



Determinants of Inclusive Growth in Java: Evidence from District-Level Panel Data (2019–2023)

I Wayan Suparta¹; Mairizal Salehudin Siatan²; Marselina³; Hanif Hanif⁴

^{1,2,3}University of Lampung, Indonesia

⁴Universitas Islam Negeri Raden Intan Lampung, Indonesia

¹Correspondence Email: wayan.suparta@feb.unila.ac.id

Received: June 5, 2025

Accepted: January 21, 2025

Published: January 30, 2026

Article Url: <https://journal.scadindependent.org/index.php/jipeuradeun/article/view/2111>

Abstract

This study aims to examine the patterns and determinants of inclusive economic growth across districts and cities in Java Island by explicitly accounting for regional structural heterogeneity. Using secondary panel data from 23 regencies/cities over the period 2019–2023, the analysis employs panel data regression within the Klassen Typology framework to distinguish between developed and rapidly growing regions and developed but depressed regions. The findings indicate that economic growth consistently contributes positively to inclusive growth across regions, although its magnitude varies by regional typology. Human capital, financial inclusion, employment opportunities, and road infrastructure are found to enhance inclusiveness in both regional groups, while income inequality persistently constrains inclusive outcomes. Poverty significantly reduces inclusiveness only in developed and rapidly growing regions, whereas sanitation infrastructure plays a more prominent role in supporting inclusive growth in structurally constrained regions. These results demonstrate that inclusive growth mechanisms are context-dependent and region-specific, highlighting the limitations of uniform development policies. By integrating district-level panel data with a regional typology approach, this study contributes to the inclusive growth literature by emphasizing the importance of structural differentiation in translating economic growth into equitable development outcomes.

Keywords: *Inclusive Economic Growth; Regional Typology; Panel Data; Economic Inequality; Java Island.*

A. Introduction

Inclusive economic growth has emerged as a central development paradigm in response to the inherent limitations of conventional growth-oriented approaches that prioritize aggregate output expansion while neglecting the distribution of economic benefits across social groups (Hidayah, 2023; Md Radzi et al., 2024). A growing body of literature demonstrates that development strategies excessively focused on Gross Domestic Product (GDP) growth often generate adverse outcomes, including social exclusion, widening income inequality, persistent structural poverty, and environmental degradation, particularly affecting poor and marginalized populations (Muftiyatul Azizah, 2002; Hartati, 2021; Aggarwal, 2023; Nordin et al., 2025; Nosach et al., 2024). These shortcomings have prompted a fundamental shift in development thinking, emphasizing that economic progress should be evaluated not only by the speed of growth but also by the extent to which growth outcomes are equitably shared (Hidayah, 2023; Md Radzi et al., 2024).

Empirically, inclusive growth is characterized by sustained increases in real income per capita accompanied by declining poverty, reduced inequality, and expanded employment opportunities that enable broader economic participation across social groups (Klasen, 2017; Habito, 2009; Garwi, 2023). This multidimensional perspective underscores that growth is inclusive only when economic expansion translates into tangible welfare improvements and enhanced access to productive opportunities for a wide segment of society. In Indonesia, inclusive growth has been formally adopted as a national development objective and operationalized through measurement frameworks developed by the National Development Planning Agency (BAPPENAS), which seek to capture not only growth performance but also its distributional and access-related dimensions.

Within this national context, Java Island occupies a uniquely strategic position. As the engine of Indonesia's economy, Java accounts for a dominant share of national output, investment, and employment, making its development trajectory crucial in determining not only the pace but also the quality of inclusive growth at the national level. The concentration of industrial activities, financial services, and human capital on Java places the island at the center of structural transformation, while simultaneously intensifying spatial inequality between and within provinces. BAPPENAS data on the

Inclusive Growth Index reveal notable variation in inclusiveness across provinces on Java during the 2019–2023 period, indicating that economic dynamism does not automatically translate into equitable outcomes.

This variation reflects differences in institutional capacity, access to inclusive financial instruments, and the effectiveness of redistributive and empowerment-oriented policies across regions (Hidayah, 2023; Maulana et al., 2024). Moreover, the uneven integration of local economic institutions, social finance mechanisms, and governance frameworks further shapes how growth benefits are distributed across communities (Md Radzi et al., 2024; Husein et al., 2024). These dynamics underscore that Java’s centrality in the national economy also makes it a critical testing ground for place-based and structurally differentiated inclusive growth strategies, with implications that extend beyond the island itself to Indonesia’s broader development agenda.

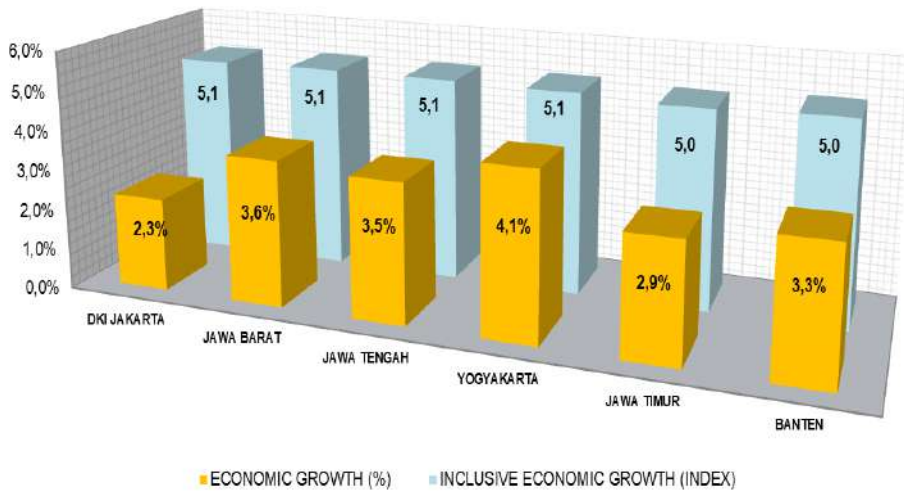


Figure 1. Development of inclusive growth in the Provinces of Java Island, 2019–2023

Figure 1 illustrates that despite relatively strong economic performance, inclusive growth outcomes across Java’s provinces are far from uniform. Several provinces recorded high economic growth rates without corresponding improvements in inclusiveness indicators, such as poverty reduction, reduced inequality, and greater access to economic opportunities. This divergence indicates that economic growth does not automatically generate inclusive development outcomes at the regional

level. Instead, it raises critical questions about the mechanisms by which growth is—or fails to be—transmitted into equitable welfare gains.

Existing empirical studies in Indonesia suggest that infrastructure development, improvements in human resource quality, regional fiscal governance, and investment climate conditions significantly influence regional economic performance. However, the impacts of these factors vary widely across provinces and have not consistently resulted in inclusive development outcomes (Fathoni, 2020; Novitasari et al., 2020; Yuliadi, 2020; Sebayang et al., 2022; Dini & Aji, 2022; Adila & Hadi Utomo, 2023; Hanipah et al., 2023; Verico & Qibthiyah, 2023). These mixed findings suggest that the drivers of economic growth do not necessarily coincide with the drivers of inclusiveness, particularly in regions with heterogeneous structural and institutional characteristics.

The broader literature further conceptualizes inclusive economic growth as the outcome of interactions among multiple structural and policy-related factors, including economic growth dynamics, investments in human capital, financial inclusion, employment quality, macroeconomic stability, and the provision of basic infrastructure. Rising GDP levels, combined with government spending on health and education and sectoral contributions from agriculture and industry, have been shown to enhance social inclusion and expand economic opportunities, especially for low-income groups (Jabeen & Khan, 2022; Breunig & Majeed, 2020). Likewise, investments in human capital and social safety nets can improve productivity and efficiency, although their effectiveness depends heavily on governance quality and institutional capacity (Alderman & Yemtsov, 2014; Xu et al., 2024; Ofori et al., 2023). Conversely, unfavorable macroeconomic conditions—such as inflation, income inequality, and unemployment—can undermine inclusiveness by restricting access to productive resources and essential services (Amar & Zghidi, 2016; Resy & Anna, 2023).

Despite the rapid expansion of research on inclusive economic growth, significant analytical gaps persist. Most existing studies focus on national or provincial levels of analysis, thereby overlooking the dynamics and heterogeneity of inclusive growth at the district and city levels, where development policies are implemented most directly and where disparities are often most pronounced. Furthermore, many studies analyze the determinants of inclusive growth in a fragmented manner, examining individual channels in isolation rather than integrating them within a comprehensive empirical framework. As a result, the mechanisms through which growth translates into inclusiveness across regions with differing structural conditions remain insufficiently

understood. In addition, regional typology approaches – particularly the *Klassen Typology* – are rarely employed to differentiate inclusive growth mechanisms across regions with distinct growth and income characteristics, especially during periods of economic disruption and recovery.

Addressing these gaps, this study advances an integrated and disaggregated analytical approach. The novelty of this research lies in its use of district- and city-level panel data from Java Island for the 2019–2023 period, combined with the *Klassen Typology*, to simultaneously examine the determinants of inclusive economic growth across structurally differentiated regions. By moving beyond aggregate provincial analysis and explicitly incorporating regional typologies, this study provides a more nuanced understanding of how inclusive growth mechanisms vary across development contexts.

Accordingly, this study aims to analyze the influence of economic growth, poverty levels, human capital, financial inclusion, employment opportunities, income inequality, and road and sanitation infrastructure on inclusive economic growth within each quadrant of the *Klassen Typology*. Through this approach, the study seeks to clarify how regional structural heterogeneity shapes the transmission of economic growth into inclusive outcomes and to contribute empirically to the international literature by demonstrating that inclusive growth is inherently contextual and region-specific rather than uniform.

B. Method

The research employed a quantitative design using panel data regression analysis to examine the determinants of inclusive economic growth in Java (Alam et al., 2024; Febrini et al., 2024). The unit of analysis consisted of 23 regencies/cities on Java Island observed over a five-year period from 2019 to 2023, forming a balanced panel dataset that combines temporal and regional dimensions. These regions were classified into Quadrant I (developing and high-growth) and Quadrant II (developing but low-growth) based on the *Klassen Typology*, which distinguishes regions by relative growth performance and income levels (Hatta & Astuti, 2018; Arkum et al., 2023). This classification was used to capture structural heterogeneity in regional development patterns and to allow comparative analysis across different regional contexts.

The study relied exclusively on secondary data obtained from official and credible sources, including the Central Statistics Agency (BPS), Bank Indonesia (BI), the



National Development Planning Agency (Bappenas), and related statistical publications. The dependent variable was the Inclusive Economic Growth Index (IPEI), which reflects the degree of inclusiveness based on growth, inequality, and access dimensions. The independent variables comprised economic growth, poverty rate, human capital, financial inclusion, employment opportunities, income inequality, and road and sanitation infrastructure. Each variable was operationalized using established indicators commonly applied in empirical studies on inclusive growth. The operational definitions and units of measurement for all variables are summarized in Table 1.

Table 1. Variables and Operational Definitions

Variable	Symbol	Measurement/ Unit	Operational Definition
Inclusive Growth Index	IPEI	Scale 1-10	Composite index reflecting inclusiveness based on growth, inequality, and access dimensions
Economic Growth	PE	%	Growth rate of real GDP per capita.
Poor Population	PM	%	Proportion of population below the poverty line, based on expenditure-based poverty line standards (Resy & Anna, 2023).
Human Capital	MM	Years	Expected years of schooling, representing human capital investment (Xu et al., 2024; Ofori et al., 2023).
Inclusive Finance	KI	%	Ratio of MSME credit accounts to total credit accounts, reflecting financial inclusion (Zahra & Ajija, 2023; Sawadogo & Fall, 2021).
Employment Opportunities	KK	%	Share of population working ≥35 hours/week, reflecting labor absorption (Behera, 2015; Kaur et al., 2020).
Income Inequality	GINI	Index (0-1)	Gini coefficient, where values closer to 1 indicate higher inequality (Amar & Zghidi, 2016).
Road Infrastructure	INF_J	%	Proportion of roads in good condition relative to total road length (Verico & Qibthiyah, 2023).
Sanitation Infrastructure	INF_S	%	Percentage of households with access to clean drinking water (Rini & Tambunan, 2021; Santos et al., 2019).

Empirical estimation was conducted using panel data regression techniques. Three alternative model specifications were initially considered, namely the Common Effects Model (CEM), the Fixed Effects Model (FEM), and the Random Effects Model

(REM). Model selection followed standard econometric procedures by applying the Chow test to compare CEM and FEM, the Hausman test to distinguish between FEM and REM, and the Lagrange Multiplier test to assess the suitability of REM relative to CEM. The sequence and logic of model selection are illustrated in Figure 2.

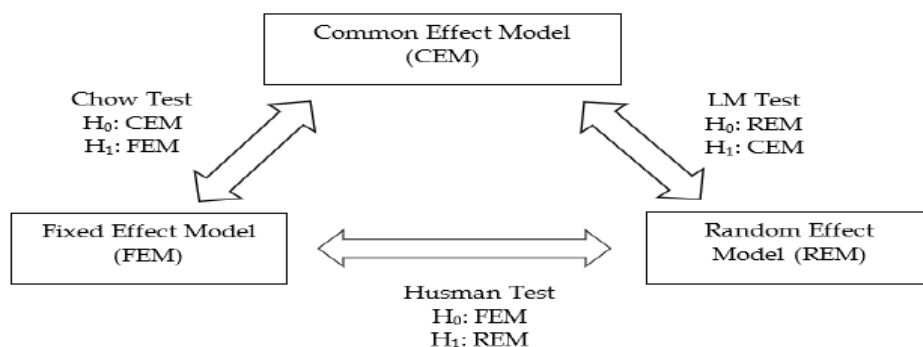


Figure 2. Panel Data Model Selection

Once the most appropriate model was identified for each Klassen Typology quadrant, diagnostic tests were conducted to ensure the robustness and validity of the estimation results. These tests included checks for multicollinearity and consistency of coefficient estimates. All estimation procedures were implemented to ensure transparency and enable replication of the empirical findings, particularly in the context of policy-oriented analysis of inclusive economic development.

From an ethical perspective, this study utilized entirely publicly available secondary data and did not involve direct interaction with human subjects. Consequently, the research posed no ethical risks and did not raise concerns related to confidentiality or informed consent. To maintain methodological proportionality, detailed outputs of model selection tests, classical assumption diagnostics, and additional statistical results are provided in the Appendix.

C. Results and Discussion

This section presents and interprets the empirical findings of the study based on the panel data regression analysis conducted for districts and cities in Java Island over the 2019–2023 period. The results are organized to reflect regional structural heterogeneity as classified by the Klassen Typology, allowing for a comparative examination of inclusive growth determinants across different development contexts. In line with the

methodological design, the results subsection reports empirical findings derived directly from the data without extended theoretical interpretation, while the discussion subsection subsequently situates these findings within relevant theoretical frameworks and prior empirical studies to highlight novelty, implications, and broader relevance.

1. Results

The panel data regression analysis reveals distinct patterns in the determinants of inclusive economic growth across regions classified as Quadrant I and Quadrant II in the Klassen Typology. Estimation using the Fixed Effects Model (FEM) was selected as the most appropriate specification following the model selection procedures described in the Methods section. The FEM results indicate strong explanatory power in both regional groups, as reflected by high coefficients of determination, suggesting that variations in the Inclusive Economic Growth Index (IPEI) are substantially accounted for by the set of explanatory variables included in the model. Differences in significance and direction of influence between variables indicate heterogeneity in inclusive growth patterns across regions. Tables 2 and 3 present the results of panel data regression estimation with the Fixed Effects Model for regions included in Quadrants I and II.

Table 2. Panel data regression estimation results (fixed effects model) – quadrant I

Quadrant I					
No.	Variables	Coefficient	Std. Error	t-Statistik	Prob.
1.	INF_S	0.027394	0.116846	0.234445	0.8155
2.	INF_J	0.249052	0.018959	13.13646	0.0000***
3.	GINI	-0.024392	0.006895	-3.53751	0.0008***
4.	KK	0.031482	0.002331	13.50334	0.0000***
5.	KI	0.184493	0.005490	33.60475	0.0000***
6.	MM	0.003482	0.001316	2.64470	0.0106**
7.	PM	-0.204617	0.034123	-5.99644	0.0000***
8.	PE	2.276378	0.387779	5.87030	0.0000***
9.	Constants	3.778084	2.148477	1.75849	0.0841

R² = 0.9552

F-statistik = 51.95842 (Prob. = 0.0000)

Durbin-Watson = 2.23684

For regions classified in Quadrant I, which represent developing regions with relatively high growth performance, the FEM estimation results show that several variables exhibit statistically significant relationships with inclusive economic growth.

Road infrastructure (INF_J), employment opportunities (KK), financial inclusion (KI), human capital (MM), income inequality (GINI), poverty rate (PM), and economic growth (PE) are all statistically significant at conventional significance levels. The sanitation infrastructure variable (INF_S), however, does not reach statistical significance in this quadrant. The estimated coefficient of determination ($R^2 = 0.9552$) indicates that the model explains a substantial proportion of the variation in IPEI across regions and time. The overall model is statistically significant, as reflected in the F-statistic, and the Durbin-Watson statistic indicates no serious autocorrelation.

The coefficients reported in Table 2 describe the direction and magnitude of the relationships between each explanatory variable and inclusive economic growth in Quadrant I regions. Economic growth (PE) exhibits a positive, highly significant coefficient, indicating that higher growth rates are associated with higher IPEI values within this group. Financial inclusion (KI), employment opportunities (KK), and road infrastructure (INF_J) also show positive, statistically significant coefficients. Human capital (MM) shows a positive coefficient and is statistically significant at the 5 percent level. In contrast, income inequality (GINI) and poverty rate (PM) are associated with negative coefficients and are statistically significant, reflecting inverse relationships with inclusive economic growth in these regions. The sanitation infrastructure variable (INF_S) does not demonstrate a statistically significant association with IPEI in Quadrant I.

Table 3. Panel data regression estimation results (fixed effects model) – quadrant ii

Quadrant II					
No.	Variables	Coefficient	Std. Error	t-Statistik	Prob.
1.	INF_S	0.266723	0.100796	2.64618	0.0155**
2.	INF_J	0.030375	0.004965	6.11754	0.0000***
3.	GINI	-1.331121	0.046223	-28.79776	0.0000***
4.	KK	0.145077	0.058094	2.49729	0.0214**
5.	KI	0.180430	0.013739	13.13303	0.0000***
6.	MM	0.036218	0.005709	6.34439	0.0000***
7.	PM	-0.082879	0.267238	-0.31013	0.7597
8.	PE	0.202538	0.065376	3.09805	0.0057***
9.	Constants	15.31675	3.478793	4.40289	0.0003***

$R^2 = 0.9799$

F-statistik = 69.70060 (Prob. = 0.0000)

Durbin-Watson = 2.04743

Note:

*** significant at $\alpha = 1\%$

** significant at $\alpha = 5\%$

For regions classified in Quadrant II, which represent developing regions with relatively lower growth performance, the FEM estimation results also demonstrate strong explanatory capacity, with an R^2 value of 0.9799. The overall model is statistically significant, and the Durbin–Watson statistic indicates acceptable levels of serial independence. In this quadrant, road infrastructure (INF_J), financial inclusion (KI), human capital (MM), employment opportunities (KK), income inequality (GINI), economic growth (PE), and sanitation infrastructure (INF_S) are statistically significant. In contrast, the poverty rate variable (PM) does not show a statistically significant relationship with inclusive economic growth in Quadrant II regions.

The estimated coefficients in Table 3 indicate that economic growth (PE) maintains a positive and statistically significant association with IPEI in Quadrant II regions. However, the magnitude differs from that observed in Quadrant I. Financial inclusion (KI), employment opportunities (KK), human capital (MM), and road infrastructure (INF_J) also exhibit positive and statistically significant coefficients. Income inequality (GINI) is negatively associated with inclusive economic growth and is statistically significant at the 1 percent level, indicating a strong inverse relationship in this group of regions. Notably, sanitation infrastructure (INF_S) displays a positive and statistically significant coefficient in Quadrant II, in contrast to its insignificant role in Quadrant I. The poverty rate (PM), while negatively signed, does not reach statistical significance in this quadrant.

A comparison of Tables 2 and 3 highlights clear differences in the statistical significance and direction of influence of certain variables across the two regional classifications. Road infrastructure, financial inclusion, human capital, employment opportunities, income inequality, and economic growth are consistently significant across both quadrants, though the magnitudes of their estimated effects vary. Sanitation infrastructure emerges as a significant factor only in Quadrant II, whereas the poverty rate is significant only in Quadrant I. These patterns underscore heterogeneity in the empirical relationships between the explanatory variables and inclusive economic growth across structurally different regions.

Based on the Klassen Typology classification applied in this study, a total of 16 regencies/ cities are categorized into Quadrant I, while 7 regencies/cities fall into Quadrant II. The spatial distribution of these regions across Java Island is presented in Figure 3.

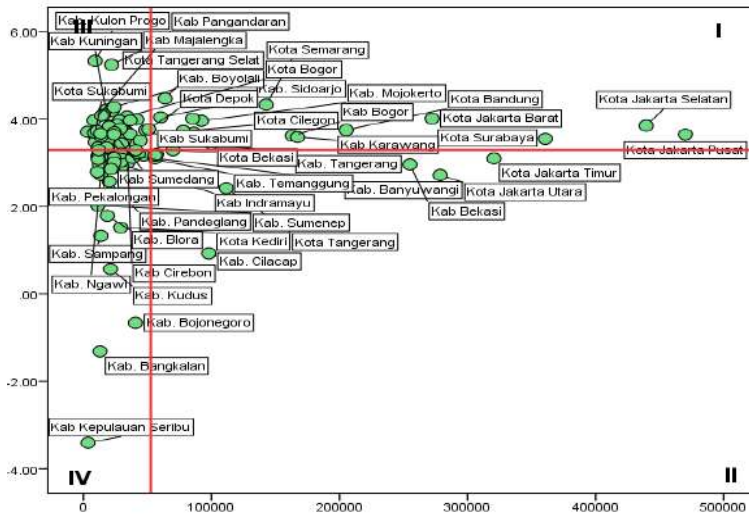


Figure 3. Typology of Regency/City Classes on Java Island

The Quadrant I group comprises South Jakarta City, East Jakarta City, Central Jakarta City, West Jakarta City, Bogor Regency, Bandung Regency, Karawang Regency, Bandung City, Semarang City, Sidoarjo Regency, Mojokerto Regency, Malang City, Surabaya City, Tangerang Regency, Cilegon City, and South Tangerang City. The Quadrant II group includes North Jakarta City, Bekasi Regency, Cilacap Regency, Jember Regency, Banyuwangi Regency, Serang Regency, and Tangerang City. This classification reflects the relative positioning of regions based on growth performance and income levels and provides the empirical basis for the differentiated regression results reported above.

Overall, the results section presents empirical evidence on the determinants of inclusive economic growth across structurally distinct regions in Java Island. The findings are reported directly from the panel data regression estimations and descriptive classifications, without interpretative or theoretical elaboration, and form the basis for further analysis in the subsequent discussion section.

2. Discussion

This study provides empirical evidence that inclusive economic growth in Java operates through structurally heterogeneous mechanisms that vary according to regional positions within the Klassen Typology. The findings clearly demonstrate that the relationship between economic growth and inclusivity is neither linear nor uniform,

even within a relatively advanced national economic corridor. By differentiating regions into Quadrant I (developed and rapidly growing) and Quadrant II (developed but depressed), this study advances the argument that inclusivity is shaped by structural conditions, institutional capacity, and absorptive mechanisms rather than by growth performance alone. This reinforces the broader theoretical view that inclusive growth is a contextual process rather than an automatic outcome of economic expansion.

The positive and significant role of economic growth in both quadrants confirms that growth remains a necessary condition for inclusivity, but not a sufficient one. In Quadrant I regions, where economic structures are relatively diversified and labor markets function more effectively, economic growth demonstrates a stronger capacity to translate into inclusive outcomes. This finding is consistent with the inclusive growth framework articulated by Klasen (2017), which emphasizes that growth becomes inclusive when supported by productive employment creation, sectoral diversification, and institutional readiness. Empirical studies in regions with strong industrial and service bases similarly show that growth tends to expand economic participation when supported by robust labor absorption mechanisms (Jabeen & Khan, 2022; Breunig & Majeed, 2020). In this context, growth acts as a catalyst, activating existing structural channels and enabling inclusivity to emerge more effectively.

In contrast, the weaker influence of economic growth on inclusiveness in Quadrant II regions underscores the presence of structural rigidities that constrain the distributive capacity of growth (Husein et al., 2024; Khamim et al., 2025). Although these regions are categorized as developed, their growth trajectories remain constrained by sectoral concentration, limited labor mobility, and insufficient integration between production and employment systems (Hafid et al., 2024; Sianturi, 2025). This finding aligns with the argument that conventional growth strategies, when not accompanied by institutional and redistributive support, tend to generate limited inclusivity (Anita & Udjianto, 2024; Anwar et al., 2024; Husein et al., 2024; Khamim et al., 2025). The differential impact of growth across quadrants strengthens this study's contribution by empirically demonstrating that growth-inclusivity linkages are contingent on regional structural conditions rather than universally applicable (Sianturi, 2025; Hafid et al., 2024).

The divergent role of poverty across quadrants further illustrates the contextual nature of inclusivity mechanisms (Maulana et al., 2024; Mas'ud & Muwazir, 2025). In Quadrant I, poverty reduction significantly enhances inclusive

economic growth, suggesting that poverty in these regions is more transitional and responsive to macroeconomic expansion and labor market dynamics (Maulana et al., 2024). This pattern corresponds with Ravallion's (2016) argument that in relatively developed regions, poverty is often cyclical and closely linked to employment opportunities, making it more amenable to growth-oriented interventions (Mas'ud & Muwazir, 2025). Conversely, the insignificant effect of poverty in Quadrant II reflects deeper structural constraints, where poverty is embedded in rigid economic structures, limited sectoral upgrading, and low labor productivity (Susanto et al., 2024). In such contexts, economic growth alone is insufficient to lift households out of poverty, as growth fails to penetrate sectors where the poor are concentrated (Resy & Anna, 2023; Maulana et al., 2024). This distinction highlights that poverty reduction strategies must be structurally differentiated to support inclusivity (Mas'ud & Muwazir, 2025; Susanto et al., 2024).

Income inequality emerges as one of the most critical structural barriers to inclusive growth, particularly in Quadrant II regions. The strong negative association between inequality and inclusiveness confirms theoretical arguments that high inequality creates distributional bottlenecks by limiting access to education, health services, and productive financing for lower-income groups (Amar & Zghidi, 2016; Bourguignon, 2004). In structurally depressed regions, inequality reinforces social segmentation, leaving economic growth to benefit a narrow segment of the population rather than broadening participation. This finding contributes to the literature by demonstrating that inequality is not merely a social outcome of growth but a structural constraint that actively weakens the inclusivity of development processes.

Human capital and employment opportunities function as key transmission mechanisms linking growth to inclusiveness, but their effectiveness varies markedly across quadrants (Hidayah, 2023; Maulana et al., 2024). In Quadrant I regions, investment in education and skills enhances workforce quality in line with the demands of modern economic sectors, strengthening the linkage between growth and inclusive outcomes (Mas'ud & Muwazir, 2025). This finding supports the view that human capital acts as an enabling factor for equitable growth when supported by adequate labor market structures (Ofori et al., 2023; Xu et al., 2024; Md Radzi et al., 2024). In Quadrant II regions, however, the positive effects of human capital and employment opportunities are more constrained, indicating a mismatch between labor supply improvements and the structure of labor demand (Sianturi, 2025). Structural limitations



in production systems reduce these regions' capacity to absorb skilled labor, thereby weakening inclusivity productively (Maulana et al., 2024; Hidayah, 2023). This reinforces the argument that human capital investment alone is insufficient without complementary structural transformation (Mas'ud & Muwazir, 2025).

Financial inclusion consistently contributes positively to inclusive growth across regions, underscoring its role as both a distributional and structural mechanism (Hidayah, 2023; Md Radzi et al., 2024). By expanding access to formal financial services, inclusive finance enables households and micro-enterprises to engage in productive investment, manage income risks, and build long-term economic resilience (Irmanelly et al., 2014; Choiri & Ardyansyah, 2024). Empirical studies at the regional level similarly indicate that financial inclusion strengthens inclusive growth by widening access to economic opportunities, particularly for previously excluded groups (Prabowo et al., 2023; Hidayah, 2023). Cross-country evidence further confirms that while financial inclusion promotes inclusivity, its effectiveness depends on institutional depth and governance quality (Biswas, 2023; Amandossuly et al., 2025). This study extends these insights by showing that financial inclusion serves as a stable channel of inclusivity across structurally different regions, albeit with varying intensities (Md Radzi et al., 2024; Choiri & Ardyansyah, 2024).

Infrastructure variables reveal differentiated roles in shaping inclusive growth. Road infrastructure contributes positively to inclusiveness by reducing transportation costs, enhancing labor mobility, and strengthening intersectoral linkages, particularly in Quadrant I regions where economic structures are already diversified (Lu et al., 2023; Verico & Qibthiyyah, 2023). In Quadrant II regions, however, the inclusive impact of road infrastructure is more limited, indicating that physical connectivity alone cannot overcome structural economic weaknesses. This finding reinforces the argument that infrastructure investment must be integrated with broader economic and institutional development strategies to generate inclusive outcomes (Batool et al., 2020). Sanitation infrastructure, by contrast, plays a more prominent role in Quadrant II regions, where meeting basic needs directly enhances health outcomes, labor productivity, and community participation. This supports the view that basic infrastructure constitutes a foundational requirement for inclusive development in structurally constrained regions (Rini & Tambunan, 2021; Santos et al., 2019).

From a broader perspective, the findings of this study contribute to the global discourse on inclusive economic growth by demonstrating that inclusivity is

inherently region-specific and structurally contingent. The differentiated mechanisms observed across Java mirror challenges faced by many developing and emerging economies characterized by spatial inequality, uneven structural transformation, and asymmetric institutional capacity. Similar patterns have been identified in contexts where local socio-religious institutions, legal pluralism, and community-based economic practices shape development outcomes in highly localized ways (Md Radzi et al., 2024; Nordin et al., 2025; Hidayah, 2023). These studies reinforce the argument that inclusive growth cannot be treated as a uniform process, but rather as an outcome mediated by local governance arrangements, social norms, and institutional embeddedness, which condition how economic expansion translates into distributive and participatory gains.

By integrating district-level panel data with a regional typology framework, this study offers a methodological contribution that can be applied in other national and subnational contexts to better understand how growth translates into inclusivity under varying structural conditions. The approach aligns with emerging international debates that emphasize place-based policy design, institutional diversity, and the interaction between economic structures and legal-social frameworks in shaping development trajectories (Husein et al., 2024; Khamim et al., 2025; Mas'ud & Muwazir, 2025). Moreover, concerns over economic rights, governance quality, and human security increasingly intersect with discussions of inclusive development, particularly in regions facing structural vulnerability and institutional fragility (Nosach et al., 2024; Sianturi, 2025). In this respect, the findings extend beyond Indonesia, positioning the study within broader international conversations on regional inequality, inclusive development, and the necessity of structurally differentiated policy interventions grounded in local realities.

Despite its contributions, this study has several limitations. The reliance on secondary data limits the ability to capture micro-level dynamics at the household and informal-sector levels, which may play an important role in shaping inclusive growth outcomes. Additionally, the relatively short observation period limits the analysis of long-term structural changes and cyclical dynamics across economic phases. These limitations should be considered when interpreting the findings and provide a basis for future research directions discussed in the concluding section.

D. Conclusion

This study demonstrates that inclusive economic growth in Java is shaped by structurally differentiated mechanisms rather than a single, uniform pathway. By applying the Klassen Typology within a regency/city-level panel data framework, the findings confirm that economic growth, human capital, employment opportunities, financial inclusion, and infrastructure contribute to inclusiveness in distinct ways depending on regional structural conditions, while income inequality consistently constrains the equitable distribution of development benefits. These results reaffirm that economic growth does not automatically translate into inclusive outcomes but rather depends on regions' capacity to channel growth into broad-based economic participation.

The key contribution of this article lies in strengthening the empirical understanding of inclusive growth as a context-dependent and region-specific process. By moving beyond aggregate and provincial analyses, this study extends the inclusive growth literature by demonstrating that regional structural characteristics play a decisive role in mediating the relationship between growth and equity. This contribution is significant for developing economies, where spatial heterogeneity and uneven institutional capacity often limit the effectiveness of generalized development strategies.

In practical terms, the findings underscore the importance of differentiated policy approaches to inclusive development. Regions with stronger and more dynamic economic structures may focus on deepening financial inclusion and improving job quality to sustain inclusiveness, whereas regions facing structural constraints require targeted efforts to reduce inequality, expand access to basic infrastructure, and strengthen local economic absorptive capacity. Such context-sensitive strategies are essential to ensure that growth generates inclusive and sustainable development outcomes.

Building on the acknowledged limitations discussed earlier, future research should advance this line of inquiry by incorporating micro-level data to better capture household behavior, informal-sector dynamics, and the distributional mechanisms underlying inclusive growth. In addition, the application of spatial panel models would allow for a deeper examination of interregional spillovers and spatial interdependence in inclusive development processes. Extending the observation period would also enable a more comprehensive assessment of long-term structural change and cyclical dynamics across economic phases.

Finally, this study reinforces the central insight that the inclusiveness of development is determined not solely by the pace of economic growth, but by regions' ability to convert growth into equitable and sustainable economic opportunities. This perspective offers an important foundation for future research and policy design aimed at promoting inclusive development in structurally diverse regions.

Declaration of Competing Interest

The authors declare that they have no known competing financial or non-financial interests that could have influenced the work reported in this paper.

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Appendix

This appendix presents the technical procedures used for panel data model selection and diagnostic testing. The results are provided to ensure transparency and replicability of the empirical analysis.

A. Panel data model selection tests

Panel data model selection was conducted using the Chow test, Breusch-Pagan Lagrange Multiplier (LM) test, and Hausman test.

Table A.1. Panel data model estimation testing

Quadrant I					
No.	Test Summary	Chi-Sq. Statistic	Chi-Sq. df	Prob.	Result
1.	Fix Effect Model	38,413088	15	0,0008	Reject H_0 , FEM preferred
2.	Random Effect Model	7,813687	8	0,4519	Fail to reject H_0 , REM not preferred
3.	Hausman Test (FEM vs REM)	21.746	8	0.0052	Reject H_0 , FEM selected
Quadrant II					
4.	Fix Effect Model	118,907564	6	0,0000	Reject H_0 , FEM preferred
5.	Random Effect Model	8,867660	8	0,3536	Fail to reject H_0 , REM not preferred
6.	Hausman Test (FEM vs REM)	18.392	8	0.0186	Reject H_0 , FEM selected

Source: Eviews, Data processed 2025

Note: Critical Value at 0.05.

A.2 Multicollinearity Test

Multicollinearity was assessed using the Variance Inflation Factor (VIF). All variables exhibit VIF values below the threshold of 10.

Table A.2. Multicollinearity test results

Quadrant I			
No.	Variable	VIF	Result
1.	Economic Growth (PE)	1,0867	In the Level of Tolerance
2.	Poor Population (PM)	1,0387	In the Level of Tolerance
3.	Human Capital (MM)	1,0031	In the Level of Tolerance
4.	Financial Inclusion (KI)	1,0578	In the Level of Tolerance
5.	Employment Opportunities (KK)	2,1561	In the Level of Tolerance

Quadrant I			
No.	Variable	VIF	Result
6.	Gini Inequality (GINI)	1,0289	In the Level of Tolerance
7.	Road Infrastructure (INF_JLN)	1,5283	In the Level of Tolerance
8.	Sanitation Infrastructure (INF_S)	1,0050	In the Level of Tolerance
Quadrant II			
1.	Economic Growth (PE)	1,0000	In the Level of Tolerance
2.	Poor Population (PM)	1,2688	In the Level of Tolerance
3.	Human Capital (MM)	1,0135	In the Level of Tolerance
4.	Financial Inclusion (KI)	1,0527	In the Level of Tolerance
5.	Employment Opportunities (KK)	1,0004	In the Level of Tolerance
6.	Gini Inequality (GINI)	1,0713	In the Level of Tolerance
7.	Road Infrastructure (INF_JLN)	1,0559	In the Level of Tolerance
8.	Sanitation Infrastructure (INF_S)	1,1410	In the Level of Tolerance

Source: Eviews, Data processed 2025

A.3 Heteroscedasticity Testing

Table A.3. Results of heteroscedasticity testing

Quadrant I					
No.	Independent Variable	Chi-Square Calculation	Chi-Square Table	Results	Conclusion
1.	8	6,672	15,507	Fail to reject H_0	Heteroscedasticity Free
Quadrant II					
2.	8	8,5925	15,507	Fail to reject H_0	Heteroscedasticity Free

Source: Eviews, Data processed 2025

A.4 Autocorrelation Testing

Table A.4. Autocorrelation test results

Quadrant I					
No.	Independent Variable	Chi-Square Calculation	Chi-Square Table	Results	Conclusion
1.	8	2,912	15,507	Fail to reject H_0	Autocorrelation Free
Quadrant II					
2.	8	5,398	15,507	Fail to reject H_0	Autocorrelation Free

Source: Eviews, Data processed 2025

A.5 Fixed effect model estimation results

Table A.5. Fixed effect model estimation results

Quadrant I				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_S	0,027394	0,116846	0,234445	0,8155
INF_J	0,249052	0,018959	13,13646	0,0000**
GINI	-0,024392	0,006895	-3,537511	0,0008**
KK	0,031482	0,002331	13,50334	0,0000**
KI	0,184493	0,005490	33,60475	0,0000**
MM	0,003482	0,001316	2,644704	0,0106**
PM	-0,204617	0,034123	-5,996441	0,0000**
PE	2,276378	0,387779	5,870301	0,0000**
C	3,778084	2,148477	1,758494	0,0841
R ²	0,955237	Prob(F-statistic)	0,000000	
F-stat	51,95842	Durbin-Watson stat	2,23684	
Quadrant II				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_S	0,266723	0,100796	2,646175	0,0155**
INF_J	0,030375	0,004965	6,117537	0,0000**
GINI	-1,331121	0,046223	-28,79776	0,0000**
KK	0,145077	0,058094	2,497289	0,0214**
KI	0,180430	0,013739	13,13303	0,0000**
MM	0,036218	0,005709	6,344391	0,0000**
PM	-0,082879	0,267238	-0,310132	0,7597
PE	0,202538	0,065376	3,098053	0,0057**
C	15,31675	3,478793	4,402892	0,0003
R ²	0,979916	Prob(F-statistic)	0,000000	
F-stat	69,70060	Durbin-Watson stat	2,04743	

Source: Eviews, Data processed 2025

Note: Critical Value at 0.05.