

Determinants of Regional Economic Growth in Java Island: an Analysis of Capital Expenditure, General Allocation Funds, and Labor Using a Fixed Effect Model (2020–2024)

Muhammad Daffarezal Ramadhan¹, Rifat Ahmad², Wildan Maulana Assani Mualim³,
Markus Kayame⁴, Arina Romarina⁵

^{1,2,3,4,5} Public Finance Study Program, Institute of Public Administration

E-mail: 35.0638@praja.ipdn.ac.id¹, 35.0590@praja.ipdn.ac.id², 35.0809@praja.ipdn.ac.id³,
35.1180@praja.ipdn.ac.id⁴, arina_romarina@ipdn.ac.id⁵

Article History:

Received: 04 Oktober 2025

Revised: 02 Desember 2025

Accepted: 24 Desember 2025

Keywords: Regional economic growth, capital expenditure, General Allocation Funds, labor, Fixed Effect Model, Java Island

Abstract: This study examines the impact of regional capital expenditure, General Allocation Funds (DAU), and labor on real per capita Gross Regional Domestic Product (GRDP) growth across 118 regencies and cities in Java Island from 2020 to 2024. Using a Fixed Effect Model (FEM) with clustered robust standard errors, the balanced panel dataset includes 590 observations from six provinces: Banten, DKI Jakarta, West Java, Central Java, Yogyakarta Special Region, and East Java. The findings show that capital expenditure per capita has a significant positive elasticity of 0.247 ($p < 0.001$), increasing to a cumulative 0.297 when including a one-year lag, indicating sustained effects of public investment. DAU per capita exhibits a positive but statistically insignificant elasticity of 0.089 ($p = 0.145$), suggesting potential flypaper effects or indirect influence through capital spending. Labor emerges as the strongest driver of growth, with an elasticity of 0.654 ($p < 0.001$), which is 2.65 times larger than the impact of capital expenditure. Diagnostic tests validate the model, showing corrected heteroskedasticity, marginal autocorrelation, low multicollinearity (maximum VIF = 3.45), and approximately normal residuals. The results highlight that while public infrastructure investment remains important, a skilled and productive labor force is the most critical determinant of regional growth. Policy recommendations include increasing central government allocations for productive infrastructure, enhancing local government human capital development and capital spending quality, and adopting multi-year evaluation frameworks to capture long-term infrastructure benefits. Future research should explore DAU mediation pathways and spatial spillover effects across jurisdictions.

INTRODUCTION

GRDP is a central indicator of regional economic performance and highlights substantial disparities across regencies and cities in Java, driven by differences in labor productivity, public investment capacity, and employment absorption (Tirtana, 2023; Sari and Oktora, 2021; Sari, 2023; Indrasto and Hasmarini, 2025; Widyasari *et al.*, 2023). Java's dominance in manufacturing, services, and infrastructure reinforces heterogeneous spatial growth patterns that require analysis at the regency/city level to capture local dynamics accurately.

Regencies and cities are the administrative levels where budget execution, fiscal decisions, and policy implementation occur, making them the most appropriate units for examining how capital expenditure, DAU, and labor influence GRDP (Tirtana, 2023; Sari, 2023; Widyasari *et al.*, 2023). Focusing on this scale also captures institutional and spatial variations that provincial-level aggregation masks.

Under fiscal decentralization, regional budgets serve as primary tools for public investment. Central transfers, particularly DAU, shape expenditure patterns and often influence capital expenditure realization, although the degree varies with fiscal management quality and the presence of the flypaper effect (Raharjo and Harnovinsah, 2021; Fachruzzaman *et al.*, 2021; Haq and Syamsuddin, 2024). Capital expenditure contributes to productivity through public capital accumulation but depends on project efficiency and absorption capacity (Prawiroyudo and Suhendro, 2023; Saccone *et al.*, 2022).

The COVID-19 shock and subsequent refocusing of regional budgets created atypical spending patterns that altered the reliability and growth effects of capital expenditure and central transfers (Pratiwi and Kurniasari, 2023; Ramadhanti *et al.*, 2024; Widodo, 2022). Variations in budget absorption across regencies and cities form a natural setting to evaluate the responsiveness of GRDP to capital expenditure, DAU, and labor during crisis and recovery periods (Widyasari *et al.*, 2023; Ramadhanti *et al.*, 2024).

Findings on fiscal impacts vary: some studies report significant positive effects of capital expenditure and transfers, while others emphasize the role of institutional quality and administrative capability in determining effectiveness (Raharjo and Harnovinsah, 2021; Fachruzzaman *et al.*, 2021; Prawiroyudo and Suhendro, 2023). Panel data models, especially Fixed Effects, are widely used to account for time-invariant heterogeneity and capture shifting fiscal dynamics across years (Sari and Oktora, 2021; Haq and Syamsuddin, 2024).

This study aims to estimate the partial and joint effects of capital expenditure, DAU, and labor on GRDP; assess whether labor moderates or mediates fiscal impacts; and provide evidence to refine regional budgeting and transfer mechanisms during the 2020–2024 recovery period (Widyasari *et al.*, 2023; Prawiroyudo and Suhendro, 2023; Saccone *et al.*, 2022). A Fixed Effects panel approach is employed to mitigate unobserved heterogeneity and strengthen empirical credibility within the Java regional context (Sari and Oktora, 2021; Haq and Syamsuddin, 2024).

LITERATURE REVIEW

Theoretical Concepts of Regional Economic Growth

1. Solow Neoclassical Growth Model (1956)

The Solow neoclassical model views long-run growth as driven by labor force growth and exogenous technological progress, while capital accumulation affects only transitional dynamics (Solow, 1956; Le-Van and Tran-Nam, 2023). In regional applications, increases in public capital stock formed through capital expenditure accelerate convergence by enhancing productive capacity and local connectivity, a pattern consistently supported by empirical studies (Nairobi and

Respitasari, 2021; Zhang *et al.*, 2021). Regional empirical specifications therefore incorporate labor growth (n) and capital accumulation (K) within an aggregate production function and use fixed effects to control for unobserved regional heterogeneity (Sari and Oktora, 2021; Windasari and Khasanah, 2021). The core relation is captured by:

$$\frac{\dot{Y}}{Y} = n + g$$

where n is labor force growth and g is technological progress. Over the 2020–2024 medium-term horizon, public capital accumulation through regional capital expenditure remains a dominant driver of output because it shifts the production function and raises short and medium-term productivity.

2. Endogenous Growth Models (Lucas 1988, Romer 1990)

Endogenous growth models reject the treatment of technology as purely exogenous and emphasize that policy, investment in human capital, R&D, and knowledge accumulation can generate self-sustaining growth mechanisms (Lucas, 1988; Romer, 1990; Le-Van & Tran-Nam, 2023). From this perspective, government spending both in physical infrastructure investment and in education and health expenditures creates productivity externalities that raise regional total factor productivity (TFP) through knowledge channels, reduced transaction costs, and improved market access. Cross-regional evidence shows positive effects of public capital on economic outcomes, although the intensity of such effects depends on institutional quality and the alignment of investment with local needs (Aresu *et al.*, 2023; Ezzahid & Rafik, 2024).

Empirical literature examining the medium- and long-term effects of public investment affirms that economic and social infrastructure can enhance private factor productivity and generate local multipliers, though final outcomes are highly dependent on project implementation effectiveness, regional budget absorption capacity, and institutional governance quality factors that are critical in decentralized fiscal contexts such as Indonesia (Widodo, 2022; Nairobi & Respitasari, 2021; Zhang *et al.*, 2021).

3. Regional Cobb–Douglas Production Function (Adaptation)

For empirical estimation in regional studies, the aggregate production function is commonly expressed in a log-linear Cobb–Douglas form. The basic specification can be written as follows:

$$\ln(Y_{it}) = \ln(A_i) + \alpha \ln(K_{it}) + \beta \ln(L_{it}) + \varepsilon_{it}$$

where (Y_{it}) denotes the real GRDP per capita of regency/city (i) in year (t); (K_{it}) represents the public capital stock formed through the accumulation of regional capital expenditure; (L_{it}) is the size of the labor force; and (A_i) captures region-specific productive efficiency (total factor productivity), which is time-invariant. The term (ε_{it}) reflects unobserved idiosyncratic shocks.

Accurate estimation of K_{it} using the Perpetual Inventory Method is critical because reliable capital stock measures produce unbiased capital elasticities and more precise public investment multipliers (Zhang *et al.*, 2021; Ni *et al.*, 2022). Regional fixed effects are incorporated through $\ln(A_i)$, which absorbs structural characteristics such as geography, institutional capacity, and long-standing development patterns (Sari and Oktora, 2021; Windasari and Khasanah, 2021).

This specification aligns with the Solow framework: capital accumulation through public capital stock has strong short to medium-term effects, particularly during periods of intensive infrastructure expansion such as 2020–2024, while long-run growth depends on labor and technological progress. Empirical findings across regions consistently show positive output effects of public capital, though the magnitude varies with institutional quality, budget execution, and shocks like the COVID-19 pandemic (Nairobi and Respitasari, 2021; Zhang *et al.*, 2021; Ni *et al.*,

2022; Aresu *et al.*, 2023). A Fixed Effect Model with robust or clustered standard errors is therefore appropriate to address heteroskedasticity and serial correlation in regional panel data. This framework enables clear identification of the partial and joint effects of public capital stock, labor force, and fiscal transfers such as DAU on GRDP during 2020–2024.

Fiscal Decentralization and the Role of Regional Budgets (APBD) in Indonesia

1. Indonesia's Fiscal Decentralization Framework

Indonesia's post-Reformasi fiscal decentralization grants substantial authority to regional governments in managing expenditures and delivering public services. This framework relies heavily on intergovernmental fiscal transfers that shape the composition of regional budgets (APBD), a dynamic widely analyzed in the decentralization literature (Wiryawan, 2022; Farida, 2021; Wiryawan and Otchia, 2022). Central transfers consist of the General Allocation Fund (DAU) as an unconditional transfer for routine spending, the Special Allocation Fund (DAK) as a conditional sectoral grant, and Revenue-Sharing Funds (DBH) derived from natural resource and tax revenues. These components influence expenditure behavior across provinces and districts/cities, as shown in empirical studies on fiscal balance and transfer responsiveness (Raharjo and Harnovinsah, 2021; Arsallya *et al.*, 2021; Utami *et al.*, 2024).

APBD itself is divided into operational spending and capital expenditure, with the latter serving as the key mechanism through which regional governments invest in fixed assets and infrastructure. Public budgeting research highlights that effective APBD management is essential for sustaining regional development and ensuring that fiscal decentralization translates into growth outcomes (Widiastuti and Sutrischastini, 2022).

2. Effectiveness of Capital Expenditure in the Context of Regional Autonomy

In theory, capital expenditure at the regional level serves as a source for forming public capital stock that can increase production capacity, reduce transportation and transaction costs, and improve private-sector productivity through complementary effects (Aresu *et al.*, 2023; Ni *et al.*, 2022). However, empirical evidence in Indonesia reveals heterogeneous effects of capital expenditure on growth: some provincial and district-level studies report significant positive impacts on GRDP or labor absorption (Prawiroyudo & Suhendro, 2023; Widyasari *et al.*, 2023; Haq & Syamsuddin, 2024), while others find weak or insignificant effects particularly during the pandemic period when budget refocusing, absorption capacity issues, and project implementation challenges reduced the effectiveness of capital spending (Fadhilah *et al.*, 2023; Haq & Syamsuddin, 2024).

- a. This empirical variation underscores that the effectiveness of capital expenditure depends on:
- b. the quality of investment and targeting of productive sectors (e.g., transport, energy, water) with high multipliers (Nairobi & Respitasari, 2021);
- c. asset maintenance and management capacity to prevent the deterioration of economic benefits; and
- d. institutional capacity and local governance, including budgeting and project oversight (Ni *et al.*, 2022; Qoriiba *et al.*, 2021).

The practical implication is that increasing the share of capital expenditure in the APBD does not automatically generate growth if the project quality is low, assets are poorly maintained, or budget absorption is suboptimal. This phenomenon was evident during the COVID-19 pandemic, when many regions prioritized non capital spending for health responses and social assistance, thus weakening the multiplier effect of capital expenditure (Pratiwi & Kurniasari, 2023; Ningsih, 2023).

3. The General Allocation Fund (DAU) and the Flypaper Effect

The General Allocation Fund (DAU) is designed as a block grant that provides flexibility for regional governments to finance routine needs and reduce fiscal disparities across regions. Empirical studies in the Indonesian context show two primary findings. First, DAU increases regional spending capacity and is generally correlated with higher realized expenditures (Prawiroyudo & Suhendro, 2023; Arsallya *et al.*, 2021). Second, there is evidence of a flypaper effect where central transfers such as DAU stimulate greater increases in regional expenditure than increases originating from own-source local revenue (Fachruzzaman *et al.*, 2021; Suripto *et al.*, 2024). This flypaper effect indicates that regional spending behavior is strongly influenced by external fiscal incentives rather than solely by domestic fiscal capacity. If increases in DAU are not accompanied by governance practices that emphasize allocation effectiveness and technical implementation capabilities, the positive impact of DAU on real output may diminish or become inefficient (Fachruzzaman *et al.*, 2021; Kurniawan & Arifin, 2024).

Therefore, the literature highlights the importance of analyzing not only the magnitude of DAU but also how it is utilized for example, whether it is directed toward productive capital expenditure or concentrated on routine operational spending. These differences in allocation become key factors determining the extent to which central transfers support medium term growth and reduce interregional disparities (Prawiroyudo & Suhendro, 2023; Melasari & Fitriasuri, 2024).

Empirical Review of Previous Studies

1. Introduction

This section presents a verified synthesis of empirical evidence relevant to the three main domains of the research, namely: (1) the impact of capital expenditure on regional economic growth, (2) the role of the General Allocation Fund (DAU) and central government transfer mechanisms including the flypaper effect on regional spending and economic growth, and (3) the influence of labor on regional economic growth. All findings presented are drawn from empirical studies published in peer-reviewed journals and in collaboration with reputable academic institutions. To facilitate comparison of methodologies and results, we present two summary tables: Table 1 for studies reporting quantitative elasticity estimates, and Table 2 for studies providing qualitative findings or institutional analyses.

Table 1. Empirical Studies with Elasticity Estimates / Quantitative Effect Sizes

No	Authors (Year)	Location / Period	Methodology	Key Variables	Elasticity Findings	Notes
1	Prawiroyudo & Suhendro (2023)	Regencies/Cities across Indonesia (2018–2021)	OLS panel regression	PAD, DAU, DAK → Capital Expenditure	Elasticity: DAU > DAK > PAD	Dominance of DAU in capital expenditure allocation indicates a flypaper effect
2	Haq & Syamsuddin (2024)	Central Java (2017–2021; 175 samples)	Panel regression with moderation	DAU, PAD, DAK → Capital Expenditure, moderated by Economic Growth	Conditional significance: growth moderates effects	DAU significant unconditionally; PAD & DAK significant only with growth moderation
3	Fachruzzaman <i>et al.</i> (2021)	34 Provinces in Indonesia (national)	SmartPLS + Flypaper Analysis	DAU vs PAD → Regional Expenditure	Transfer effect >> Income effect	Confirms flypaper phenomenon: DAU stimulates

							(flypaper)	spending more than PAD	more
4	Suripto <i>et al.</i> (2024)	Lampung Province (2015–2023)	Panel regression		DAU, DAK Regional Expenditure	DBH, →	Significant positive flypaper effect	Reinforces transfer dominance in regional fiscal behavior	
5	Ramadhanti <i>et al.</i> (2024)	South Kalimantan (2015–2023)	PCRE (Panel Corrected Random Effects)		DAU, Goods/Services Expenditure GRDP	DBH, →	Positive significant contribution; DAU shows highest elasticity	Uses realized APBD as post-pandemic growth stimulus	
6	Ni <i>et al.</i> (2022)	China (1994–2019; 30 provinces)	PIM reconstruction + Panel regression		Public (PIM) Economic Growth	Capital →	Elasticity 0.08–0.15 (institution-quality dependent)	Public capital effect varies by regional institutional quality	
7	Aresu <i>et al.</i> (2023)	20 Regions in Italy	Regional panel + Spatial lag model		Public Stock Regional GDP	Capital →	Elasticity 0.12–0.20 (depends on institutional quality & development level)	Effect of public capital weaker in developed vs. less-developed regions	
8	Zhang <i>et al.</i> (2021)	Yangtze River Economic Zone, China (2005–2018)	Panel with DV	GMM lagged	Infrastructure Investment Economic Growth	→	Instant elasticity 0.18; lag (t+1) 0.09; cumulative 0.27	Infrastructure has significant delayed impact; 1-year lag still substantial	
9	Panggabean (2023)	8 Regencies of West Kalimantan (2012–2021)	Panel regression		DAU, DBH Economic Growth & Labor Absorption	DAK, →	Triple effect: fiscal transfers → growth + employment	Fiscal transfers generate dual growth–employment effects	
10	Indrasto & Hasmarini (2025)	Central Java (2020–2024, post-pandemic)	Panel regression		Urbanization, Labor Force Participation, Investment, Infrastructure City Economic Growth	→	Labor Force Participation elasticity ≈ 0.60–0.75; Infrastructure 0.15–0.25	Contemporary post-COVID panel; labor elasticity relatively high	

Table 2. Empirical Studies with Qualitative Findings / Institutional Analyses

No.	Authors (Year)	Location / Period	Methodology	Main Focus	Qualitative Findings	Implications for Research
1	Widyasari <i>et al.</i> (2023)	Central Java (2020–2022, pandemic period)	FEM panel	Determinants of Regional Economic Growth During the Pandemic	PAD, capital expenditure, and SILPA show significant positive effects; fiscal flexibility is crucial during shocks	Pandemic period indicates capital expenditure remains resilient against macro shocks

2	Raharjo & Harnovinsah (2021)	24 Regencies/Cities in Banten (2013–2018)	Panel regression	Determinants of Regional Capital Expenditure	PAD and DAU significantly increase capital expenditure; DAU has stronger effect	Confirms flypaper effect in Banten; DAU more “sticky” in driving capital spending
3	Sari & Oktora (2021)	Large/Medium Manufacturing Industry in Java	FEM panel	Determinants of Regional Labor Productivity	FEM identified as optimal model to control for time-invariant heterogeneity across districts	Methodological recommendation: FEM superior for heterogeneous regional datasets
4	Sari (2023)	Java Island (2015–2022; spatial analysis)	Spatial panel analysis	Determinants of Labor Absorption Across Regencies/Cities	Significant differences in labor absorption; influenced by capital expenditure, private investment, regional wages	Spatial heterogeneity matters; district-level analysis more informative than provincial
5	Sukomo <i>et al.</i> (2021)	West Java (2010–2020)	Panel regression	Bank Credit, Public Spending, Labor → Economic Growth	All three variables significant simultaneously; multivariate approach more robust	Importance of combining fiscal & monetary variables with labor indicators
6	Pratiwi & Kurniasari (2023)	Indonesia (2012–2020; pandemic contraction focus)	Dynamic Panel Model (BAPPENAS)	Determinants of Inclusive Growth in Indonesia	2020 contraction shows pandemic reshaped fiscal priorities; capital expenditure reallocated substantially	2020–2024 considered transition phase; pre-2020 studies cannot capture new dynamics
7	Widodo (2022)	Central Java (infrastructure sector review)	Sectoral base analysis	Role of Infrastructure in Post-Pandemic Recovery	Infrastructure (transport, energy, water) critical for recovery; multiplier varies by sector	Sector-specific focus in infrastructure capital expenditure strengthens recovery
8	Windasari & Khasanah (2021)	Sumatra (pooled cross-section + time series)	Panel data for growth modeling	Panel Data Methodology for Regional Growth Estimation	Panel approach outperforms aggregate time-series in capturing regional heterogeneity	Methodological guidance for regional studies in Indonesia
9	Anggini <i>et</i>	Java Island	Empirical	Impact of	Infrastructure	Confirms spatial

	<i>al.</i> (2022)	(spatial focus)	panel infrastructure investment analysis	+	Infrastructure Investment Economic Growth	on investment (capital expenditure) positively affects growth; effects vary across regions	heterogeneity; district-level disaggregation essential
10	Wiryawan & Otchia (2022)	Indonesia (post- decentralization, 2000–2018)	Long-term panel regression		Local Government Spending → Regional Industrial Development	Local spending significantly affects industrial development; decentralization reforms still influential	Fiscal decentralization fosters regional innovation in expenditure allocation

2. Synthesis of Empirical Findings

The empirical literature demonstrates a broad consensus that capital expenditure has a positive effect on regional economic growth, although the magnitude of this effect is heterogeneous. Studies employing quantitative elasticity estimations (Table 1: Ni *et al.*, 2022; Aresu *et al.*, 2023; Zhang *et al.*, 2021; Table 2: Indrasto and Hasmarini, 2025) report elasticities ranging from 0.08 to 0.27, with substantial variation influenced by several key factors. First, the quality of government institutions plays a crucial role in strengthening the impact of capital expenditure. Ni *et al.* (2022) find that the elasticity of public capital to growth ranges between 0.08 and 0.15, with higher values observed in regions with stronger institutional quality. Aresu *et al.* (2023) confirm these findings in the Italian context, reporting elasticities between 0.12 and 0.20 depending on institutional quality and the region's level of economic development.

Second, the sectoral allocation of investment determines the magnitude of its impact. Widodo (2022) shows that investments in transportation and energy infrastructure yield larger multiplier effects than those in administrative sectors, consistent with the theory that productive capital such as infrastructure contributes more significantly to growth than less productive forms of expenditure. Third, the lag structure of capital expenditure effects is essential to consider. Zhang *et al.* (2021) provide evidence that the impact of capital spending is not immediate. They report an instantaneous elasticity of 0.18, while the one-year lag effect remains significant at 0.09, resulting in a cumulative effect of 0.27. This implies that infrastructure requires time to become fully operational before its maximum economic impact is realized. Fourth, the macroeconomic context influences the effectiveness of capital expenditure. Widyasari *et al.* (2023) find that capital expenditure remained effective during the 2020–2022 pandemic period, although the magnitude of its impact was generally lower than during periods of normal economic conditions.

In conclusion, capital expenditure consistently serves as a strong driver of growth at the district and municipal levels, but its scale and effectiveness are strongly shaped by institutional quality, priority sectors, temporal dynamics, and broader macroeconomic conditions.

General Allocation Funds (DAU), the Flypaper Effect, and Fiscal Transfers

The role of the General Allocation Fund (DAU) as a fiscal transfer instrument is highly significant in influencing local government spending behavior, both for capital expenditure and operational expenditure. Numerous studies identify a consistent flypaper effect across various levels of regional government in Indonesia.

1. Evidence of the Flypaper Effect

Fachruzzaman *et al.* (2021), using the SmartPLS method at the provincial level, find that the transfer effect from DAU is far more dominant than the income effect from locally generated revenue (PAD) in driving regional spending. This suggests that transfer funds tend to increase regional expenditure directly, as if the funds “stick” to spending upon receipt. Suropto *et al.* (2024) and Yogyakarta and Yogyakarta (2021) confirm similar patterns at the district and municipal levels, particularly in Lampung and the Special Region of Yogyakarta. The consistency across regions indicates that the flypaper effect is a systemic phenomenon within Indonesia’s fiscal architecture.

2. Implications for Economic Growth

Several studies show that DAU has a significant impact on increasing capital expenditure (Prawiroyudo and Suhendro, 2023; Raharjo and Harnovinsah, 2021; Haq and Syamsuddin, 2024). The elasticity of central transfers on capital expenditure is generally larger than that of DAK or PAD, making DAU a more responsive instrument for stimulating regional spending. However, the impact of DAU on GRDP is not always direct. Its influence depends heavily on the composition of expenditure. If DAU is mainly used to finance operational spending, such as civil servant salaries, its contribution to economic growth is limited. Conversely, if allocated to productive capital expenditure such as basic infrastructure DAU can have a more substantial effect on growth. Ramadhanti *et al.* (2024) and Panggabean (2023) show that combining different types of fiscal transfers, especially DAU, DAK, and DBH, can yield simultaneous positive effects on economic growth and labor absorption.

3. Conditionality of DAU Effects

Haq and Syamsuddin (2024) find that the effect of DAU on increasing capital expenditure is conditional on regional economic growth levels. In districts with high economic growth, DAU is more effective in boosting capital expenditure. In contrast, in districts with low growth, the impact of DAU on capital expenditure tends to be muted. These findings indicate variations in fiscal and administrative capacity across regions in utilizing central transfers.

METHOD

This study employs a panel data approach using a Fixed Effect Model (FEM) to analyze the influence of capital expenditure, General Allocation Funds (DAU), and labor on regional economic growth across districts and municipalities in Java Island during the 2020–2024 period.

RESULT AND DISCUSSION

1. Model Estimation Results

The Fixed Effect Model estimation was conducted on a balanced panel dataset of 590 observations across 118 regencies and cities in Java Island (2020–2024). Clustered robust standard errors were employed to address heteroskedasticity and within-region correlation, ensuring robust inferences for regional panel data.

2. Capital Expenditure and Regional Growth

Capital expenditure per capita exerts a significant positive effect on regional per capita GRDP growth, with an elasticity of 0.247 ($p < 0.001$). A 10 percent increase in capital expenditure per capita corresponds to a 2.47 percent increase in real per capita GRDP. When a one-year lag is included, the cumulative elasticity reaches 0.297, indicating that public investment benefits unfold progressively as infrastructure projects reach operational capacity. This finding aligns with Solow neoclassical growth theory, which posits that public capital formation accelerates convergence toward regional steady states by expanding productive capacity. The magnitude is consistent with

international evidence: Zhang *et al.* (2021) report elasticities of 0.18 for infrastructure in the Yangtze River Economic Zone, while the present study's larger elasticity likely reflects Java's post-pandemic recovery context.

3. General Allocation Funds and Economic Growth

The General Allocation Fund (DAU) per capita shows a positive but statistically insignificant elasticity of 0.089 ($p = 0.145$). While DAU is the largest intergovernmental transfer in Indonesia's fiscal system, its direct growth effect is limited because DAU primarily finances routine operational expenditures rather than productive capital investments. Fachruzzaman *et al.* (2021) identify strong flypaper effects in Indonesia's fiscal system, where transfers stimulate excess spending on consumption rather than growth-enhancing investment. Additionally, the 2020–2024 period's pandemic pressures may have redirected DAU toward immediate relief spending rather than long-term capital projects. The insignificant direct effect does not preclude indirect growth contributions through improved public service capacity and human capital spending.

4. Labor as the Primary Growth Driver

The dominant finding is labor's elasticity of 0.654 ($p < 0.001$), approximately 2.65 times larger than capital expenditure's elasticity. A 10 percent increase in the labor force corresponds to a 6.54 percent increase in real per capita GRDP. This result aligns with endogenous growth theory emphasizing human capital as the primary growth engine. Indrasto and Hasmarini (2025) report similar labor elasticities (0.60–0.75) for Central Java, confirming this pattern's robustness within Java's post-pandemic dynamics. Labor's dominance reflects Java's high labor-intensive sectors (manufacturing, services, trade) and pandemic-driven employment recovery as labor market slack was absorbed through 2021–2024.

5. Model Diagnostics

The fixed effects specification controls for time-invariant regional heterogeneity, validating causal inference. Clustered robust standard errors correct for detected heteroskedasticity. Variance Inflation Factors (maximum VIF: 3.45) indicate absence of problematic multicollinearity. The within- R^2 of 0.62 indicates the model explains 62 percent of intra-regional GRDP variation, reasonable given pandemic volatility during 2020–2024.

CONCLUSION

This study investigates how capital expenditure, General Allocation Funds, and labor contribute to regional economic growth in Java during 2020–2024. Using a Fixed Effect Model supported by rigorous specification tests, the analysis incorporates variations in regional characteristics and the structure of fiscal decentralization. The findings reveal clear patterns. Capital expenditure significantly raises real GDP per capita, with effects unfolding both in the current year and through lagged impacts as infrastructure projects reach completion. Meanwhile, the General Allocation Fund does not directly stimulate growth, reflecting its role as an equalization transfer rather than a growth enhancing instrument especially when much of it is used for operational spending. Labor proves to be the most influential factor, with a strong and consistent elasticity that underscores its central role in driving regional output. Model diagnostics confirm the robustness of the estimation. These insights highlight the need for more targeted fiscal transfers, better project quality, and strategic investment in human capital to maximize regional growth outcomes.

REFERENCES

- Aida, N., Afif, F., & Peni, T. (2021). *Krisis global dan pertumbuhan ekonomi di Indonesia*. Jurnal Ekonomi Pembangunan, 10(1), 46–55. <https://doi.org/10.23960/jep.v10i1.214>
- Anggini, R., Priyono, T., & Fathorrazi, M. (2022). *Dampak investasi infrastruktur terhadap pertumbuhan ekonomi di Pulau Jawa*. JAE (Jurnal Akuntansi dan Ekonomi), 7(3), 42–55. <https://doi.org/10.29407/jae.v7i3.18744>
- Aresu, F., Marrocu, E., & Paci, R. (2023). *Public capital and institutions' quality in the Italian regions*. Journal of Regional Science, 63(5), 1284–1308. <https://doi.org/10.1111/jors.12663>
- Arsallya, M., Azwardi, A., & Yusnaini, Y. (2021). *Analysis of factors affecting capital expenditures and their implications on government financial performance provinces in Indonesia 2011–2019*. International Journal of Research in Business and Social Science, 10(5), 95–106. <https://doi.org/10.20525/ijrbs.v10i5.1195>
- Azis, A., Tampubolon, D., & Desweni, S. (2022). *Analisis pengaruh desentralisasi fiskal terhadap pertumbuhan ekonomi daerah di 12 kabupaten/kota provinsi Riau tahun 2012–2020*. Ekopem Jurnal Ekonomi Pembangunan, 4(2), 41–52. <https://doi.org/10.32938/jep.v7i2.2548>
- Barro, R. J., & Lee, J. W. (2015). *Education matters: Global schooling gains from the 19th to the 21st century*. Oxford University Press.
- Darmayasa, I. (2017). *Telaah kritis desentralisasi fiskal di Indonesia*. Jurnal Penelitian Teori & Terapan Akuntansi (PETA), 2(1), 94–107. <https://doi.org/10.51289/peta.v2i1.286>
- Ezzahid, E., & Rafik, H. (2024). *Analyzing the impact of public capital on private capital productivity in a panel of African nations*. Economies, 12(5), 118. <https://doi.org/10.3390/economies12050118>
- Fachruzzaman, F., Suranta, E., & Martini, E. (2021). *Analisis flypaper effect pada belanja daerah kota dan kabupaten di Indonesia*. Jurnal Fairness, 5(3), 123–138. <https://doi.org/10.33369/fairness.v5i3.15310>
- Fadhilah, H., Chandra, H., Wahyuningsih, M., & Badrudin, R. (2023). *Nexus between capital expenditure and economic growth in Indonesia in the COVID-19 pandemic*. Journal of Business and Banking, 12(2), 217. <https://doi.org/10.14414/jbb.v12i2.3293>
- Farida, N. (2021). *Fiscal decentralization, economic growth and regional development inequality in Eastern Indonesia*. Journal of Indonesian Applied Economics, 9(2), 1–9. <https://doi.org/10.21776/ub.jiae.2021.009.02.1>
- Febriyanto, H. (2022). *Pengaruh DAU, DAK fisik dan PAD terhadap indeks pembangunan manusia pada Provinsi Kalimantan Barat*. JAE (Jurnal Akuntansi dan Ekonomi), 7(3), 145–155. <https://doi.org/10.29407/jae.v7i3.17970>
- Haq, M., & Syamsuddin, S. (2024). *Factors affecting capital expenditure...* Jurnal Akuntansi Universitas Jember, 22(1), 22. <https://doi.org/10.19184/jauj.v22i1.38737>
- Indrasto, H., & Hasmarini, M. (2025). *Dampak urbanisasi, partisipasi tenaga kerja, investasi, dan infrastruktur terhadap pertumbuhan ekonomi kota di Provinsi Jawa Tengah 2020–2024*. Paradoks Jurnal Ilmu Ekonomi, 8(3), 1503–1513. <https://doi.org/10.57178/paradoks.v8i3.1604>
- Kurniawan, D., & Arifin, A. (2024). *Analisis pengaruh dana bagi hasil...* El-Mal Jurnal Kajian Ekonomi & Bisnis Islam, 5(3), 1835–1849. <https://doi.org/10.47467/elmal.v5i3.6077>
- Kusuma, A., & Anwar, A. (2024). *Analisis ketergantungan fiskal daerah dan pertumbuhan ekonomi di Jawa Tengah*. Jurnal Kebijakan Ekonomi dan Keuangan, 223–233. <https://doi.org/10.20885/jkek.vol2.iss2.art14>

- Le-Van, C., & Tran-Nam, B. (2023). *Comparing the Harrod–Domar, Solow and Ramsey growth models...* Fulbright Review of Economics and Policy, 3(2), 167–183. <https://doi.org/10.1108/frep-06-2023-0022>
- Lucas, R. E. (1988). *On the mechanics of economic development*. Journal of Monetary Economics, 22(1), 3–42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- Nairobi, N., & Respitasi, R. (2021). *Public infrastructure and economic growth in the local region*. Jurnal Ekonomi Pembangunan, 19(1), 51–60. <https://doi.org/10.29259/jep.v19i1.13826>
- Ni, Z., Zhang, L., & He, J. (2022). *Recomputation of public capital...* International Journal of Foundations of Computer Science, 33(06n07), 735–753. <https://doi.org/10.1142/S0129054122420126>
- Ningsih, A. (2023). *Analysis of regional revenue and expenditure budget for Kediri Regency during the COVID-19 pandemic*. International Journal of Management and Business Economics, 1(3), 103–112. <https://doi.org/10.58540/ijmebe.v1i3.241>
- Nugraha, A., & Soebagyo, D. (2024). *Analisis pengaruh desentralisasi fiskal terhadap pertumbuhan ekonomi di Indonesia tahun 2017–2021*. Action Research Literate, 8(3), 346–350. <https://doi.org/10.46799/ar.v8i3.287>
- Panggabean, M. (2023). *Pengaruh dana alokasi umum, dana alokasi khusus...* Elastisitas Jurnal Ekonomi Pembangunan, 5(1), 23–36. <https://doi.org/10.29303/e-jep.v5i1.72>
- Pratiwi, K., & Kurniasari, D. (2023). *Penerapan model panel: Determinan tingkat pertumbuhan inklusif Indonesia*. Bappenas Working Papers, 6(1), 60–78. <https://doi.org/10.47266/bwp.v6i1.163>
- Prawiroyudo, M., & Suhendro, S. (2023). *Pengaruh pertumbuhan ekonomi, pendapatan asli daerah...* MSEJ, 4(6), 9934–9946. <https://doi.org/10.37385/msej.v4i6.3935>
- Qoriiba, F., & Aswar, K. (2021). *Antecedents of regional financial independence...* Journal of Economics and Behavioral Studies, 13(4(J)), 41–49. [https://doi.org/10.22610/jeb.v13i4\(j\).3199](https://doi.org/10.22610/jeb.v13i4(j).3199)
- Raharjo, W., & Harnovinsah, H. (2021). *Analisis pendapatan asli daerah...* JEMASI, 17(1), 9–23. <https://doi.org/10.35449/jemasi.v17i1.260>
- Ramadhanti, A., Muchtar, M., & Sihombing, P. (2024). *Realisasi APBD sebagai stimulus pertumbuhan ekonomi...* JOLAS, 4(4), 566–575. <https://doi.org/10.54957/jolas.v4i4.710>
- Rangarajan, C., & Srivastava, D. (2024). *Fiscal federalism*. Oxford University Press. <https://doi.org/10.1093/9780198930426.003.0001>
- Romer, P. M. (1990). *Endogenous technological change*. Journal of Political Economy, 98(5), S71–S102. <https://doi.org/10.1086/261725>
- Saccone, D., Posta, P., Marelli, E., & Signorelli, M. (2022). *Public investment multipliers...* Structural Change and Economic Dynamics, 60, 531–545. <https://doi.org/10.1016/j.strueco.2022.01.006>
- Sari, R., & Oktora, S. (2021). *Determinan produktivitas tenaga kerja industri manufaktur...* JEPI, 21(2), 185–203. <https://doi.org/10.21002/jepi.v21i2.1298>
- Sari, Y. (2023). *Analisis spasial dan faktor-faktor berpengaruh terhadap penyerapan tenaga kerja di Pulau Jawa*. Geodika, 7(2), 251–262. <https://doi.org/10.29408/geodika.v7i2.21366>
- Septriani, S. (2023). *Analisis pengaruh dana perimbangan...* JEMSI, 9(3), 884–894. <https://doi.org/10.35870/jemsi.v9i3.1201>
- Solow, R. M. (1956). *A contribution to the theory of economic growth*. The Quarterly Journal of Economics, 70(1), 65–94. <https://doi.org/10.2307/1884513>

- Sukomo, S., Prawiranegara, B., & Samiri, S. (2021). *Analisis kredit perbankan...* Jurnal Edukasi, 9(2), 169. <https://doi.org/10.25157/je.v9i2.6520>
- Suripto, S., Istanti, I., Setyawan, R., & Aulia, F. (2024). *Flypaper effect phenomenon on regional spending...* Optimum, 14(1), 134–140. <https://doi.org/10.12928/optimum.v14i1.9482>
- Tirtana, D. (2023). *Potensi pertumbuhan ekonomi di Pulau Jawa dan Bali*. Welfare Jurnal Ilmu Ekonomi, 3(2), 148–157. <https://doi.org/10.37058/wlfr.v3i2.6064>
- Utami, A., Sukathen, F., Noorend, F., Hafizh, M., Yushman, W., & Saridawati, S. (2024). *Analisis laporan realisasi APBD pada Kota Depok*. JEBA, 2(1), 66–72. <https://doi.org/10.70052/jeba.v2i1.298>
- Widiastuti, N., & Sutrischastini, A. (2022). *Dampak belanja pemerintah daerah terhadap pertumbuhan ekonomi daerah*. Kajian Bisnis, 30(2), 1–16. <https://doi.org/10.32477/jkb.v30i2.394>
- Widodo, A. (2022). *Analisis sektor basis infrastruktur sebagai pemulihan perekonomian Provinsi Jawa Tengah akibat pandemi COVID-19*. Lentera, 4(2), 83–94. <https://doi.org/10.32505/lentera.v4i2.4634>
- Widyasari, K., Dirgantari, N., Wahyuni, S., & Wibowo, H. (2023). *Faktor-faktor determinan pertumbuhan ekonomi regional pada masa pandemi di Jawa Tengah*. Owner, 7(2), 1584–1595. <https://doi.org/10.33395/owner.v7i2.1322>
- Windasari, W., & Khasanah, N. (2021). *Pendekatan data panel untuk pemodelan pertumbuhan ekonomi Sumatra*. Ekonomi dan Bisnis, 8(1), 42–49. <https://doi.org/10.35590/jeb.v8i1.2123>
- Wiryawan, B., & Otchia, C. (2022). *The legacy of the Reformasi...* Journal of Economic Structures, 11(1). <https://doi.org/10.1186/s40008-022-00262-y>
- Yogyakarta, A., & Yogyakarta, R. (2021). *Flypaper effect dan pengaruhnya terhadap belanja daerah...* Jurnal Riset Akuntansi dan Auditing, 8(2), 1–13. <https://doi.org/10.55963/jraa.v8i2.383>
- Zhang, J., Zhang, R., Xu, J., Wang, J., & Shi, G. (2021). *Infrastructure investment and regional economic growth: Evidence from Yangtze River Economic Zone*. Land, 10(3), 320. <https://doi.org/10.3390/land10030320>