ln PhysicalDAK changes sign to negative, though its statistical significance disappears, while the effect of \ln DAK becomes insignificant. The significant negative coefficient of \ln Non-PhysicalDAK suggests that districts with higher allocation of non-physical DAK are associated with lower poverty rate, albeit with a reduced effect size.

The explanatory power of the model improves substantially with the inclusion of controls: the within R-squared rises from 37.65% to 46.39%, while the between and overall R-squared also increase to 50.41% and 49.92%, respectively. Moreover, a rho statistic of close to unity (≈ 0.99) in both models indicates that unobserved, time-invariant regional characteristics explain most of the variation in poverty outcomes. This confirms that FEM is the most appropriate estimation strategy for our study (Baltagi, 2021; Wooldridge, 2010).

To identify the most suitable specification for the panel data analysis of poverty across regions and municipalities, we conducted the Chow, Lagrange Multiplier (LM), and Hausman tests. Both the Chow test ($\text{Prob} > F = 0.0000$) and the LM test ($\text{Prob} > \chi^2 = 0.0000$) reject the null hypothesis, indicating that the data have significant regional differences. Therefore, both FEM and REM are preferred over pooled OLS.

The Hausman test, with a χ^2 (11) statistic of 180.66 with $\text{Prob} > \chi^2 = 0.0000$, shows significant differences between the FEM and REM coefficients. Therefore, the null hypothesis is rejected, and FEM is deemed more valid for this analysis.

It should be noted, however, that FEM estimation may still be subject to econometric challenges, including multicollinearity, heteroskedasticity, and autocorrelation. To prevent multicollinearity, we applied partial estimates for the independent variables, notably \ln DAK. We also used cluster-robust estimation to adjust standard errors for cross-sectional heteroskedasticity and serial autocorrelation to ensure the model's robustness and reliability.

The estimation results for total DAK and its components—Physical and Non-Physical DAK—are presented in Table 4 to assess their association with poverty levels in Indonesia. The findings indicate that increases in total DAK do not significantly reduce poverty, suggesting that its aggregate effect may obscure

differences across allocation components. In fact, a 1% rise in total DAK is associated with a marginal 0.01% increase in poverty incidence, though statistically insignificant. This finding aligns with the findings reported by Rao and Gupta (1995) in the Indian context. They found that targeted fiscal transfers from the central government were ineffective at alleviating poverty because the policy design and allocation mechanisms failed to address local needs and conditions. Weak institutional capacity and administrative inefficiencies at the regional level further undermine the potential benefits of such transfers.

Table 3 Results of Fixed Effects Model (FEM) Estimation

Variable	Model 1 Baseline Specification (without control variables)	Model 2 Extended Specification (with control variables)
lnDAK	-0.401* (0.228)	0.254 (0.195)
lnPhysicalDAK	0.396*** (0.122)	-0.139 (0.0933)
lnNon-PhysicalDAK	-1.168*** (0.118)	-0.393*** (0.134)
IPM		-0.433*** (0.0419)
lnPDRBKap		-0.0407 (0.321)
PDRBgr		0.000385 (0.00280)
lnPAD		0.0796 (0.116)
lnModal		0.106* (0.0632)
lnDD		0.00357 (0.0201)
lnDAU		0.209 (0.294)
lnDBH		0.189*** (0.0462)
Constant	43.27*** (3.266)	34.65*** (8.342)
Number of ID_Pemda	380	380
Observations	3,039	2,997
Prob > F	0.0000	0.0000
R-squared within	0.3765	0.4639
R-squared between	0.2261	0.5041
R-squared overall	0.2013	0.4992
rho	0.99120824	0.98932794

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Processed by the authors

By contrast, physical DAK shows a negative and statistically insignificant association with poverty levels, suggesting that infrastructure-related expenditures do not immediately reduce poverty. This can be attributed to time lags in the realization of economic returns from infrastructure development, shaped by gradual administrative disbursement and procurement processes at the local level. Our findings are consistent with those of Nugroho (2016), who found that basic infrastructure investment typically lacks short-term poverty-reducing effects.

Non-Physical DAK shows a statistically significant and substantial effect on poverty alleviation. A 1% increase in Non-Physical DAK is associated with an estimated 0.37% reduction in poverty rate. This finding confirms that prioritizing government expenditures that enhance human capital, particularly through education, healthcare, and improved standards of living, is the fastest and most effective way to reduce poverty (S. S. Nugroho, 2016).

Building on the national-level results, the analysis further examines the differential effects of Physical and Non-Physical DAK across lagging and non-lagging regions in Indonesia. We conducted the heterogeneity analysis by running separate regressions for lagging and non-lagging regions. This approach allows coefficient estimates to vary across groups. It also avoids imposing homogeneity assumptions that may obscure distinct fiscal effects. Although the number of observations differs across subgroups, this imbalance does not bias our estimates because each model is estimated independently within a fixed-effects

framework. However, we interpret cross-group comparisons cautiously due to potential differences in statistical power.

Table 4 Partial Estimation Results on the Effect of DAK, Physical DAK, and Non-Physical DAK on Poverty in Indonesia

Variable	(1)	(2)
lnDAK	0.010 (0.074)	
lnPhysicalDAK		-0.029 (0.051)
lnNon-PhysicalDAK		-0.371*** (0.127)
IPM	-0.518*** (0.033)	-0.509*** (0.030)
lnPDRBKap	-0.006 (0.351)	-0.079 (0.336)
PDRBgr	-0.000 (0.003)	-0.000 (0.003)
lnPAD	0.111 (0.117)	0.140 (0.111)
lnModal	0.077 (0.057)	0.041 (0.051)
lnDD	-0.010 (0.033)	-0.025 (0.043)
lnDAU	0.302 (0.282)	0.009 (0.006)
lnDBH	0.209*** (0.048)	0.255*** (0.041)
Constant	39.652*** (2.858)	37.594*** (3.128)
Observations	3090	2997

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Processed by the authors

As shown in Table 5, the regression estimates indicate that aggregate DAK allocations show a statistically significant effect on poverty alleviation in lagging regions. A 1% increase in DAK is associated with a 0.43% reduction in poverty incidence. This finding corroborates Nasrudin (2016), who argues that affirmative policies prioritizing fiscal transfers to lagging regions help reduce poverty. Conceptually, DAK is designed to mitigate vertical fiscal imbalances between central and local governments. Nonetheless, its effectiveness depends on local institutional capacity, governance quality, and administrative mechanisms for reporting and disbursement. These requirements are often hard to meet in lagging areas. Additional technical barriers, such as limited construction labor and inadequate local material supply, further constrain its impact.

When disaggregated, neither Physical nor Non-Physical DAK exhibits statistically significant effects on poverty reduction in lagging regions, although both coefficients display the expected negative sign. This outcome suggests significant barriers, including weak administrative capacity, delays in the materialization of development benefits, and geographical challenges that impede program accessibility and delivery. These results corroborate the Ministry of Finance's (Peraturan Presiden (Perpres) Nomor 57 Tahun 2024 Tentang Petunjuk Teknis Dana Alokasi Khusus Fisik, 2024) call to expedite DAK disbursement. The results are also in line with Nugroho's (2016) assertion that basic infrastructure investments seldom yield immediate poverty-reducing effects.

In non-lagging regions, we found that neither total DAK nor its physical component significantly influences poverty outcomes. Rather, Non-Physical DAK demonstrates a robust and statistically significant effect: a 1% increase in this funding reduces poverty by approximately 0.39%. This finding highlights the effectiveness of social service-oriented interventions, including education, healthcare, and the promotion of local economic activity through MSMEs and cooperatives. Their impact appears to be greater in regions characterized by stronger institutional frameworks and more developed infrastructure. Our findings support the work of Nugroho et al. (2021), which shows that education and health spending through DAK significantly reduces poverty. Given that education-related transfers make up most of Non-Physical DAK funds, strengthening their targeting and monitoring mechanisms will maximize their impact on poverty reduction. These findings also support Oates' (2011) theory of fiscal decentralization. The theory posits that conditional grants targeting public service provision are most effective when local implementation capacity is sufficient, a condition more prevalent in non-lagging regions. Accordingly, enhancing policy coherence,

strengthening institutional capacity, and advancing needs-based planning emerge as critical prerequisites for optimizing Non-Physical DAK as a poverty alleviation instrument.

Table 5 Partial Estimation Results of the Effects of Total, Physical, and Non-Physical DAK on Poverty Reduction in Lagging (T) and Non-Lagging (NT) Regions

Variable	(1) Lagging Regions (T)	(2) Lagging Regions (T)	(3) Non-Lagging Regions (NT)	(4) Non-Lagging Regions (NT)
lnDAK	-0.429* (0.233)		0.036 (0.071)	
lnPhysicalDAK		-0.137 (0.176)		0.018 (0.045)
lnNon-PhysicalDAK		-0.042 (0.163)		-0.394** (0.169)
IPM	-0.577*** (0.063)	-0.580*** (0.081)	-0.432*** (0.035)	-0.339*** (0.043)
lnPDRBKap	1.107* (0.637)	1.181* (0.667)	-1.100*** (0.260)	-0.943*** (0.249)
PDRBgr	0.004 (0.013)	0.004 (0.012)	0.006** (0.003)	0.005** (0.003)
lnPAD	-0.047 (0.172)	-0.052 (0.179)	0.204* (0.107)	0.203** (0.100)
lnModal	0.139 (0.211)	0.023 (0.217)	0.065 (0.049)	0.108** (0.054)
lnDD	-0.078 (0.278)	-0.319 (0.366)	-0.013 (0.031)	0.002 (0.018)
lnDAU	2.925*** (1.006)	1.447 (1.130)	-0.263 (0.348)	-0.159 (0.363)
lnDBH	0.234*** (0.080)	0.178** (0.081)	0.235*** (0.053)	0.224*** (0.052)
Constant	-19.783 (25.349)	24.374 (31.052)	38.641*** (9.477)	37.961*** (10.176)
Observations	714	704	2376	2293

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Processed by the authors

The effectiveness of fiscal transfers via DAK depends on a region's geography. Variation between mainland and archipelagic settings determines how effectively DAK funds are implemented in a region. Factors such as accessibility, logistical costs, availability of basic infrastructure, and the strength of local institutional capacity serve as key drivers of heterogeneity in policy outcomes. In the analysis, we divide regions into two categories with differing DAK impacts: (i) mainland and mainland-archipelago regions, which benefit from greater interconnectivity and potential spillover effects; and (ii) archipelagic regions, which tend to be more isolated and face distinctive logistical constraints. To ensure methodological clarity, we estimate separate fixed-effects models for each subgroup rather than relying on a pooled specification in the analysis. While the number of observations varies across groups, the estimators remain consistent, and we take differences in precision into account when interpreting comparative results. Table 6 shows the regression estimates.

As shown in Table 6, the panel regression results indicate that the poverty-reducing effectiveness of DAK in lagging regions is highly contingent on the geographical characteristics of recipient areas. In mainland and mainland-archipelago regions, the coefficients for aggregate DAK and its disaggregated components (physical and non-physical) are negative but statistically insignificant. This outcome suggests that the developmental benefits of DAK, whether through infrastructure investment or service provision, are insufficient to account for variations in poverty levels, potentially due to interregional spillover effects that attenuate the measurable impact within individual jurisdictions.

In archipelagic regions, aggregate DAK shows a statistically significant negative effect, with a 1% increase in allocation associated with an estimated 0.698% reduction in poverty incidence. The primary driver of this outcome is Physical DAK, which significantly lowers poverty by 0.35% for every 1% increase in funding. This finding shows that investing in physical infrastructure, such as roads, clean water supply, and other essential public facilities, is vital to improving welfare in remote island regions lacking basic services.

Taken together, to reduce poverty effectively, fiscal policy design under DAK must be tailored to local needs and the physical conditions of the regions.

Table 6 Partial Estimation Results of the Effects of Total, Physical, and Non-Physical DAK on Poverty Reduction in Lagging Regions by Geographical Characteristics: Mainland & Mainland-Archipelago (D)¹ and Archipelagic Areas (K)²

Variable	(1) Mainland & Mainland- Archipelago Regions (D)	(2) Mainland & Mainland- Archipelago Regions (D)	(3) Archipelagic Regions (K)	(4) Archipelagic Regions (K)
lnDAK	-0.325 (0.263)		-0.698** (0.274)	
lnPhysicalDAK		-0.075 (0.204)		-0.350** (0.161)
lnNon-PhysicalDAK		-0.057 (0.183)		-0.238 (0.282)
IPM	-0.563*** (0.069)	-0.554*** (0.090)	-0.656*** (0.148)	-0.650*** (0.135)
lnPDRBKap	1.091 (0.675)	1.208* (0.707)	0.778 (1.445)	1.140 (1.490)
PDRBgr	0.006 (0.016)	0.007 (0.016)	0.004 (0.025)	0.002 (0.022)
lnPAD	-0.094 (0.187)	-0.094 (0.196)	0.251 (0.163)	0.284 (0.220)
lnModal	0.011 (0.237)	-0.089 (0.251)	0.487 (0.282)	0.393 (0.294)
lnDD	-0.302 (0.293)	-0.538 (0.398)	1.252** (0.440)	1.241* (0.596)
lnDAU	3.005** (1.150)	1.235 (1.355)	1.935 (1.946)	1.938 (2.099)
lnDBH	0.224*** (0.085)	0.162* (0.083)	0.311* (0.156)	0.333 (0.202)
Constant	-14.981 (28.316)	37.134 (36.513)	-31.586 (55.899)	-34.953 (68.107)
Observations	609	600	105	104

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note: ¹ Mainland regions refer to areas contiguous with other mainland jurisdictions, whereas mainland-archipelago regions are those contiguous with other mainland jurisdictions but also encompassing surrounding island territories;

² Archipelagic regions denote areas composed entirely of islands, with administrative boundaries separated by sea.

Source: Processed by the authors

CONCLUSION

The findings of this study indicate that the poverty impact of DAK between 2015 and 2023 varies according to allocation type, regional characteristics, and geographical context. While total DAK does not show a significant effect at the national level, Non-Physical DAK consistently reduces poverty by improving human capital. In contrast, Physical DAK does not exhibit an immediate effect, suggesting that infrastructure spending improves welfare gradually over time through improved connectivity, productivity gains, and service accessibility. In lagging regions, total DAK significantly reduces poverty, although its components are individually insignificant. This indicates potential complementarities and local capacity constraints. Conversely, in non-lagging regions, only Non-Physical DAK demonstrates a significant effect. This implies that human capital-focused interventions generate more immediate poverty-reduction outcomes when supported by strong institutional and infrastructural foundations. Meanwhile, the effectiveness of Physical DAK depends on the quality of implementation, the availability of institutional capacity, and sufficient time for its impacts to diffuse throughout the economy. Geographical heterogeneity further reinforces these findings. DAK is more effective in archipelagic regions, primarily through physical components that finance basic infrastructure, whereas its effects in mainland regions are statistically insignificant. Although Non-Physical DAK has a smaller impact in archipelagic settings, it remains vital. It funds education and health services that, together with infrastructure, improve long-term human capital. These results underscore the importance of incorporating geographical considerations into the design of fiscal transfer policies.

Drawing on the empirical findings, the government should refine the DAK allocation formula by incorporating explicit regional typology criteria, such as lagging status and archipelagic characteristics, into both the base allocation and affirmative components, while ensuring complementary financing between Physical and Non-Physical DAK in lagging regions. In lagging and archipelagic areas, Physical DAK should

prioritize infrastructure that improves connectivity. It is also necessary to strictly monitor project completion and the use of fund. Meanwhile, Non-Physical DAK should be performance-linked to measurable improvements in education and health outcomes. In non-lagging regions, reallocating a larger share of DAK toward targeted human capital programs and service quality improvements, supported by outcome-based evaluation mechanisms, would enhance the marginal effectiveness of fiscal transfers in reducing poverty.

This study has several limitations that need to be acknowledged. First, because the estimation model excludes lags of the independent variables (DAK and its components), it does not fully capture the long-term poverty impacts of DAK. This implies a lack of analysis of the delayed effects of DAK allocation, particularly Physical DAK, which typically requires time to plan, disburse funds, and construct before communities can benefit. Second, the model does not estimate interregional spillover effects, which may lead to differences in the benefits of DAK across regions, especially in mainland areas or those with high connectivity. This aspect is important, as evaluating the effectiveness of DAK requires considering both its local impacts and its role in strengthening interregional networks.

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