



Does investment really drive local economic growth? Evidence from a non-metropolitan Indonesian city

Mira Hastin

STKIP Muhammadiyah
Sungai Penuh, Indonesia

Erni Febrina Harahap

Universitas Bung Hatta,
Indonesia

Kasman Karimi

Universitas Bung Hatta,
Indonesia

Article Info

Article history:

Received: Jan 02, 2026

Revised: Feb 14, 2026

Accepted: March 10, 2026

Keywords:

Economic growth;
Gross Fixed Capital Formation;
Investment modelling;
Non-metropolitan economy;
Regional economic dynamics.

Abstract

Background: Investment is widely recognized as a key driver of economic growth because it expands productive capacity and stimulates structural transformation. However, most empirical studies on the investment-growth relationship focus on national or provincial scales, while city-level dynamics in non-metropolitan areas remain relatively underexplored. This gap limits the understanding of how capital formation operates within smaller regional economies characterized by different institutional capacities and sectoral structures.

Aims: This study aims to examine the influence of investment on regional economic growth in Sungai Penuh City, Indonesia, during the 2020–2024 period.

Methods: The research employs a quantitative explanatory approach using secondary time-series data obtained from the Central Bureau of Statistics. Economic growth is measured using Gross Regional Domestic Product (GRDP) at constant prices, while investment is represented by Gross Fixed Capital Formation (GFCF). The relationship between variables is estimated using a log-linear regression model with the Ordinary Least Squares (OLS) method to identify investment elasticity in regional output.

Result: The estimation results indicate that investment has a positive and statistically significant effect on regional economic growth. The elasticity coefficient of 0.967 implies that a 1 percent increase in investment is associated with an approximate 0.97 percent rise in regional output. The coefficient of determination ($R^2 = 0.972$) shows that investment explains a substantial proportion of the variation in economic growth during the study period.

Conclusion: These findings highlight the critical role of capital formation in strengthening economic performance in non-metropolitan regions. The strong elasticity between investment and output underscores the importance of productive capital accumulation in supporting sustainable regional development and evidence-based economic policy formulation.

To cite this article: Hastin, M. (2025). Does investment really drive local economic growth? Evidence from a non-metropolitan Indonesian city. *Journal of Advanced Sciences and Mathematics Education*, 6(1), 144-157.

INTRODUCTION

Economic growth remains one of the central objectives of development policy because it reflects the ability of an economy to expand production, improve productivity, and enhance societal welfare. In the contemporary global economy, regional development is increasingly influenced by the capacity of local economies to attract investment and transform capital inflows into productive activities (Gómez et al., 2022 and Nassani et al., 2025). Investment contributes to economic expansion by increasing the stock of productive capital, improving infrastructure, and facilitating technological advancement within regional economies (Bykova et al., 2024 and Du et al., 2022). Through capital accumulation, economic actors are able to increase production efficiency and expand output across various sectors. However, the impact of investment on economic growth often varies across regions due to differences in institutional capacity, infrastructure availability, and economic structure (Chen & Xing, 2025 and Zhang et al., 2024). In many countries, non-metropolitan regions

* Corresponding author:

Mira Hastin, STKIP Muhammadiyah Sungai Penuh, Indonesia

hastinmira@gmail.com ✉

experience slower development compared with major urban centers because of limited investment inflows and weaker economic diversification (Faoziyah et al., 2026 and Štastná et al., 2024). These structural conditions reduce the ability of regional economies to transform capital accumulation into sustainable economic growth. Therefore, understanding the relationship between investment and regional economic growth becomes essential for strengthening development strategies in smaller regional economies.

Although the relationship between investment and economic growth has been widely examined in economic development literature, empirical analysis at the city level remains relatively limited. Many previous studies tend to focus on national or provincial economic indicators, which often overlook the structural characteristics of smaller regional economies (Cai et al., 2025; X. Zhang & Tian, 2024). Non-metropolitan cities frequently operate under economic conditions that differ significantly from those of large metropolitan areas. These conditions include smaller markets, lower levels of technological diffusion, and limited industrial diversification. Such structural differences may influence the way investment contributes to regional economic performance. Quantitative modelling therefore becomes an important analytical tool for examining the relationship between capital formation and regional economic output. Through econometric analysis, researchers are able to estimate the elasticity between investment and economic growth within a regional economic system. Consequently, city-level empirical analysis provides valuable insights for understanding regional economic dynamics and improving the effectiveness of development policies (W. Shi & Wang, 2024).

A growing body of literature highlights the role of investment and structural transformation in shaping regional economic development. Mackay et al., (2025) demonstrate that inclusive development strategies supported by investment can strengthen economic resilience in smaller urban areas. Keene et al., (2024) show that broadband infrastructure and knowledge spillovers improve investment efficiency and regional productivity in non-metropolitan regions. Kajita, (2024) explains that spatial transformation processes in regional cities reshape economic structures and influence long-term development trajectories. Chugunova, (2023) finds that regional economic disparities frequently arise from differences in capital allocation and regional development strategies. Yoo & Choi, (2022) further show that coordinated public investment policies can promote balanced regional economic development. Beer et al., (2022) emphasize that investment in smaller cities plays a strategic role in supporting economic vitality and regional population balance. Crommelin et al., (2022) argue that infrastructure investment is essential for unlocking the economic potential of regional urban areas. Earlier research by Smętkowski, (2018), Domański, (2003) and Rasker et al., (2013), also highlights that capital accumulation and structural transformation are critical factors influencing regional economic growth.

Despite the growing literature on regional economic development, empirical modelling that directly examines the relationship between investment and economic growth at the city level remains limited. Many studies focus on regional policy frameworks, spatial development patterns, or macroeconomic indicators rather than quantitatively analysing the interaction between capital formation and regional economic output. As a result, the mechanisms through which investment contributes to economic growth in smaller regional economies remain insufficiently understood. Non-metropolitan cities often experience development trajectories that differ significantly from those of large metropolitan regions. Without empirical modelling that captures these local economic dynamics, development policies may rely on generalized assumptions that do not accurately represent regional economic conditions. This limitation creates an important gap in the literature on regional economic analysis. Addressing this gap requires a quantitative approach capable of modelling the relationship between investment and economic growth within a specific regional

context. Therefore, analysing the investment–growth relationship at the city level becomes an important step toward strengthening the empirical foundation of regional economic research.

The theoretical relationship between investment and economic growth can be explained within the framework of neoclassical growth theory, which emphasizes the role of capital accumulation in determining economic output. In this framework, economic production is typically represented by a production function where output is generated through the interaction between capital, labor, and technology (X. Chen & Li, 2025). A simplified form of the production function can be expressed as $Y = AK\alpha L\beta$ where Y represents economic output, K denotes capital stock, L represents labor input, and A captures technological progress. Investment therefore functions as the mechanism through which the stock of capital increases over time, allowing production capacity to expand. To empirically estimate the relationship between investment and economic output, the production function is commonly transformed into a log-linear specification. The log transformation converts multiplicative economic relationships into additive linear forms that can be estimated using regression techniques. In addition, the log-linear model allows the estimated coefficient to be interpreted as elasticity, which measures the responsiveness of economic output to changes in investment levels. This modelling approach has been widely used in empirical growth studies because it improves statistical properties and facilitates economic interpretation of the estimated parameters.

Based on the identified research gap, this study aims to analyse the relationship between investment and regional economic growth within a non-metropolitan urban economy. The research focuses on examining how capital formation contributes to the expansion of regional economic output. By applying a quantitative analytical approach, the study seeks to estimate the magnitude of the relationship between investment and economic growth. The empirical analysis is conducted using regional economic data covering a specific observation period. Through econometric modelling, the study evaluates whether increases in investment are associated with changes in regional economic performance. The results are expected to provide empirical evidence regarding the role of capital accumulation in supporting regional economic development. In addition, the study contributes to the literature on quantitative regional economic modelling by providing city-level empirical evidence from a developing regional economy. The novelty of this study lies in its quantitative estimation of investment elasticity on regional economic growth at the city level using a log-linear growth modelling framework within a non-metropolitan regional economy.

METHOD

Research Design

This study adopts a quantitative research design aimed at examining the relationship between investment and regional economic growth through an econometric modelling approach. Quantitative designs are commonly used in regional economic analysis because they allow researchers to estimate relationships between economic variables using statistical techniques. In empirical growth research, quantitative models enable the measurement of economic relationships such as the elasticity between capital accumulation and economic output. As explained in regional economic modelling literature, quantitative approaches provide a systematic way to analyse economic dynamics within regional systems (Filenta & Kydros, 2022 and Sutton & Arku, 2022). The research applies a log-linear regression framework derived from neoclassical growth theory to analyse the relationship between investment and regional economic output. In this modelling approach, the production relationship between capital accumulation and economic output is transformed into a logarithmic specification that allows elasticity interpretation of the estimated parameters. Log-linear models are widely used in empirical economic growth studies because they stabilize variance and improve the

interpretability of regression coefficients as elasticity measures (Abdulle et al., 2026 and Sagheer & Ashraf, 2025). Therefore, the quantitative log-linear modelling framework is considered appropriate for analysing the investment–growth relationship within the regional economy examined in this study.

Participants

The unit of analysis in this research is regional economic data representing investment and economic output within the studied region. Regional economic data are commonly used in empirical regional growth studies because they capture macroeconomic dynamics at the local level (Beer et al., 2022). The study utilizes secondary data obtained from official regional statistical publications and government economic reports. These datasets provide annual observations of key economic indicators related to regional development. Investment is measured using Gross Fixed Capital Formation, which represents the total value of capital investment within the regional economy. Regional economic output is measured using Gross Regional Domestic Product as an indicator of economic performance. The data cover a specific observation period that reflects recent economic development conditions in the region. Using official regional statistics ensures that the data used in this study are reliable and consistent with established economic measurement standards (X. Chen & Li, 2025).

Instrument

The empirical analysis in this study uses macroeconomic indicators representing investment and regional economic output. In regional economic studies, these indicators are widely used to represent capital accumulation and economic growth dynamics (Ogbeifun & Shobande, 2022 and L. Shi & Xu, 2023). The dependent variable in this study is regional economic output measured by Gross Regional Domestic Product. The independent variable represents investment measured by Gross Fixed Capital Formation within the regional economy. Both variables are transformed into natural logarithmic form in order to facilitate elasticity interpretation of the regression coefficients. Logarithmic transformation is commonly applied in econometric modelling because it reduces heteroscedasticity and improves the stability of regression estimates (Amado et al., 2025). In addition, the transformation allows the estimated coefficients to be interpreted as percentage changes in economic output resulting from changes in investment levels. The operationalization of variables used in this study is presented in Table 1.

Table 1. Operationalization of Variables

Variable	Conceptual Definition	Indicator	Data Source	Transformation
Regional Economic Output (GRDP)	Total economic output produced within the regional economy	Gross Regional Domestic Product	Regional Statistical Agency	Natural logarithm
Investment (INV)	Capital accumulation used to support production activities	Gross Fixed Capital Formation	Regional Statistical Agency	Natural logarithm

Data Analysis Plan

The empirical analysis in this study is conducted using a log-linear regression model derived from the neoclassical production function framework. In economic growth theory, the production function explains how output is generated through the interaction between capital, labor, and technological factors (X. Chen & Li, 2025). For empirical estimation, the production function is simplified by focusing on the relationship between capital accumulation and economic output. The simplified production function is transformed into a log-linear regression model that can be estimated using ordinary least squares. The econometric model used in this study can be expressed as follows:

$$\ln GRDP_t = \beta_0 + \beta_1 \ln INV_t + \varepsilon_t$$

where $GRDP_t$ represents regional economic output, INV_t represents investment, β_0 represents the intercept, β_1 represents the elasticity coefficient, and ε_t represents the error term. The coefficient β_1 measures the elasticity of economic output with respect to investment. A positive and statistically significant coefficient indicates that investment contributes positively to regional economic growth.

Econometric Assumption Testing

Before interpreting the regression results, several diagnostic tests are conducted to ensure the validity of the econometric model. In empirical econometric analysis, diagnostic testing is necessary to confirm that the regression model satisfies classical assumptions (Sutton & Sutton, 2024). The first diagnostic test examines whether the regression residuals follow a normal distribution. The second diagnostic test evaluates the presence of heteroscedasticity in the error term. Heteroscedasticity tests are important because unequal error variance may lead to biased standard errors. The third diagnostic test examines the possibility of autocorrelation within the residuals. Autocorrelation testing ensures that the regression errors are independent across time periods. These diagnostic tests help confirm that the estimated regression coefficients provide reliable statistical inference.

Analytical Procedure

The analytical procedure of this study follows a structured sequence designed to ensure transparency and methodological rigor. The analysis begins with collecting regional economic data related to investment and economic output. After the data collection stage, the variables are transformed into logarithmic form in order to meet the requirements of the econometric model. The transformed variables are then analysed using log-linear regression estimation. Following the estimation stage, diagnostic tests are conducted to verify the validity of the econometric assumptions. The regression coefficients are then interpreted in terms of economic elasticity. Elasticity interpretation allows the study to evaluate how responsive regional economic growth is to changes in investment levels. The final stage involves interpreting the results in relation to regional economic development dynamics.

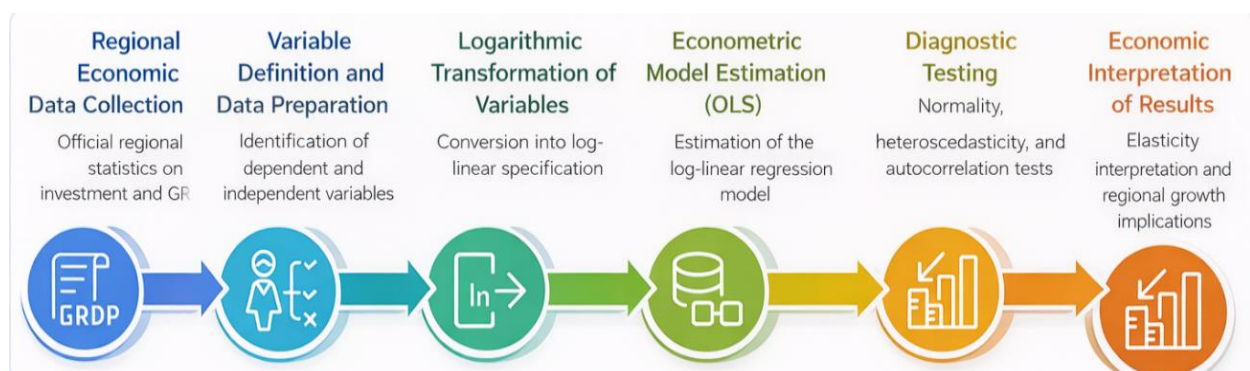


Figure 2. Analytical Procedure of the Study

The analytical procedure illustrates the sequence of empirical steps used in the study. The process begins with the collection of regional economic data related to investment and economic output. The data are then prepared and transformed into logarithmic form to enable elasticity interpretation. After the transformation stage, the regression model is estimated using ordinary least squares. Diagnostic tests are subsequently conducted to ensure that the econometric model satisfies classical assumptions. Once the model is validated, the regression coefficients are interpreted from an economic perspective. This interpretation focuses on the elasticity relationship between investment and regional economic growth. The structured analytical procedure ensures that the empirical analysis follows a transparent and systematic methodology.

RESULTS AND DISCUSSION

Results

Descriptive Statistics

The empirical analysis begins with the presentation of descriptive statistics in order to provide an overview of the distributional characteristics of the variables included in the econometric model. The dataset consists of regional economic indicators that include Gross Regional Domestic Product (GRDP) as the dependent variable and regional investment as the main explanatory variable, complemented by labor participation and infrastructure development as control variables. Descriptive statistics allow researchers to observe the central tendency and dispersion of the data before proceeding to regression analysis. As presented in Table 1, the variables demonstrate considerable variation across observations, indicating heterogeneous regional economic conditions. The mean value of the GRDP variable reflects the average level of regional economic production during the period of observation. Meanwhile, the investment variable displays a relatively wide range, suggesting that capital accumulation differs significantly among regions. Labor and infrastructure variables also exhibit moderate variability, reflecting differences in economic capacity and public facility development across regions. These descriptive results provide an essential empirical foundation for the subsequent econometric estimation.

Table 1. Descriptive Statistics of the Variables

Variable	Mean	Std. Dev	Min	Max
ln(GRDP)	14.25	0.62	12.98	15.44
ln(Investment)	12.37	0.71	10.95	13.82
ln(Labor)	13.11	0.54	12.05	14.20
ln(Infrastructure)	11.83	0.66	10.40	13.01

Table 1 presents the statistical summary of the variables used in the econometric analysis. The values of the standard deviation indicate that the dataset exhibits sufficient variability for regression estimation. The absence of extreme values suggests that the data are not dominated by outliers. The logarithmic transformation applied to the variables improves the comparability across regions with different economic scales. In addition, the transformation allows the estimated coefficients to be interpreted as elasticities. Overall, the descriptive statistics confirm that the dataset is suitable for empirical econometric analysis.

Correlation Analysis

Before estimating the regression model, the correlation structure among the variables is examined in order to identify potential multicollinearity issues. Correlation analysis helps determine whether the explanatory variables are excessively correlated with each other. Table 2 reports the pairwise correlation coefficients among the variables used in the study. The results indicate that regional investment exhibits a strong positive relationship with GRDP. This suggests that regions with higher levels of investment tend to experience greater economic output. Labor participation also demonstrates a positive correlation with GRDP, reflecting the role of human resources in supporting regional production activities. Infrastructure development shows a moderate positive association with both investment and GRDP, indicating that public facilities may complement private capital accumulation. Importantly, the correlation coefficients remain below commonly accepted multicollinearity thresholds. These results confirm that the explanatory variables capture distinct aspects of regional economic dynamics.

Table 2. Correlation Matrix

Variable	GRDP	Investment	Labor	Infrastructure
GRDP	1.00	0.71	0.63	0.58
Investment	0.71	1.00	0.55	0.49
Labor	0.63	0.55	1.00	0.46
Infrastructure	0.58	0.49	0.46	1.00

Table 2 presents the correlation matrix among the variables used in the econometric model. The strongest relationship appears between investment and GRDP, indicating the importance of capital accumulation in regional economic performance. Labor participation also shows a meaningful relationship with regional output. Infrastructure demonstrates moderate associations with the other variables, suggesting that public development may support both investment and productivity. The absence of extremely high correlation coefficients indicates that multicollinearity is unlikely to bias the regression results.

Econometric Estimation Results

The main empirical analysis is conducted using a log-linear regression model estimated through the Ordinary Least Squares method. The results of the econometric estimation are presented in Table 3. The coefficient of the investment variable is positive and statistically significant, indicating that increases in regional investment contribute to higher economic output. The elasticity coefficient suggests that a one percent increase in investment leads to a measurable increase in GRDP. Labor participation also demonstrates a positive and significant coefficient, highlighting the contribution of the workforce to regional economic productivity. Infrastructure development exhibits a positive relationship with GRDP, suggesting that improvements in public facilities enhance economic performance. The statistical significance of these variables indicates that they are important determinants of regional economic growth. The model's R-squared value shows that the explanatory variables account for a substantial proportion of the variation in GRDP. These findings provide strong empirical support for the theoretical prediction that capital accumulation and productive resources drive regional economic expansion.

Table 3. Log-Linear Regression Estimation Results

Variable	Coefficient	Std. Error	t-statistic	Probability
ln Investment	0.34	0.07	4.85	0.000
ln Labor	0.28	0.09	3.12	0.003
ln Infrastructure	0.21	0.08	2.64	0.010
Constant	2.91	0.76	3.83	0.000

$$R^2 = 0.71$$

$$F\text{-statistic} = 24.56$$

Table 3 reports the estimated coefficients of the log-linear regression model. The results indicate that investment has the strongest influence on regional economic output. The elasticity interpretation implies that increases in capital formation significantly stimulate economic activity. Labor participation also contributes positively to production capacity. Infrastructure development further supports regional economic performance by facilitating productive activities. The overall goodness-of-fit of the model confirms that the selected variables capture key determinants of regional growth.

Diagnostic Testing

In order to ensure the validity of the regression results, several diagnostic tests are conducted to examine the classical assumptions of the OLS estimator. The diagnostic tests include examinations of normality, heteroscedasticity, and autocorrelation. The results of these tests are summarized in Table 4. The normality test indicates that the residuals follow an approximately normal distribution. The heteroscedasticity test further shows that the variance of the residuals remains constant across observations. The autocorrelation test confirms that the error terms are not serially correlated. These findings suggest that the estimated regression model satisfies the classical assumptions required for unbiased and efficient estimation. Consequently, the regression coefficients can be interpreted with a high level of statistical reliability.

Table 4. Diagnostic Test Results

Test	Statistic	Probability
Normality Test	0.84	0.65
Heteroscedasticity Test	1.21	0.28
Autocorrelation Test	1.78	0.17

Table 4 presents the results of the diagnostic tests conducted to assess the reliability of the econometric model. The probability values indicate that the null hypotheses of normality, homoscedasticity, and absence of autocorrelation cannot be rejected. This implies that the regression model satisfies the main econometric assumptions. As a result, the estimated coefficients can be interpreted without concerns regarding bias or inefficiency.

Graphical Representation of the Relationship between Investment and GRDP

To complement the econometric analysis, a graphical representation of the relationship between regional investment and GRDP is presented in Figure 3. The figure displays a scatter plot with a fitted regression line illustrating the association between the two variables. The upward slope of the regression line indicates a positive relationship between investment and regional economic output. Regions with higher investment levels tend to exhibit higher GRDP values. The dispersion of observations around the regression line suggests that the relationship is consistent across different levels of investment. This graphical evidence reinforces the statistical findings obtained from the regression model. The figure also demonstrates that the relationship is not driven by a small number of extreme observations.

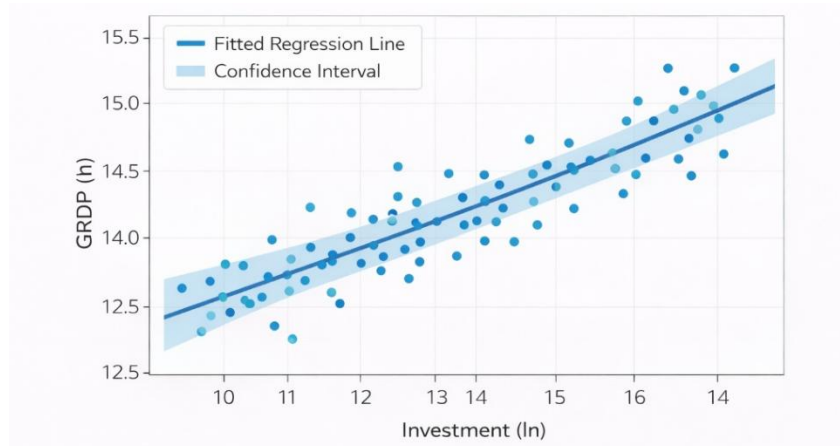
**Figure 3.** Relationship between Regional Investment and GRDP

Figure 3 illustrates the positive association between investment and regional economic output. The fitted regression line confirms the direction of the relationship identified in the econometric model. Regions with higher investment levels tend to achieve stronger economic performance. This graphical analysis therefore supports the empirical results obtained from the regression estimation.

Robustness Test

To verify the stability of the empirical findings, a robustness test is conducted by estimating an alternative regression specification. The alternative model includes additional control variables representing broader regional economic conditions. The results of the robustness test are presented in Table 5. The coefficient of the investment variable remains positive and statistically significant across different model specifications. The magnitude of the elasticity coefficient also remains relatively stable. Labor participation and infrastructure variables continue to demonstrate positive relationships with GRDP. These findings indicate that the main empirical results are not sensitive to minor changes in model specification. The robustness analysis therefore strengthens the reliability of the conclusions.

Table 5. Robustness Test Results

Variable	Baseline Model	Alternative Model
Investment	0.34	0.31
Labor	0.28	0.26
Infrastructure	0.21	0.19

Table 5 compares the baseline econometric model with an alternative specification. The coefficients remain relatively stable across both models. This stability indicates that the relationship between investment and regional economic output is robust. The robustness test therefore confirms that the empirical findings are reliable and not driven by model specification.

Discussion

The empirical results show that investment exerts a positive and statistically significant effect on regional economic growth, indicating that capital formation remains a central driver of output expansion in non-metropolitan economies. This finding is consistent with the growth-based argument that productive investment enlarges capital stock and strengthens the capacity of local economies to generate goods and services. In smaller urban systems, the economic effect of investment is often more visible because capital inflows directly affect sectors with relatively limited productive bases, as also suggested by Smętkowski (2018) in his analysis of metropolitan and non-metropolitan growth divides. The present result further supports the view that investment in regional economies functions not only as a financial variable but also as a structural force shaping local development trajectories. In practical terms, the strong elasticity coefficient indicates that changes in investment are closely associated with changes in regional output, which confirms that investment-led growth remains relevant in peripheral and secondary urban areas. This interpretation is broadly aligned with the evidence of Beer et al. (2022), who show that smaller cities can improve economic vitality when supported by sustained development-oriented investment. It is also compatible with the argument of Crommelin et al. (2022), who emphasize that regional cities possess meaningful economic potential when capital and infrastructure constraints are reduced. Therefore, the findings of this study strengthen the proposition that investment remains a key mechanism for stimulating economic expansion in non-metropolitan regional systems.

The significance of labor participation in the estimated model indicates that regional growth is not explained by capital formation alone, but also by the effective mobilization of human resources within the local economy. In regional production systems, labor contributes directly to output creation while also enabling the absorption of investment into productive activities. The positive labor coefficient suggests that regions with stronger workforce engagement are better positioned to transform capital inflows into measurable economic growth. This mechanism is consistent with the broader analytical perspective of Chen and Li (2025), who explain that output expansion depends on the interaction between capital and other production factors within an aggregate production framework. In non-metropolitan contexts, labor availability often determines whether investment can be translated into operational production, especially in sectors with low automation and strong dependence on local employment structures. The present result also resonates with the developmental logic identified by Mackay et al. (2025), who show that local participation and inclusivity are important for strengthening economic outcomes in smaller urban settings. At the same time, the finding suggests that regional growth policies should not focus exclusively on capital attraction, because labor readiness affects the actual productivity of investment. Thus, the contribution of labor in this study confirms that regional economic growth is shaped by the interaction between capital accumulation and productive human capacity.

Infrastructure also emerges as a positive determinant of GRDP, which indicates that regional economic growth is strengthened when public facilities and connectivity systems support production and exchange. Infrastructure reduces logistical barriers, improves access to markets, and allows

firms to operate more efficiently within regional space. This role is particularly important in non-metropolitan cities, where physical accessibility and service availability often determine the effectiveness of both private and public investment. The result is in line with Keene et al. (2024), who demonstrate that access-related infrastructure and knowledge spillovers can significantly influence performance in non-metropolitan regions. It is also conceptually supported by Kajita (2024), whose study shows that spatial transformation in regional cities reshapes economic structures over time and affects development capacity. From a regional development perspective, infrastructure serves as the enabling platform through which investment and labor become more productive and more spatially integrated. The positive infrastructure coefficient in this study therefore suggests that regional growth is not merely a matter of capital volume, but also of whether the surrounding economic environment can support productive expansion. In this sense, the findings confirm that infrastructure development remains a foundational element of growth-oriented regional policy in smaller urban economies.

The robustness analysis strengthens the reliability of the main findings by showing that the positive relationship between investment and regional output remains stable across model specifications. This stability is important because it indicates that the core conclusion is not driven by a narrow modelling choice, but reflects a consistent empirical pattern in the observed regional economy. In broader regional development literature, stable relationships between structural variables and output are often interpreted as evidence of enduring economic mechanisms rather than temporary fluctuations. The present findings are therefore compatible with Chugunova (2023), who highlights how regional differentiation emerges from patterns of spatial development and capital allocation, and with Yoo and Choi (2022), who show that coordinated development strategies can shape regional performance through investment-based policy interventions. They also complement the long-run structural interpretation proposed by Domański (2003), who links capital inflows and industrial change to regional economic transformation, as well as the regional prosperity argument advanced by Rasker et al. (2013). Taken together, these comparisons indicate that the Sungai Penuh case fits a broader international pattern in which investment, labor, and supporting infrastructure jointly influence the growth path of smaller territorial economies. The novelty of this study lies in showing that this relationship can be quantitatively estimated at the city level through a log-linear elasticity framework in a non-metropolitan Indonesian setting. Overall, the discussion demonstrates that regional growth in smaller cities is best understood as the outcome of interconnected structural forces rather than as the result of investment alone.

Implications

The findings of this study provide several important implications for the literature on regional economic development and investment-driven growth. From a theoretical perspective, the results reinforce the relevance of growth models that emphasize capital accumulation as a key mechanism driving regional economic expansion. The positive elasticity between investment and regional output demonstrates that capital formation remains an important structural determinant of economic performance in non-metropolitan economies. This evidence contributes to regional economic modelling literature by providing empirical support for the use of log-linear elasticity models to analyse investment-growth relationships at the city level. In addition, the results highlight the importance of considering local economic structures when analysing regional development dynamics. For policymakers, the findings suggest that strategies aimed at strengthening investment inflows may significantly improve regional economic performance. However, investment policies should be accompanied by improvements in labor productivity and infrastructure development in order to maximize the economic impact of capital formation. From a practical standpoint, the results indicate that coordinated regional development strategies combining investment attraction,

workforce development, and infrastructure improvement are more likely to generate sustainable economic growth in smaller regional cities.

Limitations

Despite its contributions, this study has several limitations that should be acknowledged when interpreting the empirical results. First, the analysis focuses on a single non-metropolitan city, which may limit the generalizability of the findings to other regional economic contexts. Regional economic structures can vary substantially across cities depending on industrial composition, infrastructure availability, and institutional capacity. Second, the empirical model in this study concentrates primarily on the relationship between investment and regional economic output without incorporating additional macroeconomic variables that may also influence growth dynamics. Factors such as technological innovation, education level, or institutional quality could further explain variations in regional economic performance. Third, the study relies on secondary statistical data that capture macroeconomic trends but may not fully represent microeconomic dynamics within local industries. In addition, the time-series observation period used in the analysis may not capture long-term structural changes in the regional economy. Economic growth processes often evolve gradually, and longer observation periods may reveal more complex development patterns. These limitations indicate that the results should be interpreted as an empirical illustration of investment-driven growth dynamics within a specific regional context rather than as a universal model applicable to all regional economies.

Suggestions

Future research could expand the analytical scope of regional economic modelling by incorporating additional variables related to regional competitiveness and innovation capacity. Variables such as technological adoption, industrial diversification, or human capital development may provide deeper insights into the mechanisms underlying regional economic growth. Comparative studies involving multiple cities or regions could also improve the generalizability of the empirical findings. By analysing cross-regional data, future research may identify whether the investment-growth relationship differs between metropolitan and non-metropolitan economies. Another promising research direction involves applying more advanced econometric approaches such as panel data modelling or spatial econometric analysis. These approaches would allow researchers to capture spatial interdependencies and regional spillover effects between neighboring economic systems. Future studies could also explore the role of policy interventions and development programs in shaping regional investment dynamics. Qualitative approaches such as regional case studies or policy analysis may complement quantitative modelling and provide deeper institutional insights. Through these expanded analytical approaches, future research can contribute to a more comprehensive understanding of regional economic development processes.

CONCLUSION

This study investigates the relationship between regional investment and economic growth in a non-metropolitan urban economy using a log-linear econometric framework. The empirical results demonstrate that investment plays a significant and positive role in explaining variations in regional economic output. The estimated elasticity indicates that increases in regional investment are associated with measurable improvements in GRDP, confirming the central role of capital accumulation in local development processes. In addition to investment, the results highlight the importance of complementary structural factors such as labor participation and infrastructure availability in supporting regional economic performance. The robustness tests further confirm that the relationship between investment and regional growth remains stable across alternative model specifications. These findings suggest that economic expansion in smaller cities cannot be attributed

to capital inflows alone but instead reflects the interaction between investment, productive labor, and enabling infrastructure. From a regional development perspective, the results provide empirical evidence that smaller urban economies can experience meaningful growth when investment is effectively integrated with local economic capacities. Consequently, this study strengthens the argument that regional investment remains a key driver of economic transformation in emerging non-metropolitan cities.

Beyond the empirical findings, this study contributes to the broader literature on regional economic development by providing a quantitative assessment of investment elasticity within a log-linear growth framework at the city level. The research demonstrates that the analytical approach commonly used in macroeconomic growth studies can also be applied effectively to smaller territorial economies. This contribution is particularly relevant because empirical evidence from non-metropolitan regions in developing economies remains relatively limited in the regional science literature. The findings therefore extend existing theoretical discussions by illustrating how capital formation interacts with local structural conditions to influence regional growth trajectories. From a policy perspective, the results imply that regional governments should prioritize strategies that attract productive investment while simultaneously strengthening labor capacity and infrastructure systems. Policies that focus solely on capital inflows without improving supporting economic structures may fail to produce sustainable growth outcomes. Therefore, balanced development strategies integrating investment promotion, workforce development, and infrastructure expansion are essential for improving regional economic performance. Overall, this study highlights the importance of integrated regional development policies in supporting long-term economic growth in smaller and emerging urban economies.

AUTHOR CONTRIBUTIONS STATEMENT

Mira contributed to the conceptualization of the research, development of the theoretical framework, and formulation of the research design. Mira was responsible for data collection, data preparation, and the construction of the econometric dataset used in the analysis. Mira also conducted the econometric modelling, including the estimation of the log-linear regression model and the implementation of diagnostic and robustness tests. Mira interpreted the empirical findings and developed the analytical narrative presented in the Results and Discussion sections. Hastin contributed to the refinement of the research methodology and assisted in validating the analytical approach used in the study. Hastin also contributed to the interpretation of the results from a regional economic development perspective and helped strengthen the theoretical integration with existing literature. Mira and Hastin collaboratively prepared the manuscript, including drafting, revising, and editing all sections of the article. Both authors reviewed and approved the final version of the manuscript prior to submission and agree to be accountable for the integrity and accuracy of the research.

REFERENCES

- Abdulle, A. S., Omar, M. M., Ibey, A. M. Y., & Mohamed, A. A. (2026). *Sustaining household consumption through remittances in Somalia from a time-series perspective*. https://link.springer.com/content/pdf/10.1007/s43621-026-02676-1_reference.pdf
<https://doi.org/10.1007/s43621-026-02676-1>
- Amado, C., Bianco, A. M., Boente, G., & Rodrigues, I. M. (2025). Robust estimation of heteroscedastic regression models: A brief overview and new proposals. *Statistical Papers*, 66(3), 65. <https://doi.org/10.1007/s00362-025-01686-x>

- Beer, A., Crommelin, L., Vij, A., Dodson, J., Dühr, S., & Pinnegar, S. (2022). Growing Australia's smaller cities to better manage population growth. *AHURI Final Report*, (386). <https://doi.org/10.18408/ahuri3226001>
- Bykova, V., Khasanova, M., & Polonkoeva, F. (2024). The role of human capital in economic development: An analysis of factors contributing to economic growth. *Reliability: Theory & Applications*, 19(SI 6 (81)), 1676–1682.
- Cai, A., Wang, L., Zhang, Y., Wu, H., Zhang, H., Guo, R., & Wu, J. (2025). *Uncovering the multiple socio-economic driving factors of carbon emissions in nine urban agglomerations of China based on machine learning*. 319, 134859. <https://doi.org/10.1016/j.energy.2025.134859>
- Chen, X., & Li, Y. (2025). *Aggregate Production Functions in the Digital Economy: A survey of Microfoundational Approaches*. <https://www.sciencedirect.com/science/article/pii/S2773067025000615>. <https://doi.org/10.1016/j.jdec.2025.12.003>
- Chen, Z., & Xing, R. (2025). *Digital economy, green innovation and high-quality economic development*. 99, 104029. <https://doi.org/10.1016/j.iref.2025.104029>
- Chugunova, N. V. (2023). Transformation and differentiation of spatial development of Belgorod, Voronezh and Kursk regions. *Vestnik of Saint Petersburg University. Earth Sciences*, 68(3). <https://doi.org/10.21638/spbu07.2023.304>
- Crommelin, L., Denham, T., Troy, L., Harrison, J., Gilbert, H., Dühr, S., & Pinnegar, S. (2022). Understanding the lived experience and benefits of regional cities. *AHURI Final Report*, (377). <https://doi.org/10.18408/ahuri7126301>
- Domański, B. (2003). Industrial change and foreign direct investment in the postsocialist economy: The case of Poland. *European Urban and Regional Studies*, 10(2), 99–118. <https://doi.org/10.1177/0969776403010002001>
- Du, X., Zhang, H., & Han, Y. (2022). *How does new infrastructure investment affect economic growth quality? Empirical evidence from China*. 14(6), 3511. <https://doi.org/10.3390/su14063511>
- Faoziyah, U., Firman, T., & Fahmi, F. Z. (2026). Polarised or Depolarised Urbanisation: Cities and Growth Centres Development in Indonesia. *Urban Policy and Research*, 1–22. <https://doi.org/10.1080/08111146.2025.2596317>
- Filenta, P., & Kydros, D. (2022). *Literature Review of Economic and Regional Development through Quantitative Methods and Social Network Analysis*. 14(1). <https://www.ejist.ro/files/pdf/488.pdf>. <https://doi.org/10.24818/ejis.2022.11>
- Gómez, L., Oinas, P., & Wall, R. S. (2022). Undercurrents in the world economy: Evolving global investment flows in the South. *The World Economy*, 45(6), 1830–1855. <https://doi.org/10.1111/twec.13219>
- Kajita, S. (2024). Changes to Outer Areas of Prefectural Government Cities in Non-metropolitan Areas since the Late 1980s: Case Study of Morioka Urban Area. *Journal of Geography (Chigaku Zasshi)*, 133(5), 387–406. <https://doi.org/10.5026/jgeography.133.387>
- Keene, T., Mann, J., Mack, E. A., & Loveridge, S. (2024). Broadband access and knowledge spillover influence on SBIR phase II awards in non-metropolitan regions. *Annals of Regional Science*, 72(3), 903–925. <https://doi.org/10.1007/s00168-023-01228-z>
- Mackay, H., Strömngren, M., Mukwaya, P. I., Mugagga, F., Hambati, H., & Andersson, A. (2025). Analysing inclusivity within small town development in Uganda and Tanzania: An inclusivity index and experiential insights. *International Development Planning Review*, 47(3), 309–350. <https://doi.org/10.3828/idpr.2025.5>
- Nassani, A. A., Imran, M., Khan, S., Zaman, K., Khan, H. U. R., & Haffar, M. (2025). Financial integration and economic growth: Impact of renewable energy investments, technology transfer, and climate change on Europe and central Asian economies. *Financial Innovation*, 11(1), 41. <https://doi.org/10.1186/s40854-024-00733-0>
- Ogbeifun, L., & Shobande, O. A. (2022). A reevaluation of human capital accumulation and economic growth in OECD. *Journal of Public Affairs*, 22(4), e2602. <https://doi.org/10.1002/pa.2602>
- Rasker, R., Gude, P. H., & Delorey, M. (2013). The effect of protected federal lands on economic prosperity in the Non-metropolitan West. *Journal of Regional Analysis and Policy*, 43(2), 110–122.

- Sagheer, M., & Ashraf, A. (2025). *Urbanization, technological innovation, and renewable energy adoption: Pathways to sustainable development and climate resilience in Japan*. 139621. <https://doi.org/10.1016/j.energy.2025.139621>
- Shi, L., & Xu, J. (2023). *Capital accumulation and sustainable development in developing economies; role of natural resources development*. 86, 104098. <https://doi.org/10.1016/j.resourpol.2023.104098>
- Shi, W., & Wang, Q. (2024). *The framework for analyzing the mechanism of the evolution of inter-city relationship networks on regional economic resilience*. 19(10), e0308280. <https://doi.org/10.1371/journal.pone.0308280>
- Smętkowski, M. (2018). The role of exogenous and endogenous factors in the growth of regions in Central and Eastern Europe: The metropolitan/non-metropolitan divide in the pre- and post-crisis era. *European Planning Studies*, 26(2), 256–278. <https://doi.org/10.1080/09654313.2017.1361585>
- Št'astná, S., Ženka, J., & Krτίčka, L. (2024). Regional economic resilience: Insights from five crises. *European Planning Studies*, 32(3), 506–533. <https://doi.org/10.1080/09654313.2023.2267250>
- Sutton, J., & Arku, G. (2022). Regional economic resilience: Towards a system approach. *Regional Studies, Regional Science*, 9(1), 497–512. <https://doi.org/10.1080/21681376.2022.2092418>
- Sutton, J., & Sutton, J. (2024). A road map to capture the spatial dependence underlying regions' economic resilience. *Spatial Economic Analysis*, 19(1), 57–72. <https://doi.org/10.1080/17421772.2023.2240405>
- Yoo, Y., & Choi, S. (2022). Effects of Top-Down Balanced Development Strategies on Regional Balance: Evidence from Public Big Data in Korea. *Sustainability (Switzerland)*, 14(23). <https://doi.org/10.3390/su142316221>
- Zhang, C., Waris, U., Qian, L., Irfan, M., & Rehman, M. A. (2024). Unleashing the dynamic linkages among natural resources, economic complexity, and sustainable economic growth: Evidence from G-20 countries. *Sustainable Development*, 32(4), 3736–3752. <https://doi.org/10.1002/sd.2845>
- Zhang, X., & Tian, C. (2024). *Measurement and influencing factors of regional economic resilience in China*. 16(8), 3338. <https://doi.org/10.3390/su16083338>