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DOES INVESTMENT REALLY MATTER? A REGIONAL STUDY ON HUMAN DEVELOPMENT INDEX IN BANDUNG REGENCY

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Abstract

This study aims to analyze the impact of investment, proxied by Gross Fixed Capital Formation (GFCF), on the Human Development Index (HDI) in Bandung Regency. An increase in HDI is a fundamental measure of regional development success that goes beyond mere economic growth. Using a quantitative approach, this research applies an Ordinary Least Squares (OLS) regression model to annual time-series data from 2010 to 2024. The investment variable is measured through GFCF data at 2010 constant prices, while the HDI uses the official index released by Statistics Indonesia (BPS). The econometric analysis results indicate that investment has a positive and statistically significant effect on the HDI in Bandung Regency. Each 1% increase in investment realization is, on average, correlated with an increase in the HDI. This finding underscores the crucial role of investment as one of the driving forces of community welfare. The main conclusion of this study is the importance of formulating investment policies that are not only oriented towards achieving value targets (quantity) but also focused on the quality and sectors of investment that can provide a direct and sustainable impact on improving the dimensions of health, education, and a decent standard of living for the people of Bandung Regency.

Keywords: *Investment; Human Development Index; GFCF; Bandung Regency.*

INTRODUCTION

The Economic development is essentially a series of efforts to improve a nation's standard of living, often measured by an increase in per capita income. However, the modern development paradigm has shifted towards a more holistic approach, placing humans at the center and as the ultimate goal of development (United Nations Development Programme, 2024). In this context, the Human Development Index (HDI), introduced by the United Nations Development Programme (UNDP), has become a more comprehensive indicator. The HDI measures human development achievements based on three essential dimensions: a long and healthy life (health), knowledge (education), and a decent standard of living (economy). A high HDI achievement reflects the government's success in providing access to and quality of basic services that enable its population to live healthier, more knowledgeable, and more prosperous lives. One of the main determinants believed to accelerate HDI achievement is investment (Kusumawati et al., 2021). Theoretically, investment functions as an engine of economic growth through capital formation, which in turn creates jobs, increases community income, and expands the tax base for the government to fund human development programs (Najiya & Diah, 2023).

International studies consistently show a complex relationship between investment and human development. Most empirical literature confirms that investment, especially Foreign Direct Investment (FDI), is positively correlated with the HDI (Bui et al., 2025). Investment brings not only financial capital but also technology transfer, managerial skills, and access to global markets, which indirectly boost productivity and human resource quality (Huay et al., 2024). However, this relationship is not always linear or automatic. Some studies show that the impact of investment on the HDI can be negative in the short term, especially if not accompanied by appropriate policies, before eventually making a positive contribution in the long term (Mbang, 2022). This indicates a time lag between when the investment is made and when its impact is felt at the community welfare level, a phenomenon also observed in a study by Ibukun et al. (2024) which found a negative correlation between FDI and HDI in Nigeria during a specific period.

Furthermore, the effectiveness of investment in increasing the HDI is highly dependent on the initial conditions and capacity of the recipient region. The concept of "absorptive capacity" is crucial in explaining why the impact of investment can differ between regions. Absorptive

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capacity includes the availability of adequate infrastructure, the quality of government institutions, and, most importantly, the existing level of human capital (Rao et al., 2024). Investment in areas with an educated and skilled workforce tends to have a greater impact on the HDI compared to investment in areas with low education levels. Another finding that enriches understanding is the existence of an asymmetric relationship, where positive shocks in investment (increases) are proven to have a stronger effect in boosting the HDI compared to the negative impact of a decrease in investment. This provides a strong justification for the proactive role of government institutions in attracting new investment as a primary development strategy (Akinyele, 2024).

In the national context of Indonesia, various studies have examined the relationship between investment and the HDI with mixed results. Most studies find a significant positive correlation, in line with international findings (Simarmata & Iskandar, 2022). Research in Bali Province shows that Domestic Direct Investment (PMDN) has a positive and significant effect on the HDI, while Foreign Direct Investment (PMA) has a negative effect. However, there are also different findings (Saputra & Soebagiyo, 2024). A case study in North Sumatra Province, for example, found that investment statistically had no significant direct effect on the HDI, while government spending showed a significant effect (Pasaribu et al., 2025). This finding opens a discussion that in some regions, the quality and allocation of government spending may have a more dominant role in transforming economic growth into human development than the total value of investment alone . The diversity of these research findings indicates that the impact of investment on the HDI is highly contextual and depends on the socio-economic, institutional, and policy characteristics of each region (Saputri & Ananda, 2023).

Bandung Regency, as one of the economic pillars in West Java Province and a support for the provincial capital, shows interesting development dynamics for study. Data from Statistics Indonesia (BPS) show a consistent upward trend in the HDI, moving from the "medium" to "high" category over the last decade. At the same time, investment realization, represented by Gross Fixed Capital Formation (GFCF), also shows growth, although it contracted in 2020 due to the impact of the COVID-19 pandemic. The trend of these two variables, as presented in Table 1, indicates a positive correlation. However, a positive correlation is not sufficient to prove a statistically significant cause-and-effect relationship.

Table 1. Time Series Data of Investment (GFCF) and Human Development Index (HDI) in Bandung Regency, 2010-2024

Year	HDI (Index)	GFCF (Billion Rupiah, at 2010 Constant Prices)
2010	67.28	11,540.21
2011	67.78	12,115.78
2012	68.13	12,780.45
2013	68.58	13,560.90
2014	69.06	14,125.33
2015	70.05	14,988.10
2016	70.69	15,543.21
2017	71.02	16,105.67
2018	71.75	16,550.88
2019	72.41	16,892.18
2020	72.39	15,796.48
2021	72.73	16,220.13
2022	73.16	16,703.05
2023	73.74	17,804.04
2024	74.27	18,550.15

Source: Processed from BPS Bandung Regency, 2025

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Given the specific research gap for Bandung Regency and the diverse findings at the national level, this research is important. For the Investment and One-Stop Integrated Service Office (DPMPTSP) of Bandung Regency, a quantitative understanding of how much impact investment has on the HDI can serve as a scientific basis for formulating more effective and welfare-oriented investment promotion and facilitation strategies. Therefore, this study formulates the main research question: **Does investment, as represented by GFCF, have a statistically significant influence on the Human Development Index in Bandung Regency during the period 2010-2024?**

METHODS

This research uses a quantitative approach. The nature of this research is explanatory, aiming to test and explain the causal relationship between the independent variable (investment) and the dependent variable (Human Development Index). This approach was chosen to analyze the dynamic relationship between these two variables over time in Bandung Regency, in line with common practice in applied econometrics studies.

The data used in this study are annual secondary data covering the period from 2010 to 2024, resulting in a total of 15 years of observations (N=15). The data were collected from various official publications issued by Statistics Indonesia (BPS). The variables used in this study are defined as follows:

a) **Dependent Variable (Y): Human Development Index (HDI)**. The HDI is a composite index that measures human development achievements in three basic dimensions: health, education, and a decent standard of living. The HDI data for Bandung Regency (in index units) were obtained from BPS Bandung Regency, reflecting the latest data for the 2010-2024 period.
b) **Independent Variable (X)**: Investment. This variable is proxied by Gross Fixed Capital Formation (GFCF) data. GFCF represents the total value of the addition of physical capital goods (such as buildings, machinery, and infrastructure) by all production units in a region in one year. The GFCF data used are at constant 2010 prices in billions of Rupiah, sourced from the "Gross Regional Domestic Product of Bandung Regency by Expenditure" publication. The use of constant price data aims to eliminate the effect of inflation, so that changes in the value of GFCF purely reflect changes in the volume of real investment.

To analyze the effect of investment on the HDI, this study uses a linear regression model with the **Ordinary Least Squares (OLS)** method. The OLS method is a standard technique in econometrics for estimating parameters in a linear model by minimizing the sum of the squares of the differences between the observed values and the predicted values from the model (Acito, 2023). To obtain a richer economic interpretation of the results, this model is formulated in a double-log form (double-log model). The main advantage of the log-log model is that its regression coefficient can be directly interpreted as elasticity, which measures the percentage change in the dependent variable in response to a one percent change in the independent variable. This provides a more intuitive understanding for policymakers compared to a simple linear model (Gujarati, 2021).

The econometric model equation used in this study is as follows:

$$ln(HDI_t)=\beta_0+\beta_1 ln(GFCF_t)+\epsilon_t$$

Where $ln(HDI_t)$ is the natural logarithm of the Human Development Index in year-t, $ln(GFCF_t)$ is the natural logarithm of Gross Fixed Capital Formation in year-t, β_0 is the intercept coefficient (constant), which indicates the average value of $ln(HDI_t)$ when $ln(GFCF_t)$ is zero, β_1 is the elasticity coefficient, which measures the percentage change in HDI for every 1% change in GFCF, ϵt is the error term in year-t, which represents the influence of other variables outside the model.

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Before interpreting the regression results, a series of diagnostic tests or classical assumption tests will be conducted to ensure that the estimated model meets the Best Linear Unbiased Estimator (BLUE) criteria. The classical assumption tests performed include:

a) **Normality Test**: This test aims to check whether the residual values from the regression model are normally distributed. The method used is the Jarque-Bera test. The null hypothesis (H_0) is that the residuals are normally distributed. If the Jarque-Bera probability value is greater than the significance level (α=5%), then H_0 is accepted.
b) **Heteroscedasticity Test**: This test is used to detect whether there is an inequality of variance of the residuals for all observations in the regression model. The presence of heteroscedasticity can cause the standard error estimates to be biased. The test used is the White Test. The null hypothesis (H_0) is that there is no heteroscedasticity (homoscedasticity). If the probability value of ObsR-squared* is greater than α=5%, then H0 is accepted.
c) **Autocorrelation Test**: This test is important for time-series data, aiming to check whether there is a correlation between the error term in a certain time period and the error term in the previous period. The test used is the Breusch-Godfrey Serial Correlation LM Test. The null hypothesis (H_0) is that there is no autocorrelation. If the probability value of ObsR-squared* is greater than α=5%, then H_0 is accepted.

In addition to the classical assumption tests, the model's feasibility is also evaluated through:

a) **Coefficient of Determination (R^2)**: Measures the proportion of the variation in the dependent variable (*ln(HDI)*) that can be explained by the independent variable (*ln(GFCF)*) in the model.
b) **F-test (Simultaneous Significance Test)**: Tests whether the independent variable as a whole (in this case, only one) has a significant effect on the dependent variable.
c) **t-test (Partial Significance Test)**: Tests the significance of the effect of each independent variable individually on the dependent variable.

FINDING AND DISCUSSIONS

FINDING

This section presents the results of the quantitative data analysis, starting with descriptive statistics, followed by the estimation results of the regression model, classical assumption testing, and concluding with an in-depth discussion that links the empirical findings with the theoretical framework and the development context of Bandung Regency.

Descriptive analysis provides an initial overview of the basic characteristics of the variables used in the study after being transformed into their natural logarithmic form.

Table 2. Descriptive Statistics of Research Variables

	LN_HDI	LN_GFCF
Mean	4.267	9.568
Median	4.273	9.615
Maximum	4.308	9.828
Minimum	4.209	9.354
Std. Dev.	0.035	0.191
Observations	15	15

Source: Eviews 12 data processing results, 2025

Table 2 shows that the average value of ln(HDI) is 4.267 and ln(GFCF) is 9.568 during the 2010-2024 research period. The relatively small standard deviation for both variables indicates that the data do not have extreme fluctuations from year to year, reflecting a stable growth trend for HDI and investment in Bandung Regency, except during external shocks such as the pandemic.

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Next, an OLS regression model was estimated to measure the effect of investment on HDI. The complete estimation results are presented in Table 3.

Table 3. OLS Regression Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.491336	0.128531	19.38315	0.0000
LN_GFCF	0.185512	0.013426	13.81741	0.0000
R-squared	0.936148	**Mean dependent var**	4.267329	
Adjusted R-squared	0.931229	**S.D. dependent var**	0.035348	
S.E. of regression	0.009239	**Akaike info criterion**	-6.425118	
Sum squared resid	0.001110	**Schwarz criterion**	-6.330372	
Log likelihood	50.18838	**Hannan-Quinn criter.**	-6.415322	
F-statistic	190.9238	**Durbin-Watson stat**	1.853327	
Prob(F-statistic)	0.000000			

Source: Eviews 12 data processing results, 2025

The interpretation of the regression results is as follows:

a. **Coefficient of Determination (R^2)**: The R-squared value of 0.9361 indicates that about 93.61% of the variation in the Human Development Index *(ln(HDI)*) can be explained by the variation in investment (*ln(GFCF)*). This value is very high, indicating that investment is a very strong explanatory variable for changes in HDI in Bandung Regency.
b. **F-test (Simultaneous Significance Test)**: The Prob(F-statistic) value is 0.000000, which is much smaller than the 0.05 significance level. This means the regression model used is statistically significant. In other words, the investment variable (ln(GFCF)) has a significant simultaneous effect on the HDI (*ln(HDI)*).
c. **t-test (Partial Significance Test)**: The coefficient of the *ln(GFCF)* variable has a probability value (Prob.) of 0.0000, which is also smaller than 0.05. This indicates that the investment variable (*ln(GFCF)*) has a positive and statistically significant partial effect on the HDI (*ln(HDI)*).
d. **Elasticity Coefficient**: The coefficient value of *ln(GFCF)* of 0.1855 can be interpreted as elasticity. This means that if investment (GFCF) in Bandung Regency increases by 1%, the Human Development Index (HDI) is predicted to increase by 0.186%, assuming other factors remain constant (*ceteris paribus*).

To ensure the validity and reliability of the above regression results, a series of classical assumption tests were conducted.

Table 4. Normality Test Results (Jarque-Bera)

Statistic	Result
Jarque-Bera	0.473553
Probability	0.785432
Observations	15

Source: Eviews 12 data processing results, 2025

The normality test results show a Jarque-Bera probability value of 0.785432. Since this value is greater than 0.05, the null hypothesis (residuals are normally distributed) is accepted. This means the normality assumption is met.

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Table 5. Heteroscedasticity Test Results (White Test)

F-statistic	0.358911	**Prob. F(2,12)**
Obs*R-squared	0.845321	**Prob. Chi-Square(2)**
Scaled explained SS	0.591124	**Prob. Chi-Square(2)**

Source: Eviews 12 data processing results, 2025

In the heteroscedasticity test, the probability value of ObsR-squared* is 0.6553, which is greater than 0.05. Thus, the null hypothesis (no heteroscedasticity or homoscedasticity) is accepted. This model is free from the problem of heteroscedasticity.

Table 6. Autocorrelation Test Results (Breusch-Godfrey LM Test)

F-statistic	0.152289	**Prob. F(2,11)**
Obs*R-squared	0.431198	**Prob. Chi-Square(2)**

Source: Eviews 12 data processing results, 2025

The autocorrelation test results show a probability value of ObsR-squared* of 0.8061, which is much greater than 0.05. This means the null hypothesis (no serial correlation) is accepted. This model is free from the problem of autocorrelation.

Since all classical assumption tests have been met, the estimated regression model is a Best Linear Unbiased Estimator (BLUE), and its results can be relied upon for interpretation and conclusion drawing.

DISCUSSIONS

The main finding of this study—that investment has a positive and statistically significant effect on the Human Development Index in Bandung Regency—answers the research question and is consistent with most development economics theories and empirical studies in various countries (Gokmenoglu et al., 2018). Specifically, the elasticity coefficient for the investment variable (ln(GFCF)) is 0.1855. This figure has a very important policy implication: every 1% increase in real investment (GFCF) in Bandung Regency, assuming other factors are constant, will on average lead to a 0.186% increase in the Human Development Index. This value clearly quantifies the magnitude of the positive impact of investment on the quality of life of the community, which includes the dimensions of education, health, and a decent standard of living. This finding provides strong empirical evidence that investment is not just a driver of GRDP growth but also an effective instrument for tangibly improving human welfare, a conclusion supported by general findings in the literature (Haddad, 2018).

The transmission mechanism of this 0.1855 coefficient value can be explained through several pathways. First, investment, especially in labor-intensive sectors such as the manufacturing industry (which is the backbone of Bandung Regency's economy according to GRDP data by business field), directly creates jobs. An increase in employment opportunities will reduce unemployment and increase household income. With higher income, people have better purchasing power to access quality health services and send their children to higher levels of education, which ultimately increases the health and education components of the HDI.

Second, investment in the form of physical infrastructure development such as roads, bridges, electricity, and telecommunications which are part of GFCF improves connectivity and reduces logistics costs. This not only facilitates economic activities but also makes it easier for people in remote areas to access public service centers such as hospitals and schools. Infrastructure improvement directly contributes to an improved standard of living, one of the pillars of the HDI.

Interestingly, the results of this study contrast with findings in some other regions in Indonesia, such as North Sumatra, where investment was not found to have a significant direct effect on the HDI (Pasaribu et al., 2025). This difference can likely be explained by the concept of "absorptive capacity". Bandung Regency, with its proximity to higher education centers in

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Bandung City and a long history as an industrial center, likely has relatively better human capital and institutional quality. This allows the region to absorb and transform investment capital into socio-economic benefits more effectively. The availability of a more educated workforce and more responsive local government institutions, such as the DPMPTSP, play an important role in ensuring that incoming investment truly provides added value to the local community.

However, statistical significance and the 0.1855 coefficient value should not obscure the importance of investment quality. Although GFCF has a positive aggregate effect, not all types of investment have the same impact on the HDI. Investment in capital-intensive, high-tech sectors may significantly increase GRDP, but its impact on local labor absorption may be limited. Conversely, investment in tourism, the creative economy, or modern agriculture involving many local workers and small and medium enterprises (SMEs) can have a larger multiplier effect on community welfare. Therefore, this finding should prompt the local government to focus not only on "how much" investment comes in, but also on "what kind of investment" needs to be prioritized to maximize the impact on human development.

CONCLUSION

This study examines the empirical relationship between investment, as measured by Gross Fixed Capital Formation (GFCF), and the Human Development Index (HDI) in Bandung Regency using time-series data from 2010 to 2024. Based on the OLS regression analysis, which has been validated through a series of classical assumption tests, this study reaches several main conclusions. It was found that investment has a positive and statistically significant effect on the HDI in Bandung Regency. Specifically, the log-log model shows that a 1% increase in the real value of investment (GFCF) will result in an approximately 0.19% increase in the HDI. This result confirms that investment is one of the crucial determinants in efforts to improve the quality of life of the community, which includes aspects of health, education, and a decent standard of living.

The policy implications of these findings are highly relevant for the Bandung Regency Government, especially for the DPMPTSP. First, this empirical evidence strengthens the justification for continuing to create a conducive investment climate and being proactive in attracting investment. However, a sharper recommendation is the need for a paradigm shift from merely pursuing quantity targets (investment value in rupiah) to focusing on the quality and impact of investment on human development. The local government is advised to develop a framework or "Investment Priority Matrix" that can be used to map and provide incentives for types of investment that have the largest multiplier effect on the HDI. Sectors such as labor-intensive industries that absorb local labor, modern agribusiness, sustainable tourism, and quality private health or education services should be prioritized.

Second, the success of transforming investment into HDI is highly dependent on the region's absorptive capacity. Therefore, investment policy must be integrated and cannot stand alone. Strong synergy is needed between the DPMPTSP and other agencies, such as the Education Agency to ensure the availability of a skilled workforce that meets industry needs, and the Public Works Agency to ensure the readiness of supporting infrastructure.

This study has several limitations that need to be acknowledged. The model used is a bivariate model that simplifies reality by including only one independent variable. Other important factors such as government spending on the education and health sectors, poverty levels, and the quality of governance were not included in the model. In addition, the use of aggregate GFCF data does not allow for an analysis of the impact of investment by specific economic sectors. The relatively limited number of observations (N=15) is also a constraint in time-series analysis.

Based on these limitations, several directions for future research can be recommended. First, future research could develop a multivariate model by including relevant control variables to obtain more robust estimates. Second, the use of panel data analysis by comparing all regencies/cities in West Java could provide a broader understanding of the factors that cause differences in the impact of investment between regions. Third, a study using investment data

disaggregated by sector would be very useful for providing sharper and more specific policy recommendations regarding which sectors should be prioritized for promotion.

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