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Dynamics of inclusive growth in Indonesia: Key factors in emerging and lagging regions of Java

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Abstract: Inclusive economic growth is characterized by an increase in real per capita income, poverty reduction, diversification of business sectors, and decreasing inequality. This growth must include all segments of society without discrimination, ensuring equal economic opportunities, especially for the poor. This study analyzes the dynamics of inclusive growth in regencies and cities across Java Island, covering 37 developing regions (Quadrant III) and 96 underdeveloped regions (Quadrant IV) based on Klassen's Typology. The data used comprise time series (2019–2023) and cross-sectional data, analyzed using panel data regression with a fixed-effects model. The findings indicate that economic growth, human capital, financial inclusion, employment opportunities, and road infrastructure positively influence inclusive growth in both quadrants. The poverty rate has a positive impact on Quadrant IV, whereas inequality has a negative impact on both quadrants. Sanitation infrastructure does not have a significant effect in either region. Strategies for Quadrant III focus on infrastructure acceleration, MSME development, vocational education, and financial inclusion. Meanwhile, Quadrant IV prioritizes agribusiness, investment, job training, and access to education and healthcare. Regional connectivity and basic sanitation improvements are enhanced through government and private sector collaboration.

Keywords: *Employment opportunities, Financial inclusion, Inclusive growth, Klassen typology, Poverty, Inequality.*

1. Introduction

The concept of 'inclusive growth' encompasses multiple social and economic dimensions. One broad approach to inclusive growth also considers non-income aspects. A more comprehensive perspective emphasizes the participation of all segments of society, both in the process and its outcomes, [1]. Inclusive development is an alternative development model that emerged in response to the negative impacts of conventional development policies, which are often overly focused on economic growth and tend to prioritize the interests of elite groups while neglecting a bottom-up approach. This approach overlooks marginalized groups, including the poor and minorities. The resulting impacts include a decline in human development quality, rising poverty rates, and widening social inequalities, [2].

The outcomes experienced by countries that have transformed their economic systems highlight the impact of inclusive economic growth. This growth is reflected in increased real per capita income, reduced poverty rates, diversified business opportunities, and lower unemployment levels, [3]. Inclusive growth enhances societal participation, ensuring equal benefits for all. It provides opportunities for all social groups to engage in economic activities, measured by three key indicators: reduced social inequality and poverty, as well as higher employment absorption, [4].

According to Jmurova [5] inclusive economic development is designed for everyone, regardless of background or differences. Similarly, Ali and Son [6] argues that inclusive growth not only generates new economic opportunities but also guarantees equal access to these opportunities, particularly for the poor.In Indonesia, inclusive growth is measured by Bappenas. The concept of inclusive growth is also

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outlined in the framework of the National Development Planning Agency (Bappenas), which divides it into three main pillars: Economic Growth and Development, Income Distribution and Poverty Reduction, and Expansion of Access and Opportunities. The following presents the development of the inclusive growth index across these three pillars in provinces across Java Island:

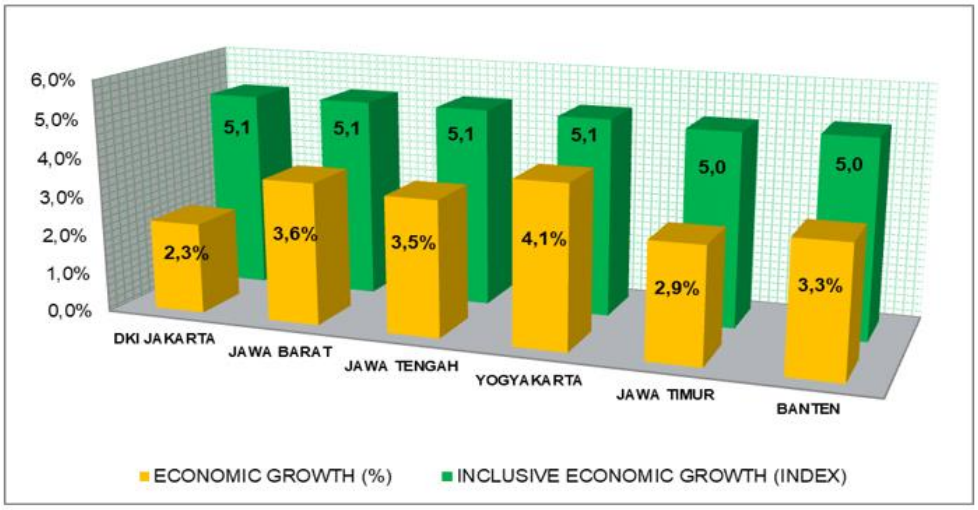

Figure 1.
Development of inclusive growth in the provinces of Java Island and 2019-2023.

Economic growth across the six provinces of Java Island exhibits significant variation, with Yogyakarta recording the highest rate at 4.1% and DKI Jakarta the lowest at 2.3%. Yogyakarta's strong growth is likely driven by the tourism sector, SMEs, and sustainable development. Meanwhile, West Java (3.6%) and Central Java (3.5%) reflect stable growth in the industrial and trade sectors. Banten (3.3%) and East Java (2.9%) show slightly lower growth, which may be attributed to dependence on specific sectors or suboptimal investment. Despite being the national economic hub, DKI Jakarta has the lowest growth rate, possibly due to economic saturation and reliance on the service sector, which tends to grow more slowly than manufacturing. On the other hand, the inclusive economic growth index stands at 5.1 for five provinces—DKI Jakarta, West Java, Central Java, and Yogyakarta—while East Java and Banten recorded 5.0. The uniform index of 5.1 suggests that, despite differences in economic growth rates, the distribution of economic benefits remains relatively stable in several regions. However, the slightly lower inclusive index in East Java and Banten may indicate challenges in ensuring equal access to economic opportunities for the population. The relationship between economic growth and inclusivity presents an intriguing dynamic. Yogyakarta stands as a positive anomaly, exhibiting the highest growth while maintaining equitable economic distribution. Conversely, DKI Jakarta experiences the lowest growth rate, yet its inclusivity remains high, indicating a relatively stable distribution of economic benefits.

Meanwhile, East Java and Banten have lower inclusive indices, suggesting greater economic inequality. High economic growth does not always correlate directly with inclusivity. Yogyakarta has successfully balanced both, whereas DKI Jakarta remains inclusive despite its slower growth. The main challenge lies in East Java and Banten, where the distribution of economic benefits remains suboptimal. Therefore, development strategies in Java should not only focus on GDP growth but also on ensuring equitable distribution to achieve more inclusive and sustainable growth. Indonesia has already recognized that the future economic growth paradigm should not solely focus on economic expansion but must also consider inclusive development. A growth-oriented development approach has led to social exclusion and three major crises: social inequality, poverty, and environmental degradation.

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Therefore, a new, more inclusive development paradigm is necessary [7]. The variables used to analyze inclusive growth vary widely. However, most studies identify key variables such as inflation, GDP in the agricultural sector, financial inclusion, economic infrastructure, fiscal policy, human capital, land area, and labor force. Inflation, defined as the continuous increase in general price levels [8] is one of the key variables examined for its impact on inclusive growth.

Research suggests that inflation has predominantly negative effects on inclusive economic growth. Using an endogenous growth model, studies show that inflation negatively impacts resource allocation and economic expansion. While reducing inflation is necessary, it is not sufficient to achieve sustainable or inclusive growth, [9]. The relationship between economic factors and poverty is complex and context-specific. Although lower inflation and reduced unemployment can contribute to poverty alleviation, evidence suggests that the negative impact of inflation hinders sustainable development. Achieving inclusive, equitable economic growth requires well-targeted policies, [10].

Infrastructure is a fundamental component in the formulation of inclusive development. It plays a crucial role in achieving the Sustainable Development Goals (SDGs) by reducing economic disparities, alleviating poverty, and decreasing open unemployment while enhancing the efficiency of goods and services flows and attracting foreign direct investment, [11]. Infrastructure consistently demonstrates a positive impact on these three dimensions of inclusivity, even if its effects are not immediately apparent. Given its significant role, policy implications suggest the necessity of prioritizing infrastructure development that benefits low-income communities and supports environmentally friendly sectors to promote greater inclusivity, [12, 13] constructed an inclusive growth index for 43 developing countries based on data from 1996–2006, using three primary indicators: poverty (headcount ratio at US$2 per day PPP), inequality (GINI index), and economic participation (employment rates). The rationale behind this framework is that inclusive growth can be measured by examining how economic expansion distributes its benefits (through poverty reduction and inequality mitigation) and how it creates opportunities for broader economic participation.

Several studies have demonstrated a positive relationship between various economic factors and inclusive growth. Research by Kouton [14] and Qiu and Zhao [15] shows that economic growth, the Gini ratio, years of schooling, and labor force participation positively contribute to inclusive development, particularly in advanced economies. Moreover, income disparity, regional distribution, population density, wages, and skill levels also play a crucial role in fostering urban inclusivity, especially for migrant workers. From a sectoral perspective, agriculture-driven industries serve as key enablers of inclusive growth. Kristyanto [16] argues that the agricultural sector possesses strong inclusivity potential as it fosters economic expansion while simultaneously increasing employment absorption, particularly in rural areas. However, Asian Development Bank [17] found that while growth in agriculture, oil, manufacturing, and service sectors may initially elevate rural unemployment, the non-agricultural manufacturing sector is instrumental in accelerating inclusive growth and reducing poverty in a sustainable manner.

Inclusive growth and poverty alleviation must go hand in hand and be evenly driven by a large population, which can serve as a development asset in the form of labor. Therefore, the workforce must be well-managed through inclusive and sustainable labor development, [18, 19]. To ensure that financial development interacts effectively with complementary policies that promote inclusive growth, a minimum threshold and a positive impact on growth are required. Policies regarding the necessary level of investment in financial development should be designed to stimulate growth and ensure a more equitable distribution of income [20]. The level of inclusive growth in a province is influenced by government spending, financial inclusion, investment, inflation, and trade openness. Specifically, increasing government spending on education, financial inclusion, investment, and trade openness will enhance inclusive growth by creating equal opportunities, driving economic expansion, and improving poverty conditions, [21]. This study aims to analyze the distribution patterns of economic growth and per capita income across 119 regencies/cities in Java Island and determine the positioning of each region within the economic structure using the Klassen Typology classification. Furthermore, this

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research explores the impact of economic growth, poverty levels, human capital, financial inclusion, employment opportunities, income inequality (Gini coefficient), as well as road and sanitation infrastructure on inclusive growth within each quadrant of the Klassen Typology. This analysis seeks to understand the key factors that either drive or hinder economic inclusivity in both developing and lagging regions.

2. Research Methodology

Inclusive growth not only enhances economic output and ensures an equitable distribution of benefits, particularly for vulnerable groups [13, 22]. The determinants of sustainability are complex, encompassing employment opportunities, income distribution, economic access, social policies, and sustainable environments, all of which are influenced by social norms and historical contexts [23, 24]. This study aims to identify the key factors supporting inclusive growth by analyzing economic policies, equal opportunity distribution, the role of social institutions, and environmental impacts, [15, 25, 26]. The findings are expected to provide effective policy recommendations for reducing inequality and enhancing sustainable social welfare.

Secondary data refer to information obtained indirectly. This study analyzes all regencies/cities in Java categorized in quadrants III and IV, covering 96 regencies/cities. The dataset comprises time-series data from 2019 to 2023 and cross-sectional data. The secondary data were obtained from the Central Bureau of Statistics (BPS), Bank Indonesia (BI), National Development Planning Agency (Bappenas), and other published sources.

This research employs the following variables, symbols, units, and operational variable descriptions:

1. Inclusive Growth Index (IPEI): This index measures the inclusiveness of economic development in Indonesia based on growth, inequality, and access. The scale ranges from 1–3 (unsatisfactory), 4–7 (satisfactory), and 8–10 (highly satisfactory).
2. Economic Growth (PE): Real GDP per capita growth rate (%).
3. Poverty Rate (PM): The percentage of the population living below the poverty line (%), based on per capita expenditure and the official poverty threshold.
4. Human Capital (MM): Expected Years of Schooling (HLS) in years, representing the average expected duration of schooling.
5. Financial Inclusion (KI): The ratio of MSME credit accounts to total credit accounts (%), reflecting public access to financial services.
6. Employment Opportunities (KK): The percentage of the population working ≥35 hours per week (%), indicating labor market availability.
7. Income Inequality (GINI): Gini Index (0–1), a measure of income inequality, where values closer to 1 indicate higher inequality.
8. Economic Infrastructure-Roads (INF_J): The ratio of roads in good condition (%), reflecting the quality of regional access.
9. Sanitation Infrastructure (INF_S): The percentage of households with access to clean drinking water (%), representing access to basic infrastructure.

2.1. Klassen Typology

In this study, the classification of regencies/cities in Java Island follows the Klassen typology criteria. Klassen Typology analysis is an analytical tool used to understand the patterns and structure of economic growth in each region [27]. Fundamentally, Klassen Typology classifies regions based on two key indicators: regional economic growth and regional per capita income. The classification consists of four categories:

1. Rapidly Developing and Fast-Growing Regions (High Growth and High Income)
2. Developed but Stagnant Regions (High Income but Low Growth)
3. Rapidly Developing Regions (High Growth but Low Income)

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4. Relatively Underdeveloped Regions (Low Growth and Low Income)

The Klassen Typology analytical tool is used to identify priority or leading sectors, subsectors, industries, or commodities within a region. It also provides insights into the economic growth patterns and structures of a region. This typology is expected to clarify and strengthen the analysis results, [28, 29].

2.2. Panel Data Analysis

2.2.1. Selecting the Best Panel Data Model

Fundamentally, four models are used in panel data analysis: Pooled Least Squares, Pooling Independent Cross-Sections Over Time, Least Squares Dummy Variable (Fixed Effects), and Random Effects. These models can be illustrated as follows:

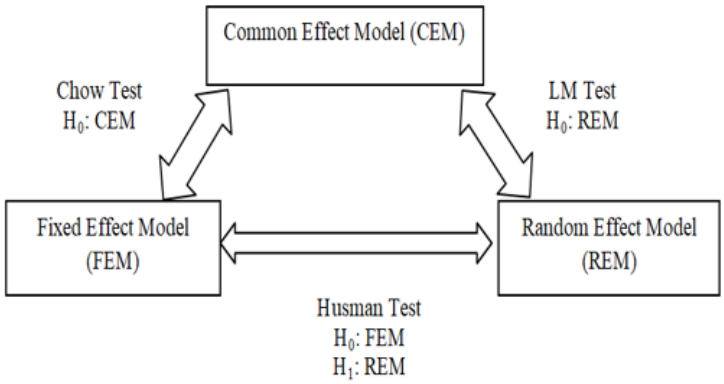

Figure 2.
Selection of Panel Data Model.

2.2.2. Pooled Least Squares (PLS)

In this model, all coefficients are assumed to remain constant across the cross-sectional units and time periods. The general form of the model is as follows:

$$y_{it} = a + X_{it}\beta + U_{it} \qquad i=1,...,N\ t=1,...,T,$$

Where ii represents countries, companies, or other cross-sectional units, and tt represents time. The key assumption of this model is that the intercept is the same for all cross-sectional units, and the slope coefficients of the explanatory variable X are identical across all units, [30].

2.2.3. Chow Test/Fixed Effect Model

The Chow test is used to determine whether the panel data regression technique with a fixed-effect model (FEM) is more appropriate than the Common Effect Model (CE) by examining the residual sum of squares. This approach refines the Least Squares Dummy Variable (LSDV) model, ensuring that a large cross-sectional unit does not reduce the degrees of freedom [30]. The Fixed Effect Model allows for different intercepts across individuals; however, each individual's intercept remains constant over time. The model is expressed as follows:

$$Y_{it} = \beta_{0i} + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_n X_{nit} + \mu_{it}$$

Where β_{0i} represents the intercept, and β_1, $\beta_2$are the slope coefficients. The variation in intercepts across the cross-sectional units is indicated by subscript ii. Although the intercepts differ among countries, they remain constant over time, a characteristic known as time-invariant. To determine whether the Pooled Least Squares (PLS) model or the Fixed Effect Model (FEM) is more suitable, the Chow Test is conducted with the following hypotheses:

1) **H0:** Pooled Least Squares (PLS) is the appropriate model.

2) H_1: Fixed-effect model (FEM) is the appropriate model.

2.2.4. Hausman Test/Random-Effect Model

The null hypothesis of the Hausman Test states that there is no systematic difference between the estimators of FEM and REM. The test is conducted by comparing these estimates with the test statistic following a chi-square distribution with degrees of freedom (kk), where k represents the number of independent variables. If the Hausman test statistic is greater than its critical value, the fixed-effect model (FEM) is preferred; otherwise, the random-effect model (REM) is more suitable. Mathematically, the Hausman test is expressed as follows:

$$W = \left(\beta_{fe} - \beta_{re}\right)^1 \left[V\left(\beta_{fe}\right) - V(\beta_{re})\right]^{-1} \left(\beta_{fe} - \beta_{re}\right) \sim x^2(k) W$$

where:

The Hausman test statistic follows a chi-square (χ2\chi^2) distribution with k degrees of freedom, where k represents the number of independent variables. The hypothesis framework for the test is as follows:

1) H_0: H0 : E (τ xit) = 0 ; hence, the random-effect model (REM) is the appropriate model.
2) H_1: H1 : E (τ xit) ≠ 0 ; ; hence, the Fixed Effect Model (FEM) is the appropriate model.

The specification approach of the Hausman test follows a chi-square distribution. If the calculated Chi-Square statistic (χ2\chi^2calculated) is greater than the critical value (χ2\chi^2 table) and the p-value is significant, then H_0 is rejected, indicating that the Fixed Effect Model (FEM) is more suitable, [30].

2.3. Classical Assumption Testing

2.3.1. Multicollinearity Detection

Multicollinearity detection can be conducted by examining the Variance Inflation Factor (VIF) from the regression analysis results. If VIF > 10, it indicates a high degree of multicollinearity, [31]. The rate at which the variance or covariance increases can be assessed using the Variance Inflation Factor (VIF), which is defined as follows:

$$VIF = \frac{1}{(1 - R^2)}$$

As R2R^2 approaches 1, VIF tends toward infinity. This suggests that as the range of collinearity increases, the variance of an estimator also increases and, at a certain threshold, may become infinite, [30].

The hypothesis for multicollinearity detection is as follows:

1) H_0: If VIF > 10, multicollinearity exists among independent variables.
2) H_1: If VIF < 10, no multicollinearity exists among independent variables.

A high VIF value indicates that the predictor variables are highly correlated, which can distort the accuracy of the regression model's coefficient estimates.

2.3.2. Heteroskedasticity Test

According to, Stock and Watson [32] a model free from heteroscedasticity implies that the variance of the error term remains constant (homoscedasticity). One of the most commonly used methods to detect heteroscedasticity is the White Test. A model is considered to exhibit heteroscedasticity if the White statistic (computed as n × R2R^2) is greater than the critical value from the Chi-Square (χ2\chi^2) table. Another approach to address heteroscedasticity is the Generalized Least Squares (GLS) Weight Cross-Section Method, which is available in statistical software such as EViews. In this method, the Weighted Sum of Squared Residuals (SSR Weighted) is compared with the Unweight Sum of Squared Residuals (SSR Unweight) as follows:

1) If SSR Weighted < SSR Unweight, the model is considered free from heteroscedasticity.

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2) If SSR Weighted > SSR Unweight, the model suffers from heteroscedasticity.

By applying these tests, researchers can determine whether the assumption of constant variance holds, thus ensuring the reliability of regression model estimates.

2.3.3. Autocorrelation Test

According to, Winkelmann [33] one of the fundamental assumptions in the Ordinary Least Squares (OLS) method is the absence of correlation between error terms across observations. Autocorrelation occurs when the error term in one observation is correlated with the error term in another observation at a different period. In the context of the OLS method, autocorrelation indicates a correlation between one error term and another, which violates the assumption of independent errors. As a result, the OLS estimator is no longer the Best Linear Unbiased Estimator (BLUE) but is merely a linear unbiased estimator (LUE), meaning that the estimation efficiency is compromised.

Breusch-Godfrey (BG) Test:

1) Detects higher order autocorrelation.
2) If the test statistic is greater than the critical Chi-Square (χ2\chi^2χ2) value or if the p-value is significant, autocorrelation exists in the model.

If autocorrelation is present, corrective measures such as Generalized Least Squares (GLS) or Newey-West standard errors can be applied to improve the reliability of the estimations.

2.4. Multiple Linear Regression Equations in Quadrants III and IV of the Klassen Typology

In this model, a panel data regression analysis is conducted to examine the relationship between Economic Growth (PE), Poverty Rate (PM), Human Capital (MM), Financial Inclusion (KI), Employment Opportunities (KK), Gini Inequality Index (GINI), Road Infrastructure (INF_JLN), and Sanitation Infrastructure (INF_S) on Inclusive Economic Growth (IPEI) in districts/cities classified as rapidly developing areas (Quadrant III) based on Klassen's typology analysis. The regression model assesses the impact of economic, social, and infrastructure-related factors on inclusive economic growth in regions with high development potential. The model is specified as follows:

$$IPEI_{it} = \beta_0 + \beta_1 PE_{it} + \beta_2 PM_{it} + \beta_3 MM_{it} + \beta_4 KI_{it} + \beta_5 KK_{it} + \beta_6 GINI_{it} + \beta_7 INF\_J + \beta_8 INF\_S_{it} + \varepsilon_{it}$$

Description:

$IPEI_{it}$	=	Inclusive Economic Growth Index (IPEI) in Districts/Cities of Quadrants III and IV
PE	=	Economic Growth
PM	=	Poverty Rate
MM	=	Human Capital
KI	=	Financial Inclusion
KK	=	Employment Opportunities
GINI	=	Gini Inequality Index
INF_J	=	Road Infrastructure
INF_S	=	Sanitation Infrastructure
i	=	Districts/Cities in Quadrants III and IV (Cross-Section Analysis)
t	=	Research Period: 2019-2023 (Time Series Analysis)
β_0	=	Intercept Coefficient as a Scalar Constant
α_0	=	The intercept coefficient is a scalar constant.
β1, β2, β3, β4, β5' β6, β7, β8	=	Regression coefficients or slopes of each variable.
et	=	Standard error in the mathematical model (Error Term).

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3. Results and Discussion

3.1. Klassen Typology Results

This approach is used to identify development disparities across regions. The Klassen Typology helps pinpoint areas requiring priority intervention for inclusive growth, ensuring that development efforts are not solely concentrated in advanced regions but also foster the progress of underdeveloped areas by enhancing access and economic opportunities. This approach facilitates the integration of sectorial and regional planning in a more holistic and synchronized manner, thereby reducing inequality and improving societal well- being [34]. Economic growth, as a key indicator of regional success, reflects changes in the driving economic sectors and the increasing capacity for goods and services production. Therefore, regional planning must be based on economic analysis to support sustainable development, [35]. The following presents the results of the Klassen typology analysis:

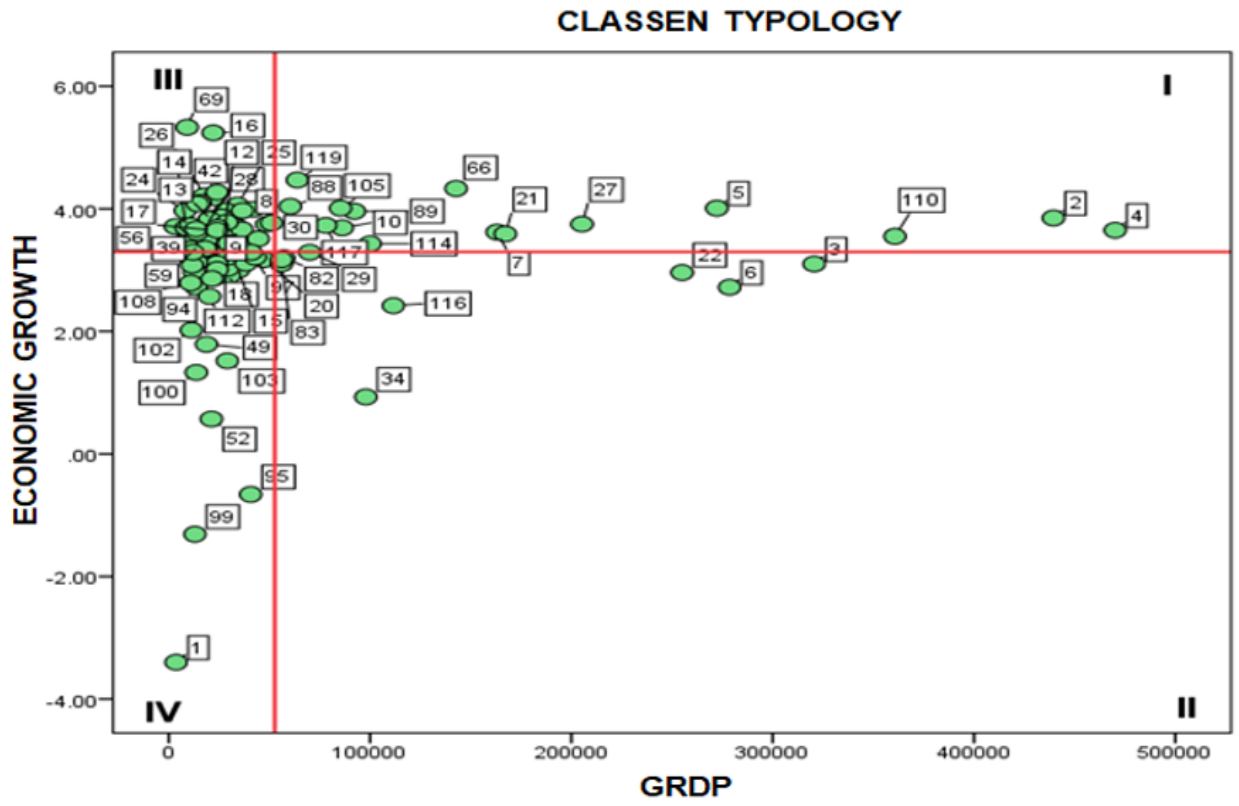

Figure 3.
Classen Typology Results.

Names of regencies/cities in Java Island, Indonesia, that still have the potential for rapid development (Quadrant III): The regions in Quadrant III consist of 59 areas, namely Sukabumi Regency, Cianjur Regency, Garut Regency, Tasikmalaya Regency, Ciamis Regency, Kuningan Regency, Majalengka Regency, Sumedang Regency, Pangandaran Regency, Bogor City, Sukabumi City, Cirebon City, Depok City, Cimahi City, Tasikmalaya City, Banjar City, Banyumas Regency, Purbalingga Regency, Banjarnegara Regency, Kebumen Regency, Purworejo Regency, Wonosobo Regency, Magelang Regency, Boyolali Regency, Klaten Regency, Sukoharjo Regency, Wonogiri Regency, Karanganyar Regency, Sragen Regency, Grobogan Regency, Rembang Regency, Pati Regency, Jepara Regency, Demak Regency, Kendal Regency, Batang Regency, Pekalongan Regency, Pemalang Regency, Tegal Regency, Brebes Regency, Magelang City, Surakarta City, Salatiga City,

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Pekalongan City, Tegal City, Kulon Progo Regency, Bantul Regency, Gunung Kidul Regency, Sleman Regency, Yogyakarta City, Pasuruan Regency, Jombang Regency, Nganjuk Regency, Madiun Regency, Gresik Regency, Blitar City, Probolinggo City, Pasuruan City, and Serang City. These areas have significant potential for further rapid development in the future based on typological classification.

Names of regencies/cities in Java, Indonesia, that are relatively underdeveloped (Quadrant IV): The regions in Quadrant IV consist of 37 areas, including Kepulauan Seribu Regency, Cirebon Regency, Indramayu Regency, Subang Regency, Purwakarta Regency, West Bandung Regency, Bekasi City, Blora Regency, Kudus Regency, Semarang Regency, Temanggung Regency, Pacitan Regency, Ponorogo Regency, Trenggalek Regency, Tulungagung Regency, Blitar Regency, Kediri Regency, Malang Regency, Lumajang Regency, Bondowoso Regency, Situbondo Regency, Probolinggo Regency, Magetan Regency, Ngawi Regency, Bojonegoro Regency, Tuban Regency, Lamongan Regency, Bangkalan Regency, Sampang Regency, Pamekasan Regency, Sumenep Regency, Kediri City, Mojokerto City, Madiun City, Batu City, Pandeglang Regency, and Lebak Regency. These areas are classified as relatively underdeveloped based on typological classification. The following is the distribution mapping result.

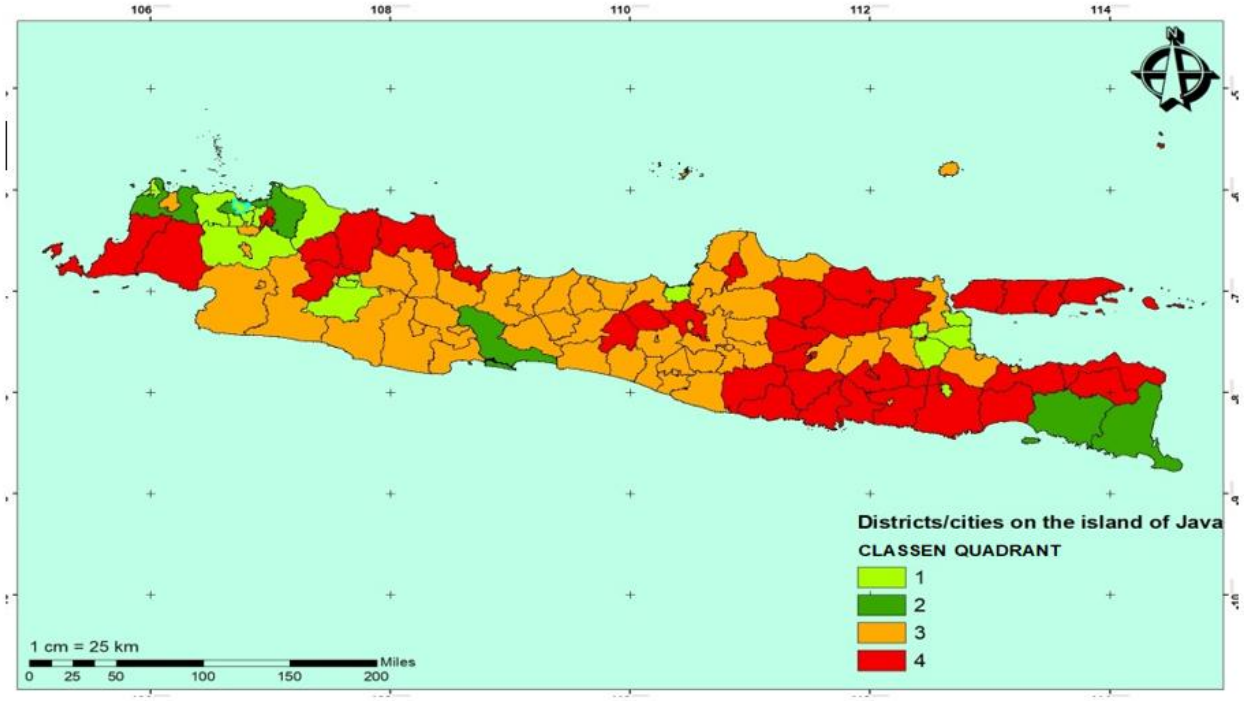

Figure 4.
Here, is the distribution map result for Quadrants III and IV.

Quadrant III regions have diverse economic bases, such as agriculture, tourism, the creative industry, and educational services. For example, Garut, Tasikmalaya, and Kuningan excel in agriculture, while Jepara and Pekalongan are prominent in the creative industries. The main challenges are limited infrastructure and suboptimal market access; however, improvements in connectivity, investment, and human capital development can drive economic growth. In Quadrant IV, challenges include minimal infrastructure, low accessibility, and economic dependence on traditional sectors, as seen in Kepulauan Seribu, Lebak, and Bojonegoro. Better planning through infrastructure investment, education, and economic diversification can support the development of these areas. Development strategies are tailored to regional conditions: maintaining advanced sectors in the short term,

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developing potential sectors in the medium term, and transforming underdeveloped sectors in the long term, [36-38].

3.2. Results of Large-Multiplier Test on Panel Data

The panel data procedure is conducted to determine the best model to be used in the analysis, whether it is the Pooled Least Squares (PLS), fixed-effects (FEM), or random-effects (REM). The Chow Test and the Hausman Test were performed to select the appropriate model. The following is a brief summary of the best panel regression model:

Table 1.
Large-Multiplier Test for Panel Data.

Quadrant III				
No	**Test Summary**	**Chi-Sq. Statistic**	**Chi-Sq. df**	**Prob.**
1	Fix Effect Model	1013.659	58	0.0000
2	Random-effects model	45.5099	8	0.0000
Quadrant IV				
1	Fix Effect Model	801.7082	36	0.0000
2	Random-effects model	94.95351	8	0.0000

The results of the Chi-Square test indicate that all models in Quadrants III and IV are significant and can be used in panel data regression. In Quadrant III, the Chi-Square Statistic value of 1013.659735 is greater than the Chi-Square table value (76.778) with df = 58 and a probability level of 0.000 < 0.05. Additionally, the Chi-Square Statistic value of 45.509978 exceeds the Chi-Square table value (15.507) with df = 8, leading to the rejection of the null hypothesis (Ho). Similarly, in Quadrant IV, the Chi-Square Statistic value of 801.708273 is greater than the Chi-Square table value (50.998) with df = 36, and the Chi-Square Statistic value of 94.953512 exceeds the Chi-Square table value (15.507) with df = 8, with a probability level of 0.000 < 0.05, also leading to the rejection of Ho. Therefore, the fixed-effect model is statistically significant and can be used for panel data regression analysis.

3.3. Classical Assumption Testing in Panel Data Models

3.3.1 Multicollinearity Test

A regression model is said to experience multicollinearity if there is a perfect linear function among some or all independent variables within the linear function. One way to determine the presence of multicollinearity is to examine the variance inflation factor (VIF). A VIF value less than 10 indicates that multicollinearity is not present. The test results are as follows:

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Table 2.
Multicollinearity Test Results

Quadrant III			
NO	**Variable**	**VIF**	**Results**
1	Economic Growth (PE)	1.0029	Within tolerance level
2	Poverty Rate (PM)	1.0119	Within tolerance level
3	Human Capital (MM)	1.0737	Within tolerance level
4	Financial Inclusion (KI)	1.0466	Within tolerance level
5	Employment Opportunities (KK)	1.3333	Within tolerance level
6	Gini Inequality Index (GINI)	1.0001	Within tolerance level
7	Road Infrastructure (INF_JLN)	1.9402	Within tolerance level
8	Sanitation Infrastructure (INF_S)	1.1406	Within tolerance level
Quadrant IV			
1	Economic Growth (PE)	1.0128	Within tolerance level
2	Poverty Rate (PM)	1.0002	Within tolerance level
3	Human Capital (MM)	1.0895	Within tolerance level
4	Financial Inclusion (KI)	1.0105	Within tolerance level
5	Employment Opportunities (KK)	1.3991	Within tolerance level
6	Gini Inequality Index (GINI)	1.1035	Within tolerance level
7	Road Infrastructure (INF_JLN)	1.0063	Within tolerance level
8	Sanitation Infrastructure (INF_S)	1.0308	Within tolerance level

The results of the multicollinearity test indicate that the Variance Inflation Factor (VIF) values for all independent variables are less than 10. This finding suggests that all variables fall within the acceptable tolerance level, confirming the absence of multicollinearity in the regression model.

3.3.2. Heteroscedasticity Test

The results of the heteroscedasticity test using the White method indicate that the models in Quadrants III and IV are free from heteroscedasticity issues. In Quadrant III, the computed nR-squared value of 47.435 is greater than the Chi-Square table value (15.507, df = 8, significance level 0.05%), leading to the acceptance of Ha. Similarly, in Quadrant IV, the nR-squared value of 27.195 also exceeds the Chi-Square table value (15.507, df = 8, significance level 0.05%), confirming the acceptance of Ha. Thus, the model does not exhibit heteroscedasticity and is also free from autocorrelation issues when applying Cross-Section Weights.

Table 3.
Heteroscedasticity Test Results.

Quadrant III				
No	**Independent Variable**	**Chi-Square Statistic**	**Chi-squared Table Value**	**Results**
1	8	47.435	15.507	Homoscedastic
Quadrant IV				
2	8	27.195	15.507	Homoscedastic

Heteroscedasticity was detected and issues were initially identified. However, in the final calculation of the multiple linear regression panel data model, the problem of heteroscedasticity is resolved, ensuring that the model meets the assumption of homoscedasticity.

3.3.3. Autocorrelation Test

The results of the autocorrelation test using the Breusch-Godfrey method indicate different characteristics for the models in Quadrants III and IV. In Quadrant III, the computed n*R-squared value of 20.746 is greater than Chi-Square table value (15.507, df = 8, significance level 0.05%). As a result, the hypothesis accepts Ha, confirming that the model is free from autocorrelation when using the Coefficient Covariance Method. In Quadrant IV, the n*R-squared value of 8.732 is smaller than

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Chi-Square table value (15.507, df = 8, significance level 0.05%). Despite this, the hypothesis still accepts Ha, reinforcing the observation that this model also does not exhibit autocorrelation. Thus, both models satisfy the assumption of no autocorrelation, ensuring the reliability of the regression results.

Table 4.
Heteroscedasticity Test Results.

Quadrant III				
No	**Independent Variable**	**Chi-Square Statistic**	**Chi-squared Table Value**	**Results**
1	8	20.746	15.507	No Auto corelation
Quadrant IV				
2	8	8732	15.507	No Auto corelation

Autocorrelation was detected, and initial issues were identified. However, the problem of autocorrelation was resolved in the final calculation of the multiple linear regression panel data model. The corrective measure applied was changing the Coefficient Covariance Method to the White Cross-Section in the panel options. This adjustment effectively modified the regression equation, ensuring that it was free from autocorrelation problems [32].

3.4. Panel Data Regression Estimation Results Using the Fixed-Effect Model

The mathematical model is constructed using a multiple linear regression equation or the Ordinary Least Squares (OLS) method. This regression analysis determines the direction of the relationship between independent and dependent variables while empirically assessing the magnitude of the estimated coefficients. These coefficients quantitatively indicate the extent to which the dependent variable increases or decreases in response to changes in the independent variables. The mathematical representation of the Fixed Effect Model (FEM):

Table 5.
Panel Data Regression Estimation Results.

Quadrant III				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
INF_S	0.00629	0.0215	0.29149	0.7709
INF_J	0.37091	0.0746	4.96720	0.0000
GINI	-0.00619	0.0008	-7.13603	0.0000
KK	0.00348	0.0006	5.04773	0.0000
KI	0.15608	0.0149	10.4147	0.0000
MM	0.48845	0.1056	4.62504	0.0000
PM	-0.01662	0.0126	-1.31531	0.1897
PE	0.00575	0.0017	3.38361	0.0008
C	5.47075	1.2695	4.30922	0.0000
R^2	0.99208	Prob F	0.00000	
F-stat	432.861	Dw	1.70357	
Quadrant IV				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF_S	0.08218	0.0601	1.3663	0.1740
INF_J	0.01865	0.0014	12.955	0.0000
GINI	-0.00431	0.0014	-2.9680	0.0035
KK	0.01135	0.0033	3.3888	0.0009
KI	0.16264	0.0237	6.8486	0.0000
MM	0.00490	0.0016	2.8993	0.0043
PM	-0.02193	0.0078	-2.7926	0.0060
PE	0.00319	0.0015	2.0918	0.0383
C	8.916570	0.3536	25.213	0.0000
R^2	0.99651	Prob F	1195.93	
F-stat	0.00000	Dw	2.14751	

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3.4.1. Inclusive Growth Model for Quadrant III:

$$\text{IPEI\_KIII}_{it} = 5{,}4707 + 0{,}0057\text{PE}_{it} - 0{,}0166\text{PM}_{it} + 0{,}4884\text{MM}_{it} + 0{,}1560\text{KI}_{it} + 0{,}0034\text{KK}_{it} - 0{,}0061\text{GINI}_{it} + 0{,}3709\text{INF\_J}_{it} - 0{,}0062\text{INF\_S}_{it}$$

Based on the Ordinary Least Squares (OLS) estimation results for Quadrant III, the R-squared value is 0.992082, indicating that the model explains approximately 99.20% of the variation in the data. This means that 99% of the independent variables influence inclusive growth (IPEI), whereas the remaining 1.8% is affected by other factors outside the research model. The Durbin-Watson (DW) value of 1.703574, which is close to 2, suggests a slight positive autocorrelation in the model's residuals but remains negligible. The probability of the F-statistic is 0.000000, with an F-statistic value of 432.8616, demonstrating that the regression model is highly statistically significant.

3.4.2. Inclusive Growth Model for Quadrant IV

$$\text{IPEI\_KIV}_{it} = 8{,}9165 + 0{,}0031\text{PE}_{it} - 0{,}0219\text{PM}_{it} + 0{,}0049\text{MM}_{it} + 0{,}1626\text{KI}_{it} + 0{,}01135\text{KK}_{it} - 2{,}96807\text{GINI}_{it} + 0{,}0186\text{INF\_J}_{it} - 0{,}08218\text{INF\_S}_{it}$$

Based on the Ordinary Least Squares (OLS) estimation results for Quadrant IV, the R-squared value is 0.996513, indicating that the model explains approximately 99.65% of the variation in the data. This means that 99% of the independent variables influence inclusive growth (IPEI), whereas the remaining 1.4% is affected by other factors outside the research model. The Durbin-Watson (DW) value of 2.147517, which is close to 2, suggests a slight positive autocorrelation in the model's residuals, but it remains negligible. The probability of the F-statistic is 0.000000, with an F-statistic value of 1195.931, demonstrating that the regression model is highly statistically significant.

3.5. Discussion

3.5.1. Economic Growth (PE)

Economic growth (PE) in regions that still have the potential for rapid development (Quadrant III) has a positive and significant impact on inclusive growth (IPEI), with a coefficient of 0.005759. This means that every 1% increase in economic growth (PE) leads to a 0.05% increase in inclusive growth (IPEI). This effect is observed in 59 regencies/cities in Java. Similarly, in relatively underdeveloped regions (Quadrant IV), economic growth (PE) also has a positive and significant impact on inclusive growth (IPEI), with a coefficient value of 0.003193. This indicates that every 1% increase in economic growth (PE) results in a 0.03% increase in inclusive growth (IPEI). This effect is evident in 37 regencies and cities in Java.

These research findings align with previous studies, such as those by Khan and Nazir [39] which highlighted that conventional economic growth has a positive impact on inclusive economic growth by improving overall social welfare. Their study indicates that GDP growth, government spending on the health sector, and the contributions of the agricultural and industrial sectors all play crucial roles in strengthening social inclusion. Economic growth continues to contribute to expanding economic opportunities, particularly for the poor. Investment in human resources, social safety nets, and entrepreneurship development are key factors in fostering more equitable growth. In addition, improvements in infrastructure, accessibility, and quality healthcare services are necessary to ensure that the benefits of economic progress are experienced by all societal groups.

Similarly Anita and Udjianto [40] found that conventional economic growth positively contributes to inclusive economic growth through increased Gross Regional Domestic Product (GRDP) and the Human Development Index (HDI), both of which significantly enhance development inclusivity. Although the number of poor people does not have a significant impact, the trickle-down effect of economic growth still plays a role in job creation and promoting equitable welfare distribution. Therefore, sustainable economic growth can strengthen social inclusion and reduce inequality eventually. Furthermore, Anwar, et al. [41] emphasize that conventional economic growth positively contributes to inclusive economic growth by improving access to and use of financial services. Their

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study suggests that financial inclusion in Asian countries is primarily influenced by the usability dimension, with per capita GDP as the dominant factor. Additionally, unemployment rates and rural populations significantly affect financial inclusion indices. As a result, stable economic growth drives increased financial access and more equitable welfare distribution, reinforcing inclusive economic development.

3.5.2. Poverty Rate (PM)

The Poverty Rate (PM) in regions with high growth potential (Quadrant III) does not have a significant impact on inclusive growth (IPEI), with a coefficient value of -0.016622, indicating no effect of the Poverty Rate (PM) on inclusive growth (IPEI). The observed influence is evident in 59 regencies and cities in Java. Conversely, the Poor Population (PM) in relatively underdeveloped regions (Quadrant IV) has a positive and significant effect on inclusive growth (IPEI), with a coefficient of 0.021936. This means that a 1% increase in the Poverty Rate (PM) will enhance inclusive growth (IPEI) by 0.21%. This influence was observed in 37 regencies/cities in Java.This study aligns with previous research findings that poverty has a significant negative impact on inclusive economic growth because it hampers economic development and slows the improvement of societal well-being. Factors such as low Human Development Index, high unemployment rates, inflation, and sluggish economic growth contribute to the rising poverty levels in Indonesia. Investment in education and healthcare plays a crucial role in enhancing labor productivity and household income, ultimately reducing poverty.

However, despite economic growth, unequal income distribution makes it difficult for the poorest segments of society to benefit from economic development. Therefore, policies focused on the equitable distribution of growth outcomes are essential for achieving a more inclusive economy, [42]. Economic inequality measured by the Gini Index, and poverty levels, as indicated by the number of poor people, have a significant negative impact on inclusive economic development in East Java Province. Panel data analysis for 2011–2021 reveals that higher inequality and poverty levels are associated with lower economic inclusivity. Hence, to achieve more inclusive economic development, policies aimed at reducing income inequality and poverty through improved access to education, healthcare, and economic opportunities are needed [43].

Poverty, both directly and indirectly, continues to have a significant negative impact on regional ec nomic inclusivity, particularly among economically disadvantaged groups, marginalized socio-religious communities, and women. Despite India experiencing significant GDP growth, these groups continue to face challenges in accessing economic resources and essential services, such as healthcare, education, and decent employment [22].

3.5.3. Human Capital (MM)

Human Capital (MM) in regions with high growth potential (Quadrant III) has a positive and significant impact on inclusive growth (IPEI), with a coefficient of 0.488455. This implies that a 1% increase in Human Capital (MM) enhances inclusive growth (IPEI) by 0.48%. This effect was observed in 59 regencies/cities in Java. Similarly, Human Capital (MM) in relatively underdeveloped regions (Quadrant IV) has a positive and significant impact on inclusive growth (IPEI), with a coefficient of 0.004905. This indicates that a 1% increase in Human Capital (MM) will lead to a 0.049% increase in inclusive growth (IPEI). The observed effect applies to 37 regencies and cities in Java.

These findings align with previous research. Xu, et al. [44] found that human capital positively influences inclusive growth in OECD economies by enhancing productivity, efficiency, and job creation. This study highlights that investments in skill development, education, and access to information drive innovation and promote more equitable economic growth. With improved human capital, societies are better equipped to navigate economic changes and seize better employment opportunities, thereby reducing social inequality and fostering sustainable development. Furthermore, human capital is a key mechanism linking urban expansion to inclusive income growth. Urbanization increases labour productivity, directly boosting rural household incomes. In addition, rural-to-urban labour migration

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accelerates income growth and reduces regional economic disparities. Therefore, urban development policies that emphasize positive and significant investments in human capital can strengthen inclusive economic growth, [45].

Ofori, et al. [20] Indicated that human capital positively impacts inclusive growth in Africa, but its effectiveness is highly dependent on governance quality. An analysis of data from 43 African countries from 2005 to 2020 using the SYS-GMM method reveals that weak governance can neutralize the positive impact of human capital, thereby hindering inclusive growth. In other words, although investments in education and workforce skills can enhance economic inclusion, these benefits cannot be fully realized without significant institutional reforms. To achieve sustainable inclusive growth, Africa must improve governance quality through transparency, accountability, and effective public policy.

3.5.4. Financial Inclusion (KI)

Financial Inclusion (KI) in regions with high growth potential (Quadrant III) has a positive and significant impact on inclusive growth (IPEI), with a coefficient of 0.156088. This indicates that a 1% increase in Financial Inclusion (KI) will enhance inclusive growth (IPEI) by 0.15%. This effect was observed in 59 regencies/cities in Java. Similarly, Financial Inclusion (FI) in relatively underdeveloped regions (Quadrant IV) has a positive and significant impact on inclusive growth (IPEI), with a coefficient of 0.162649. This means that a 1% increase in Financial Inclusion (KI) will lead to a 0.16% increase in inclusive growth (IPEI). The observed effect applies to 37 regencies and cities in Java.

The findings of this study are consistent with those of Sawadogo and Fall [46]. Financial inclusion has a positive impact on inclusive growth in Economic and Monetary Union (WAEMU) countries, particularly through the development of banking services. This study demonstrates that increased access to and use of banking services significantly contributes to inclusive economic growth. However, the penetration of microfinance services has not yet shown a significant impact, indicating the need for efficiency improvements before expanding their reach. Additionally, high interest rates on individual loans and consumption negatively affect inclusive growth. Therefore, policies that promote broader access to banking services while enhancing microfinance institutions' efficiency will strengthen more inclusive economic growth in this region.

Financial inclusion contributes positively to inclusive growth in Africa, whereas financial stability alone is insufficient to drive inclusive development. However, when financial stability and financial inclusion are combined, they create stronger synergies in fostering equitable economic growth. A stable financial system enhances public trust and reinforces the effectiveness of financial inclusion in providing access to financial services for underprivileged groups. Consequently, policies that balance financial inclusion with financial stability are crucial for more inclusive economic development in Africa [47].

Financial inclusion plays a vital role in promoting inclusive growth in West and East Africa, with both short-term and long-term significant relationships between financial indicators and inclusive economic growth. Domestic savings and infrastructure development have been found to positively impact inclusive growth, whereas domestic credit provided by the private sector and consumer prices have negative effects associated with high interest rates. Therefore, government policies should focus on strengthening financial institutions and improving access to capital, including setting more favorable interest rates and relaxing overly stringent financial regulations, to ensure inclusive economic growth, [48].

3.5.5. Employment Opportunities (KK)

Employment Opportunities (KK) in regions with high growth potential (Quadrant III) have a positive and significant effect on inclusive growth (IPEI), with a coefficient of 0.003484. This implies that a 1% increase in Employment Opportunities (KK) will lead to a 0.03% increase in inclusive growth (IPEI). This effect is observed in 59 regencies and cities across Java Island. Similarly, Employment Opportunities (KK) in relatively underdeveloped regions (Quadrant IV) have a positive and significant effect on inclusive growth (IPEI), with a coefficient of 0.011359. This indicates that a 1% increase in

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Employment Opportunities (KK) will contribute to a 0.011% increase in inclusive growth (IPEI). This effect was observed in 37 regencies and cities across Java Island.

This research is consistent with a study by Kumari and Balurghat [49] which found that employment opportunities have a positive impact on inclusive growth by creating an economic environment that enables individuals to contribute to and benefit from economic growth fairly. Quality employment enhances labour productivity, stimulates consumption, and strengthens purchasing power, ultimately accelerating economic growth. Furthermore, stable economic growth generates new job opportunities through investment policies and the development of productive sectors. In the context of inclusive growth, a well-functioning labour system must include social security, workplace safety, labour efficiency, and skill alignment. Thus, individuals not only secure jobs but also gain access to decent and sustainable employment. This will foster a more equitable economic ecosystem, reduce social inequality, and enhance overall societal well-being [50]. Employment plays a crucial and positive role in supporting inclusive growth by improving social welfare and narrowing economic disparities. By creating quality job opportunities, individuals gain access to stable incomes that drive consumption, investment, and overall economic productivity. In addition, equitable employments opportunities help reduce poverty and social inequality, ensuring that vulnerable groups directly benefit from economic growth. Therefore, policies that promote job creation, workforce skill development, and access to decent employment are key factors in achieving more equitable and sustainable economic growth.

Employment plays a crucial and positive role in inclusive growth by reducing poverty, improving wealth distribution, and strengthening the market economy. The creation of productive job opportunities is essential for ensuring broad social and economic inclusion. A significant proportion of the working poor remains in the informal sector, highlighting the need for comprehensive labour policies and skill development programs to enhance the quality and accessibility of decent employment. Through this approach, economic growth becomes not only sustainable but also more equitably distributed across all societal groups, [51].

3.5.6. Gini Inequality Index (GINI)

The Gini Inequality Index (GINI) in regions with high growth potential (Quadrant III) has a negative and significant impact on inclusive growth (IPEI), with a coefficient of 0.006193. This implies that a 1% increase in the Gini Inequality Index (GINI) reduces inclusive growth (IPEI) by 0.06%. The observed impact affects 59 regencies/cities in Java. Similarly, the Gini Inequality Index (GINI) in relatively underdeveloped regions (Quadrant IV) also has a negative and significant impact on inclusive growth (IPEI), with a coefficient value of -0.004319. This means that a 1% increase in development inequality (GINI) will decrease inclusive growth (IPEI) by 0.04%. The observed effect applies to 37 regencies and cities in Java.

The findings of this study align with those of previous research, indicating that the Gini Index or inequality has a negative impact on inclusive growth by worsening economic and social disparities within society. This study highlights that in Africa, economic growth has not been accompanied by equitable development, leaving marginalized communities further excluded. High inequality hinders access to education, healthcare services, and economic opportunities, ultimately limiting the contribution of vulnerable groups to economic growth. Moreover, a structural model tested across 33 African countries during 1986–2010 confirmed that high inequality is negatively correlated with economic growth, thereby hindering inclusive development. Therefore, policies aimed at reducing the Gini Index by enhancing access to economic and social resources are essential for achieving more inclusive growth [52]. The Gini Index or inequality negatively influences inclusive growth, as higher inequality makes it more difficult for the poor to benefit from economic growth. This study demonstrates that the Gini Index significantly affects the inclusivity index of development in Java, with a significance value of 0.0225. High-income inequality obstructs the equitable distribution of welfare, slows poverty reduction, and diminishes the positive impact of economic growth on vulnerable groups. Therefore, to achieve more inclusive growth, policies that reduce inequality—such as improving access

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to education, healthcare, and employment—are crucial in creating a more equitable and just economy, [2].

The Gini Index or inequality negatively impacts inclusive growth, as income disparities make it increasingly difficult for impoverished communities to benefit from economic expansion. This study indicates that income inequality hampers economic participation and slows poverty alleviation, which are fundamental elements of inclusive growth. High inequality can also lead to social instability and weaken fiscal policies' effectiveness in fostering equitable development. Consequently, reducing inequality through income redistribution policies, improving access to education and healthcare, and promoting economic inclusion are strategic measures to drive more inclusive and sustainable growth [53].

3.5.7. Road Infrastructure (INF_J)

Road infrastructure (INF_J) in regions with high growth potential (Quadrant III) has a positive and significant impact on inclusive growth (IPEI), with a coefficient of 0.370910. This means that a 1% increase in road infrastructure (INF_J) will lead to a 0.37% increase in inclusive growth (IPEI). This effect was observed across 59 regencies and cities in Java. Similarly, road infrastructure (INF_J) in relatively underdeveloped regions (Quadrant IV) has a positive and significant impact on inclusive growth (IPEI), with a coefficient value of 0.018652. This indicates that a 1% increase in road infrastructure (INF_J) will contribute to a 0.018% increase in inclusive growth (IPEI). This effect was observed in 37 regencies/cities in Java Island.

This research is consistent with previous studies, indicating that road infrastructure positively impacts inclusive growth by enhancing connectivity, facilitating the distribution of goods and services and expanding access to economic opportunities, particularly in remote areas. This study highlights that in the long term, investments in road infrastructure significantly contribute to inclusive growth in India. High-quality infrastructure accelerates trade flows, attracts foreign direct investment (FDI), and improves public access to education and healthcare services. Therefore, road infrastructure development and improvement serve as key factors in fostering more equitable and sustainable economic growth, [54].

Road infrastructure positively influences inclusive growth by improving connectivity, accelerating the distribution of goods and services, and expanding public access to labour markets, education, and healthcare services. Well-developed roads stimulate investment, reduce economic disparities between regions, and enhance labour mobility from remote areas to economic centres. With adequate infrastructure, productive sectors such as industry and agriculture can operate more efficiently, create more employment opportunities, and improve societal well-being. Hence, road development is crucial for achieving more equitable and sustainable economic growth, [55].

Physical infrastructure positively impacts inclusive growth by increasing public access to education, healthcare, and more equitable economic opportunities. This study finds that investments in physical infrastructure, including transportation, public facilities, and financial infrastructure, help reduce income inequality by broadening access to economic resources. Well-developed infrastructure facilitates the efficient distribution of goods and services, encourages investment, and generates more employment opportunities. Therefore, policies supporting the development of physical and financial infrastructure are essential to achieve inclusive and sustainable economic growth, [56].

3.5.8. Sanitation Infrastructure (INF_S)

Sanitation Infrastructure (INF_S) in regions with high growth potential (Quadrant III) did not have a significant impact on inclusive growth (IPEI), with a coefficient value of 0.006290, indicating no measurable effect of Sanitation Infrastructure (INF_S) on inclusive growth (IPEI). This finding applies to 59 regencies/cities in Java. Similarly, Sanitation Infrastructure (INF_S) in relatively underdeveloped regions (Quadrant IV) does not significantly influence inclusive growth (IPEI), with a coefficient value

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of 0.082189, showing no discernible effect of Sanitation Infrastructure (INF_S) on inclusive growth (IPEI). This result was observed for 37 regencies/cities in Java.

These research findings align with previous studies, such as those by Rini and Tambunan [57] which highlighted the positive impact of sanitation infrastructure on inclusive growth. Adequate sanitation enhances quality of life, public health, and labour productivity. Improved sanitation reduces the risk of infectious diseases, lowers absenteeism from work and school due to illness, and enhances human resource efficiency in economic activities. In addition, better access to sanitation helps reduce social disparities, particularly among vulnerable groups in both rural and densely populated urban areas. Therefore, investment in sanitation infrastructure directly contributes to welfare improvement, poverty reduction, and the creation of a healthier and more productive environment, ultimately supporting more inclusive and sustainable economic growth.

Sanitation infrastructure positively influences inclusive growth by increasing public access to adequate basic services, particularly for vulnerable populations in urban and rural areas. Sufficient access to clean water and sanitation not only improves public health but also enhances labor productivity, reduces social inequality, and elevates the overall quality of life. This study underscores the importance of inclusive policies in the water and sanitation (WatSan) sector, which must consider social, environmental, and relational aspects to effectively reach impoverished groups lacking access to formal housing. Hence, inclusive sanitation development can contribute to more equitable and sustainable economic growth by improving public health, enhancing workforce competitiveness, and reducing social costs associated with diseases caused by poor sanitation [58].

4. Conclusions, Limitations and Future Research

Economic growth, human capital, financial inclusion, employment opportunities, and road infrastructure have a positive and significant impact on inclusive growth (IPEI) in both developing regions (Quadrant III) and underdeveloped regions (Quadrant IV) in Java. Poverty does not have a significant effect in Quadrant III but has a positive influence in Quadrant IV. Development inequality has a negative and significant impact on both quadrants, whereas sanitation infrastructure does not have a significant effect in either region. The analysis covers 59 regencies/cities in Quadrant III and 37 regencies/cities in Quadrant IV. The strategy for Quadrant III focuses on accelerating infrastructure development, promoting MSMEs, strengthening vocational education, and providing credit subsidies to enhance financial inclusion. Village and MSME empowerment support job creation and reduce inequality, while efforts are being made to improve village connectivity and community sanitation. Meanwhile, Quadrant IV prioritizes agribusiness, sustainable investment, local workforce training, and access to education and healthcare. Cooperative-based financial inclusion is reinforced,
labour intensive programs are expanded, and interregional connectivity is improved. Road infrastructure is developed to enhance access to remote areas, while basic sanitation services are expanded through public-private partnerships.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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