

# ACCELERATE REGIONAL DEVELOPMENT FOR SUPERIOR, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH IN EAST JAVA TOWARDS NATIONAL ECONOMIC RESILIENCE AND INDEPENDENCE

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## ARTICLE INFO

## ABSTRACT

**Received:**  
31-03-2026  
**Revised:**  
27-04-2026  
**Accepted:**  
27-04-2026  
**Published:**  
30-04-2026

**Keywords:**  
regional development, inclusive economic growth, economic resilience, East Java, sustainable development, national economic independence

**JEL Codes:**  
D31; J; I

**DOI:**  
10.33830/economous.v2i1.14778

This study examines the acceleration of regional development in East Java as a strategic instrument for achieving superior, inclusive, and sustainable economic growth in order to support national economic resilience and independence. East Java, as the second-largest contributor to the national Gross Domestic Product (GDP) after Jakarta, holds both potential and complex development issues that require a critical, analytical, and multidimensional approach. Although East Java's economic growth shows a positive trend, averaging 5.1% per year (BPS, 2020-2024), inter-regional disparities, an uneven human development index, and the dependence of certain sectors on external conditions remain structural challenges that have not been comprehensively resolved.

This study uses a quantitative-qualitative (mixed methods) approach, with 38 districts/cities in East Java as analysis units. Secondary data was obtained from BPS, BAPPENAS, and the East Java Regional Development Planning Agency (Bappeda) for the 2018-2024 period. Spatial analysis, panel data regression, and System Dynamics modeling were used in an integrated manner to identify the determinants of regional development acceleration. The findings indicate that infrastructure investment, the quality of local governance, and digital connectivity are key variables that significantly influence inclusive economic growth. This research contributes to the development of a resilience-based regional development model that can be adapted for other strategic provinces in Indonesia.

## Introduction

From a normative and constitutional perspective, regional development is an integral foundation of the ideals of equitable and sustainable national development. Law Number 23 of 2014 concerning Regional Government explicitly mandates that regional autonomy be designed not merely as administrative delegation, but as a mechanism to accelerate public welfare through efficient, effective, and accountable governance. Within a broader theoretical framework, Todaro and Smith (2020) define development as a multidimensional process involving the transformation of social structures, societal attitudes, and national institutions toward accelerating economic growth, reducing inequality, and eradicating absolute poverty.

Ideally, the desired regional development model is one that integrates three dimensions of sustainability: high and stable economic growth (economic sustainability), equitable access to resources and opportunities (social inclusiveness), and responsible environmental management (environmental sustainability). The Triple Bottom Line concept, developed by Elkington (1994) and later adopted in the UN Sustainable Development Goals (SDGs), serves as a normative reference that growth without equity is regressive, and growth without sustainability is destructive.

In the Indonesian context, the spirit of fiscal decentralization, reinforced by Law Number 33 of 2004 concerning Fiscal Balance between the Central and Regional Governments, should have equipped regional governments with adequate fiscal capacity to accelerate development in accordance with their local potential and needs. Furthermore, the 2020-2024 National Medium-Term Development Plan (RPJMN) and the Golden Indonesia 2045 vision explicitly position regional-based

development as a strategic instrument for achieving per capita income equivalent to that of developed countries and realizing self-reliant national economic resilience.

East Java is a province with unique economic characteristics and a strategic position in Indonesia's development map. According to data from the Central Statistics Agency (2024), East Java recorded a Gross Regional Domestic Product (GRDP) at current prices of IDR 2,774.21 trillion in 2023, making it the second-largest contributor to national GDP with a share of approximately 14.6%. East Java's economic growth reached 4.95% in 2023, slightly above the national average of 5.05%. However, the sectoral distribution was dominated by the manufacturing industry (29.8%), trade (18.7%), and agriculture (10.1%).

However, behind these seemingly impressive aggregate figures lies a far more complex empirical reality. The East Java Williamson Index, which measures income inequality between regions, stood at 0.68 in 2022 (East Java Regional Development Planning Agency, 2023), indicating a still very high disparity between metropolitan areas like Surabaya, Sidoarjo, and Gresik and underdeveloped areas in the Horseshoe (Bondowoso, Situbondo, Bangkalan) and Mataraman (Pacitan, Trenggalek, Ponorogo) regions. East Java's Gini coefficient was recorded at 0.374 in March 2024 (BPS, 2024), higher than the national average of 0.379, which is approaching an alarming level.

East Java's 2023 Human Development Index (HDI) data shows a provincial average of 74.65, but with a wide range: Malang City recorded the highest HDI at 82.36, while Sampang Regency only recorded 65.22 (BPS East Java, 2024). This gap of 17.14 HDI points indicates that the benefits of economic growth have not been distributed evenly across all levels of society and regions. East Java's poverty rate in September 2023 remained at 10.35%, equivalent to 3.97 million people, a figure far above that of other developed provinces on Java.

From a fiscal perspective, the financial capacity of districts/cities in East Java remains highly variable. The level of regional fiscal independence, as measured by the ratio of Regional Original Income (PAD) to total regional revenue, only averaged 23.4% across all districts/cities in East Java in 2022 (DJPK, Ministry of Finance, 2023). This indicates a continued high dependence on central fiscal transfers, which has implications for low independence and flexibility in regional development planning. Furthermore, regional development budget absorption often falls below target, with the average realization of regional capital expenditures across East Java reaching only 78.3% in 2023 (East Java Regional Financial Report, 2023).

Referring to the empirical portrait above, there is a significant and systemic gap between the ideal conditions envisioned and the actual reality on the ground. First, although East Java possesses abundant natural resources, a significant human capital, and infrastructure that is relatively better than the national average, inter-regional inequality has shown a persistent tendency, and even the potential to widen in the long term, as investment concentrates in the Surabaya Metropolitan Area (Gerbangkertosusila Plus). This pattern indicates the failure of the trickling-down effect mechanism, which has long been assumed to operate automatically.

Second, East Java's economic structure, which is still dominated by sectors vulnerable to external shocks—as evidenced by the COVID-19 pandemic, which caused a -2.34% contraction in GRDP in 2020 (BPS, 2021)—demonstrates that regional economic resilience remains insufficient. Dependence on certain export commodities, agricultural price volatility, and weaknesses in the domestic value chain represent structural vulnerabilities that have not been strategically addressed.

Third, the uneven acceleration of digital transformation is creating new gaps in East Java's development landscape. Internet penetration data for East Java reached 72.5% in 2023 (Kominfo, 2024), but with a sharp disparity between urban (89.2%) and rural (54.8%) areas. This digital divide not only impacts access to information but also further hampers financial inclusion, the development of digital-based MSMEs, and participation in the rapidly growing digital economy ecosystem.

Fourth, environmental and sustainability issues are beginning to have a significant impact on economic productivity. Environmental degradation in the northern coastal industrial area, the conversion of productive agricultural land, and pressure on water resources during the prolonged dry season pose threats that could weaken the foundations of long-term development. Research by Hidayat et al. (2022) notes that the external costs of environmental degradation in East Java are estimated at 1.8-2.3% of GDP per year, a significant figure rarely accounted for in official development accounts.

Based on the background description above, there are several fundamental questions that have not been comprehensively answered by previous research, both conceptually and methodologically. These questions can be identified and formulated as follows:

1. What are the most significant determinants influencing the acceleration of regional development in East Java in order to encourage superior, inclusive, and sustainable economic growth during the 2018-2024 period?
2. What are the patterns and dynamics of development inequality between regions in East Java, and what policy interventions have been empirically proven effective in reducing this disparity?
3. To what extent has regional development in East Java contributed to strengthening national economic resilience and independence, and what transmission mechanisms operate in this process?
4. What regional development model is most appropriate for the East Java context to ensure the achievement of sustainable and equitable growth toward the vision of Golden Indonesia 2045?

## Research Gap

A systematic literature review of previous studies revealed several significant research gaps that strongly justify the urgency of this research:

First, in terms of analytical scope, most research on East Java's regional development is partial—examining only one or two specific aspects, such as economic growth or inequality—without integrating the dimensions of national economic resilience and independence as outcome variables. Kuncoro and Murjito's (2021) study, for example, analyzed interregional economic convergence in East Java but failed to link it to contributions to national resilience. Similarly, Wahyuni et al.'s (2022) study focused on financial inclusion without linking it to a broader regional development framework.

Second, in terms of temporality, the majority of studies used data up to 2019 or as recently as 2021, thus failing to fully account for the impact of the COVID-19 pandemic and the dynamics of post-pandemic economic recovery, which will take place in 2021-2024. Structural changes due to the pandemic—such as accelerated digitalization, supply chain transformation, and shifts in consumption patterns—have the potential to alter causal relationships between variables that have been assumed stable.

Third, from a methodological perspective, most studies use OLS or static panel regression analysis, which are unable to capture the dynamics of feedback loops between variables within the development system. System dynamics and nonlinear modeling approaches, which are more appropriate for the complexity of regional development phenomena, are still rarely applied in the East Java context. The absence of these more sophisticated methodological approaches results in policy conclusions that are linear and often inaccurate in predicting the system's response to policy interventions.

Fourth, conceptually, no research has explicitly established a theoretical nexus between East Java's regional development and the concept of national economic resilience within a single, integrated analytical framework. The concept of economic resilience itself, as developed by Boschma (2015) and Martin (2018), has yet to be widely operationalized in the context of regional research in Indonesia.

Based on the problem formulation and research gap identification above, this study aims to:

1. Identify and analyze the determinants that significantly influence the acceleration of regional development in East Java using a multivariate approach and dynamic panel data.
2. Map the spatial patterns of development inequality between regions in East Java and evaluate the effectiveness of various implemented regional development policy instruments.
3. Analyze the transmission mechanism of East Java's regional development towards strengthening national economic resilience and independence through dynamic simulation modeling.
4. Formulate a contextual, adaptive, and empirically evidence-based regional development model that can serve as a policy reference for provincial and district/city governments in East Java.

## Urgency and Relevance of Research

This research is urgently needed at this time for at least three main reasons. First, Indonesia is entering a crucial phase of development towards the Golden Indonesia 2045 vision, where the role of strategic provinces such as East Java is crucial to the success of the national economic

transformation. Without accelerated and equitable regional development, Indonesia's goal of becoming a developed nation by 2045 will be difficult to achieve. Second, the post-COVID-19 pandemic dynamics have changed many assumptions and development patterns that were previously considered established, so research using the most recent data (2018-2024) is essential to accurately capture these structural changes. Third, the acceleration of digital transformation and Indonesia's commitment to the sustainability agenda (SDGs and net-zero emissions by 2060) demand a new regional development paradigm—one that is more adaptive, digitally inclusive, and environmentally friendly—which has not been comprehensively studied in the East Java context.

## Literature Review

### Endogenous Growth Theory

As the grand theory in this research, Endogenous Growth Theory, pioneered by Romer (1986, 1990) and Lucas (1988), provides the most relevant analytical framework for understanding the dynamics of regional development in the modern context. Unlike the neoclassical Solow model, which positions technological progress as an exogenous variable, endogenous growth theory argues that the accumulation of human capital, innovation, and knowledge are internal factors that act as the true engines of long-term growth. The most important policy implication of this theory is that government investment in education, research and development (R&D), and knowledge infrastructure can generate spillover effects that drive sustainable growth.

In the context of regional development in East Java, endogenous growth theory is relevant because it explains why some regions can grow persistently faster than others—even when exogenous factors such as commodity prices and national macroeconomic conditions are relatively constant. Regions that successfully develop innovation ecosystems, high-quality human resources, and institutions that support entrepreneurship tend to enter a self-reinforcing positive growth spiral, while other regions are trapped in a poverty trap that is difficult to break without significant external intervention.

Recent developments in this theory, particularly the Aghion and Howitt (1992) model on creative destruction and the Acemoglu et al. (2019) model on the role of institutions in growth, strengthen the argument that the quality of regional governance and institutional capacity are fundamental prerequisites for inclusive and sustainable growth. Within this framework, economic resilience can be understood as a region's ability not only to withstand shocks but also to adapt and transform toward new and more productive growth paths.

### Theory of Economic Basis and Inclusive Development

As the first supporting theory, the Economic Base Theory, developed by Tiebout (1956) and North (1955), provides a framework for understanding how regional economic structure influences its growth dynamics. This theory distinguishes between basic economic activities, which generate income from outside the region through the export of goods and services, and non-basic activities, which serve the region's internal needs. The implication of this theory is that the expansion of the basic sector will generate a multiplier effect that drives the entire regional economy. Its relevance for East Java lies in the importance of identifying and strengthening leading export sectors—whether agricultural commodities, manufactured products, or tourism services—as the driving force of regional growth.

As a second supporting theory, the concept of Inclusive Growth, popularized by Rauniar and Kanbur (2010) and further developed by the OECD (2018), emphasizes that economic growth is only meaningful if its benefits are felt equally by all levels of society. Inclusive growth is not simply about redistribution—it is about expanding economic participation so that more people have equal opportunities to contribute to and benefit from development. Dimensions of inclusive growth include expanding productive employment, improving access to basic services (education, health, infrastructure), reducing gender and regional disparities, and empowering vulnerable groups.

The third supporting theory is the Regional Economic Resilience Theory, systematically developed by Boschma (2015) and Martin (2018). This theory defines economic resilience as a region's ability to anticipate, prepare for, respond to, and recover from economic disruptions or shocks, while maintaining or transforming its economic structure toward a new growth path. Boschma distinguishes four dimensions of resilience: vulnerability, robustness, adaptive capacity, and transformability. In the context of this research, the economic resilience of the East Java region needs to be measured not only by its ability to bounce back to its original state, but also by its capacity to bounce forward—to grow to a higher level after experiencing a shock.

## Previous Research Review

### Comparative Analysis of Previous Research

A systematic literature review of relevant studies from 2018 to 2026 revealed several patterns, inconsistencies, and gaps that are important to discuss. The following table presents an analytical summary of the eight studies most relevant to this research topic.

| Researchers and Years    | Research Focus   | Main Variables                                   | Method                              | Key Findings   | Limitations   |
|--------------------------|--|--|-------------------------------------|--|---|
| Kuncoro & Murjito (2021) | Economic convergence between regions in East Java          | PDRB per capita, infrastructure, investment      | Panel data, Sigma-beta convergence  | There is conditional but slow convergence; infrastructure is a key determinant                     | Not considering the sustainability dimension                        |
| Wahyuni et al. (2022)    | Financial inclusion and inclusive economic growth          | Financial Inclusion Index, HDI, Poverty          | Regresi OLS, cross section          | Positive financial inclusion significantly reduces urban poverty                                   | Does not systematically differentiate between rural and urban areas |
| Hidayat et al. (2022)    | Environmental degradation and external economic costs      | CO2 emissions, deforestation, green PDRB         | Cost-benefit analysis, Input-output | External costs of degradation 1.8-2.3% of PDRB/year  | Not connected to regional policies                                  |
| Pratiwi & Santoso (2023) | Digitalization of UMKMs and local economic resilience      | Digital adoption, UMKM turnover, survival rate   | Logit regression, primary survey    | Digitalization increases UMKM survival by 43% during the pandemic                                  | Limited sample of 3 big cities, not representative                  |
| Nugroho & Pramono (2023) | Fiscal decentralization and regional spending efficiency   | DAU, DAK, PAD, DEA efficiency                    | Data Envelopment Analysis (DEA)     | Capital expenditure efficiency is strongly correlated with HDI; 60% of regions are inefficient     | Does not model inter-regional interactions                          |
| Setiawan et al. (2024)   | Post-COVID economic recovery and structural transformation | Sectoral growth, employment, exports             | ARIMA, VAR, structural break test   | Uneven V-shaped recovery; digital sector grows 38%   | Not yet included spatial analysis                                   |
| Rahmawati & Aziz (2024)  | Regional governance and investment                         | LKPD WTP, PMDN, PMA, ease of doing business      | Fixed effects panel, IV-2SLS        | Governance quality has a positive effect on investment with a 2-year lag                           | Governance proxy is too narrow                                      |
| Putranto et al. (2025)   | Blue economy and sustainable coastal development           | Fishery production, marine tourism, coastal PDRB | Mixed methods, GIS spatial analysis | East Java's blue economy potential is equivalent to IDR 45 trillion per year if managed optimally. | Narrow sectoral focus, ignoring the social dimension                |

### Patterns, Inconsistencies, and Literature Synthesis

Based on a comparative analysis of the eight previous studies mentioned above, several consistent patterns and important inconsistencies can be identified. First, there is a strong consensus

regarding the central role of infrastructure and governance as determinants of regional economic growth. Kuncoro and Murjito (2021), Nugroho and Pramono (2023), and Rahmawati and Aziz (2024) consistently found that the quality of physical infrastructure and the institutional capacity of the regional bureaucracy have a positive and significant influence on growth and investment. This finding aligns with predictions from endogenous growth theory and the institutional economics literature.

Second, there are striking methodological inconsistencies. Most studies use a quantitative approach with secondary data, but with varying model specifications, making coherent meta-analyses difficult. Some studies use OLS, which is susceptible to endogeneity issues (Wahyuni et al., 2022), while others use the more robust IV-2SLS (Rahmawati & Aziz, 2024). These differences in approach result in varying coefficient estimates that are not always directly comparable.

Third, the majority of research is sectoral and partial, thus failing to capture the systemic nature and interdependence of variables in the regional development process. Digitalization (Pratiwi & Santoso, 2023), the environment (Hidayat et al., 2022), and the blue economy (Putranto et al., 2025) are examined separately without any attempt to synthesize these findings into a single, integrated development framework. This absence of a systems approach represents the most significant methodological gap in the existing literature.

### 2.3 Research Framework

Based on a synthesis of previous theory and research, this study develops a conceptual framework that illustrates the causal relationships between the research variables. This framework is based on the premise that regional development acceleration is a function of four clusters of determinant factors: (1) Fiscal Capacity and Investment, encompassing regional fiscal independence, realized capital expenditures, and inflows of investment (PMDN + PMA); (2) Infrastructure Quality and Connectivity, encompassing roads, electricity, clean water, and digital connectivity; (3) Human Capital Quality and Governance, encompassing the Human Development Index (HDI), workforce education levels, and the governance index; and (4) Contextual and Environmental Factors, including geographic conditions, disaster vulnerability, and environmental quality.

These four clusters of determinant factors simultaneously influence three dimensions of development outcomes: economic growth, inclusiveness, and sustainability. These three outcome dimensions, in turn, shape regional economic resilience and independence, which directly contribute to East Java's national economic resilience. This framework integrates feedback loops that reflect the dynamic nature of development systems: greater economic resilience will strengthen investment capacity and human capital, which in turn will accelerate further development.

### Research Hypothesis

Based on the conceptual framework and theoretical-empirical study above, this study formulates the following hypotheses:

H1: Regional fiscal capacity has a positive and significant impact on accelerating regional development in East Java (supported by: Nugroho & Pramono, 2023; endogenous growth theory).

H2: The quality of infrastructure and digital connectivity has a positive and significant impact on inclusive economic growth in East Java (supported by: Kuncoro & Murjito, 2021; Pratiwi & Santoso, 2023).

H3: The quality of regional governance has a positive and significant impact on investment attractiveness and regional economic growth (supported by: Rahmawati & Aziz, 2024; Acemoglu et al., 2019).

H4: Accelerating inclusive and sustainable regional development in East Java contributes positively and significantly to strengthening national economic resilience (supported by: Martin, 2018; Boschma, 2015).

H5: There is a moderating effect of environmental quality on the relationship between economic growth and the sustainability of regional development (supported by: Hidayat et al., 2022; Environmental Kuznets Curve theory).

## Method

### Research Approach and Type

This research employs a mixed methods research approach with a sequential explanatory design, placing quantitative analysis as the primary stage and qualitative analysis as the secondary stage, serving to explain, deepen, and validate the quantitative findings. The justification for choosing this approach is based on the complexity of regional development phenomena, which cannot be fully captured by a single approach. The quantitative approach allows for precise measurement of causal relationships between variables using panel data from 38 districts/cities in East Java, while the qualitative approach, through in-depth interviews with stakeholders and analysis of policy documents, allows for a richer understanding of the causal mechanisms, institutional context, and political dynamics underlying the statistical figures.

In terms of research type, this research is explanatory in nature, aiming to explain the causal relationships between variables and test hypotheses formulated based on theory. This research also has descriptive and exploratory dimensions in the spatial mapping and regional typology identification stages. The research time horizon is longitudinal using panel data for the period 2018-2024 (seven years), which includes the pre-pandemic period, the COVID-19 pandemic, and post-pandemic recovery, thus enabling dynamic analysis of the structural changes that occur.

### Subject, Object, and Unit of Analysis

The subjects of this study were 38 level II regional governments (regencies/cities) in East Java Province, comprising 29 regencies and 9 cities. These 38 units served as the units of analysis in the quantitative research component, therefore, no sampling was conducted to avoid selection bias. The selection of the entire population as the unit of analysis was also driven by the need to conduct a comprehensive spatial analysis, which requires complete data from all regions.

For the qualitative research component, subjects were selected purposively (purposive sampling) based on relevance and representativeness criteria. The research informants included: (1) Bappeda officials at the provincial level and at least six regencies/cities selected based on development typology; (2) academics and development policy researchers; (3) representatives of business actors and industry associations; and (4) civil society figures with direct experience with regional development programs.

The research object is the phenomenon of accelerated regional development, inclusive and sustainable economic growth, and their contribution to national economic resilience and independence in East Java. More specifically, this study examines the interaction between fiscal policy, investment, infrastructure, governance, and human capital variables in determining regional development trajectories.

### Operational Definition of Variables

The following table presents the operational definitions, measurements, and data sources for each research variable:

| Variables                                | Operational Definition   | Indicator/Proxy                            | Data source    | Scale     |
|--|--|--|----------------|-----------|
| Acceleration of Regional Development (Y) | The annual rate of increase in real per capita PDRB adjusted for the price deflator      | Growth rate of PDRB per capita (ADHK 2010) | BPS Jawa Timur | Ratio     |
| Development Inclusion (Y2)               | The level of equitable distribution of development results to all levels of society      | HDI, Gini Coefficient, Poverty Rate        | BPS, BPS Jatim | Composite |
| Sustainability (Y3)                      | The ability of regions to maintain growth without sacrificing natural and social capital | Green index of PDRB, environmental quality | KLHK, BPS      | Index     |
| Fiscal Capacity (X1)                     | The ability of regions to generate and manage fiscal resources independently             | PAD/Total APBD Revenue Ratio               | DJPk Kemenkeu  | Ratio     |
| Investment (X2)                          | Total inflow of direct investment from within and outside the country                    | Realization of PMDN+PMA (Rp billion)       | DPMPSTP Jatim  | Nominal   |

| Variables                 | Operational Definition   | Indicator/Proxy                                    | Data source      | Scale |
|---------------------------|--|--|------------------|-------|
| Infrastructure (X3)       | Availability and quality of physical infrastructure that supports economic activities  | Composite index of roads, electricity, clean water | Bappeda Jatim    | Index |
| Digital Connectivity (X4) | The level of penetration and utilization of digital technology in the regional economy | Internet penetration, digital economy index        | Kominfo          | Index |
| Governance (X5)           | The quality of regional government administration is good, accountable and transparent | SAKIP evaluation score, WTP BPK, IKM               | BPK, KemenPAN-RB | Score |
| Human Capital (X6)        | The quality and productivity of human resources as development input                   | HDI, Average years of schooling, AHH               | BPS              | Index |

### Data Collection Techniques

The data used in this study comprises secondary and primary data. Secondary data were obtained from various official government sources: (1) the East Java Central Statistics Agency (BPS) for GRDP, HDI, poverty, and Gini data; (2) the Directorate General of Fiscal Balance (DJPK) of the Ministry of Finance for regional fiscal data; (3) the Investment Coordinating Board (BKPM/DPMPTSP) for investment realization data; (4) the Ministry of Communication and Informatics for digital data; and (5) the Supreme Audit Agency (BPK) and the Ministry of Administrative and Bureaucratic Reform (KemenPAN-RB) for governance data. Data were collected for 38 districts/cities during the 2018-2024 period.

Primary data were obtained through two mechanisms. First, in-depth interviews with 24 purposively selected key informants using a semi-structured interview guide developed based on the theoretical dimensions of the study. Second, Focus Group Discussions (FGD) were conducted in four regional clusters (Surabaya Metropolitan, Mataraman, Tapal Kuda, and Madura) involving local stakeholders.

### Data Analysis Techniques

#### Dynamic Panel Data

For the quantitative component, this study employed several analytical techniques applied in stages. First, descriptive statistical analysis and data exploration were conducted to understand the characteristics and distribution of each variable. Second, spatial analysis using GeoDa software mapped the spatial distribution patterns of key variables and identified spatial clusters (spatial autocorrelation) using Moran's I index.

Third, dynamic panel data regression analysis used the Arellano-Bond (1991) Generalized Method of Moments (GMM) estimator, chosen for its ability to address the problems of endogeneity, heteroscedasticity, and autocorrelation common in development panel data. The GMM model is also capable of capturing adjustment dynamics, which are important in the long-term development process. The main model specifications are:

$$\Delta Y_{it} = \alpha + \beta_1 \Delta Y_{i,t-1} + \beta_2 \Delta X1_{it} + \beta_3 \Delta X2_{it} + \beta_4 \Delta X3_{it} + \beta_5 \Delta X4_{it} + \beta_6 \Delta X5_{it} + \beta_7 \Delta X6_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Where Y is the dependent variable (growth rate of PDRB per capita), X1-X6 are the independent variables as defined,  $\mu_i$  is the individual regional fixed effect (unobserved heterogeneity),  $\lambda_t$  is the time effect, and  $\varepsilon_{it}$  is the error term.

To model the complexity and dynamics of feedback within a regional development system, this study employs a System Dynamics (SD) approach using Vensim PLE software. SD modeling was chosen for its ability to depict non-linear causal relationships, identify causal loop diagrams, and conduct policy simulations to project the impact of various intervention scenarios on regional development. The SD model developed encompasses four interacting subsystems: the economic subsystem, the fiscal subsystem, the human capital subsystem, and the environmental subsystem.

Qualitative data from interviews and focus group discussions were analyzed using thematic analysis techniques as developed by Braun and Clarke (2006). The analysis process included: (1)

familiarization with the data through transcription and repeated reading; (2) initial coding using NVivo software; (3) grouping codes into potential themes; (4) review and refinement of themes; and (5) definition and naming of final themes. Triangulation was performed by comparing qualitative findings with quantitative results to ensure the validity and reliability of the findings.

## Results and Discussion

### Description of Data and Development Profile of East Java

Descriptive analysis of panel data from 38 regencies/cities in East Java for the 2018-2024 period reveals significant heterogeneity in almost all dimensions of development. The average per capita GRDP growth during the study period was 4.12% per year, with a high standard deviation of 3.87%, indicating significant variation across regions. Gresik Regency experienced the highest growth (7.9% per year), driven by industrial estate expansion, while Sampang Regency recorded the lowest growth at 1.8% per year—reflecting persistent inequality.

In terms of fiscal capacity, the average ratio of local revenue (PAD) to total regional budget (APBD) revenues in regencies/cities in East Java was 23.4%, with a range ranging from 8.1% (Pamekasan Regency) to 67.3% (Surabaya City). These findings confirm the conclusions of Nugroho and Pramono's (2023) study that there is a significant fiscal capacity gap between metropolitan cities and underdeveloped regions. They also surpass previous estimates, showing that this condition is likely to worsen after the 2020-2022 pandemic.

Investment data demonstrates a very strong spatial concentration pattern. Thirteen regencies/cities that make up the Gerbangkertosusila region (Surabaya, Sidoarjo, Gresik, Lamongan, and surrounding areas) absorbed 72.4% of East Java's total domestic and foreign direct investment (PMDN) realization during 2018-2024, while 25 other regions competed for the remaining 27.6%. This investment concentration is statistically strongly correlated ( $r=0.78$ ,  $p<0.01$ ) with disparities in per capita PDRB between regions, indicating that investment inequality is a key transmission mechanism for development inequality.

### Hypothesis Test Results and Panel Regression Analysis

#### Determinants of Regional Development Acceleration

The results of the Arellano-Bond GMM model estimation for the dependent variable, GRDP per capita growth rate, are presented with several important findings. The model specification test indicates that the model meets the requirements: the Arellano-Bond AR(1) test is significant ( $z=-2.34$ ,  $p=0.019$ ) and AR(2) is insignificant ( $z=1.12$ ,  $p=0.263$ ), and the Sargan/Hansen test indicates a valid instrument ( $\chi^2=31.4$ ,  $p=0.287$ ). Thus, the estimation results can be interpreted as consistent and unbiased.

The results of the H1 test indicate that regional fiscal capacity (X1) has a positive and significant effect on regional development acceleration, with a coefficient of  $\beta_1=0.342$  ( $t=4.23$ ,  $p<0.01$ ). This finding is consistent with the predictions of endogenous growth theory and supports the findings of Nugroho and Pramono (2023). Interpretation: A 1 percentage point increase in the PAD ratio is associated with a 0.34 percentage point increase in PDRB per capita growth, all other things being equal. Interestingly, the effect of fiscal capacity on growth is stronger in regions with a low HDI (interaction coefficient  $\beta=0.51$  in the lower HDI quartile vs.  $\beta=0.22$  in the upper HDI quartile), indicating that disadvantaged regions are more sensitive to increases in fiscal capacity because the marginal productivity of public spending is higher there.

Testing H2 confirms the positive and significant effect of infrastructure (X3) on growth with  $\beta_3=0.289$  ( $t=5.67$ ,  $p<0.01$ ), and digital connectivity (X4) with  $\beta_4=0.198$  ( $t=3.45$ ,  $p<0.01$ ). These findings regarding physical infrastructure are consistent with Kuncoro and Murjito (2021), while the findings regarding digital connectivity extend the findings of Pratiwi and Santoso (2023) to a more aggregate and representative level of analysis. What is novel in this research finding is that the effect of digital connectivity on growth has a threshold effect: in regions with internet penetration below 40%, the effect is insignificant, but once it exceeds 40%, the effect becomes positive and strong. This finding has important policy implications regarding the need for digital infrastructure investment to reach critical mass.

Testing H3 shows that governance quality (X5) has a positive and significant effect on growth with  $\beta_5=0.256$  ( $t=4.88$ ,  $p<0.01$ ). This finding confirms and strengthens the findings of Rahmawati and Aziz (2024) by adding a longer temporal dimension and including the pandemic period. Further analysis reveals that the effect of governance on growth operates primarily through the investment

channel: regions with higher governance scores attracted 2.3 times more investment than regions with poor governance, after controlling for other factors. This mechanism is consistent with institutional economics arguments, which emphasize that institutional quality is a fundamental precondition for productive investment activity.

### **Spatial Dynamics of Development Inequality**

Spatial analysis using Moran's I index revealed significant spatial autocorrelation in the distribution of per capita PDRB in East Java (Moran's  $I=0.437$ ,  $p<0.001$ ), indicating that wealthy regions tend to cluster close to each other (high-high cluster), and vice versa for poor regions (low-low cluster). The high-high cluster is concentrated in the Gerbangkertosusila area and its surroundings, while the low-low cluster is concentrated in Madura (Bangkalan, Sampang, Pamekasan, Sumenep) and parts of Tapal Kuda (Bondowoso, Situbondo).

The results of the beta convergence analysis ( $\beta$ -convergence) indicate that convergence is indeed occurring, but at a very slow rate: the absolute convergence coefficient  $\beta=-0.012$  per year, meaning it will take approximately 58 years for disadvantaged regions to reach half the per capita PDRB gap with leading regions. This is a worrying finding because it suggests that without more aggressive policy interventions, structural inequality in East Java will persist for generations. This convergence rate is significantly slower than Kuncoro and Murjito's (2021) estimate of 40 years, a difference likely due to the impact of the COVID-19 pandemic, which slowed the convergence process.

### **Contribution to National Economic Resilience**

System Dynamics modeling results reveal a complex transmission mechanism between East Java's regional development and national economic resilience. Model simulations reveal three main transmission pathways. The first pathway is the fiscal contribution pathway: East Java's regional budget surplus and tax contributions to the national budget provide additional fiscal space for the central government for national stimulus programs. Simulations show that a 1 percentage point increase in East Java's growth is correlated with an increase in national tax revenue of IDR 8.7 trillion in the medium term.

The second pathway is the value chain and export pathway: as an industrial and trade hub, East Java plays a crucial role in the national supply chain. Disruptions to East Java's economic activity—as evidenced by the 2020 pandemic—can have ripple effects throughout the national value chain. SD simulations show that a 1% contraction in East Java's economy results in a 0.14% decline in national GDP—or approximately 1.7 times East Java's share of the economy—due to the multiplier effect through the supply chain.

The third pathway is the socio-political resilience pathway: the social and political stability of East Java, Indonesia's second-most populous province, has direct consequences for the conduciveness of the national investment climate. This finding is in line with Boschma's (2015) resilience theory which emphasizes the socio-institutional dimension of economic resilience, and provides empirical support for H4 that regional development in East Java contributes significantly to national resilience.

### **Theoretical and Practical Implications**

Overall, the findings of this study make several important contributions to the regional development literature. First, it confirms the relevance of endogenous growth theory in the context of Indonesian regional development and enriches it by demonstrating that the effects of human capital and technology are non-linear and threshold-dependent—a finding that the linear approach dominant in previous research cannot capture. Second, this study provides the first empirical evidence regarding the threshold effect of digital connectivity on regional development in East Java, which has significant policy implications for the minimum internet penetration target that must be achieved for digital investment to have a real impact.

Third, the finding of the slow rate of inter-regional convergence (58 years) is a serious policy alarm. Compared with the study by Kuncoro and Murjito (2021) which estimated a timeframe of 40 years, this slowdown indicates that the impact of the COVID-19 pandemic has deepened existing structural disparities and made it more difficult to achieve equitable development. The most pressing policy implication is the need for a much more aggressive and integrated affirmative action policy for disadvantaged regions, beyond simply consumptive fiscal transfers.

Fourth, the findings regarding the triple-track transmission mechanism of East Java's development to national resilience provide strong scientific justification for the argument that

regional development investment is not merely a local matter, but a national strategic instrument. The central government has a direct—not merely a normative—interest in ensuring East Java's development proceeds smoothly, as the negative impacts of East Java's development failures will be felt far beyond the province's borders.

## Conclusion

This research has successfully addressed the four research questions proposed through a comprehensive analysis integrating GMM panel data regression, spatial analysis, System Dynamics modeling, and qualitative analysis. The conclusions drawn are synthetic and multidimensional, as follows:

First, regarding the determinants of regional development acceleration: this study demonstrates that inclusive economic growth in East Java is significantly determined by regional fiscal capacity, infrastructure quality, digital connectivity, governance quality, and human capital. Fiscal capacity has a stronger effect in regions with a low HDI, implying that more pro-disadvantaged fiscal redistribution can be an effective convergence instrument. Digital connectivity has been shown to have a threshold effect: its benefits only become apparent after internet penetration exceeds 40%, underscoring the importance of digital infrastructure investment reaching a critical minimum scale.

Second, regarding the patterns and dynamics of inequality: the spatial analysis confirms the persistence of spatial clusters of prosperity and poverty in East Java, which show no signs of weakening in the short term. The very slow pace of convergence—it took 58 years to close half the gap—is evidence that market mechanisms are insufficient to promote equitable development. This underscores the need for stronger structural policy interventions, not just temporary remedial programs.

Third, regarding contributions to national resilience: System Dynamics modeling successfully identified three main transmission channels from East Java's development to national economic resilience—the fiscal channel, the value chain channel, and the socio-political channel. The finding that a 1% economic contraction in East Java results in a 0.14% decline in national GDP through the value chain multiplier effect is new empirical evidence that reinforces the urgency of addressing East Java's development as a strategic national agenda, not merely a regional one.

Fourth, regarding the development model: this study successfully formulated a Resilience-Based Regional Development Model (MPDBR) that integrates five dimensions: fiscal capacity-investment, digital infrastructure, institutional governance, human capital-innovation, and environmental sustainability. This model differs from previous models in three ways: (a) it combines static and dynamic analysis within a single framework; (b) considering threshold effects and non-linearity; and (c) explicitly linking regional development with national resilience and independence.

## Scientific Contribution

This research makes identifiable scientific contributions at three levels. At the theoretical level, this research expands endogenous growth theory by incorporating resilience and digital connectivity as interacting endogenous variables and empirically proves the relevance of threshold effects in the context of regional development in Indonesia. At the methodological level, this research demonstrates the feasibility and added value of a mixed methods approach that integrates GMM, spatial analysis, and System Dynamics within a single regional development research framework. At the empirical level, this research produces more up-to-date and comprehensive data and estimates than previous research, covering the pandemic and post-pandemic periods, which have been understudied.

## Suggestions

Based on the research findings, several concrete and measurable policy recommendations are available for the East Java Provincial Government and district/city governments. First, strengthen the fiscal capacity of underdeveloped regions through reforming the fiscal transfer system, oriented more toward capacity-building than simply filling gaps. The Special Allocation Fund (DAK) formula needs to be revised to give greater weight to regions with low fiscal capacity but high development potential. Second, accelerating digital infrastructure in the 18 districts/cities still below the 40% internet penetration threshold needs to be prioritized as a strategic program with measurable targets and a clear timeline in the RPJMD (Regional Medium-Term Development Plan). Third, regional governance reform needs to focus not only on accountability and compliance, but also on increasing bureaucratic innovation capacity and responsiveness to the needs of investors and business actors. Fourth, regional development policies need to implement a regional cluster approach that connects

underdeveloped regions with the nearest growth poles through deliberately designed economic corridors.

For further research, several directions are suggested based on the limitations of this study. First, future research should explore heterogeneity in the effects of development policies using a Heterogeneous Panel approach (mean group estimator) that can estimate coefficients specific to each region, rather than just the average coefficient. Second, the dimensions of climate change and disaster risk—which are increasingly relevant but absent in this study—need to be integrated into regional development models to capture regional vulnerability and resilience to climate shocks. Third, research with an international dimension comparing the development of East Java with comparable provinces in other ASEAN countries (such as Central Java Province in Thailand or Cebu in the Philippines) would provide a valuable comparative perspective for identifying adaptable best practices. Fourth, future research should explore in more depth the micro-mechanisms (firm-level and household-level) of regional development processes through more granular longitudinal survey data, to complement the aggregate findings of regional-level studies such as those conducted in this study.

Theoretically, this study opens up opportunities to further develop the concept of regional economic resilience in the context of developing countries. The resilience theory developed by Boschma and Martin is primarily based on the experiences of regions in Europe and North America with institutional, historical, and structural characteristics that differ from those of regions in Indonesia. More systematic theorizing efforts are needed to construct a contextualized concept of regional economic resilience for developing countries characterized by strong formal-informal economic dualism, incomplete decentralization, and high vulnerability to external shocks. The contribution of this study can serve as a starting point for such a theoretical agenda, with the caveat that generalization of the research findings beyond the context of East Java requires caution and adequate contextual sensitivity.

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