Indonesian Journal of Economics and Management
Vol. 5, No. 3, 2025, pp. 288 – 297
https://doi.org/10.35313/ijem.v5i3.6527

Effect of Capital Investment and Population Growth on Unemployment Rate in West Java Province 2019-2023

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How to cite: Nurichwan, R., & Lestari, D.A. (2025). Effect of Capital Invesment and Population Growth on Unemployment Rate in West Java Province 2019-2023. *Indonesian Journal of Economics and Management*,*5*(3), 288 - 297.
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Abstract: West Java is the most populous province in Indonesia and contributes significantly to the national unemployment rate. The region's unemployment rate has fluctuated annually, showing a stagnant trend without significant change. This study aims to: (1) examine the effect of capital investment on the open unemployment rate in West Java from 2019 to 2023; (2) analyze the effect of population density on the same; and (3) evaluate their simultaneous effects during the period. The study applies panel data regression analysis to explore the unemployment phenomenon across 27 cities and regencies in the province. Variables analyzed include capital investment, population density, and the open unemployment rate, processed using EViews 12 software. The findings indicate that capital investment significantly reduces the open unemployment rate. On the other hand, population density does not have a significant individual effect. However, both variables jointly influence the open unemployment rate in West Java during the period under study.

Keywords: Population density, Capital investment, West Java Province, Open unemployment rate.

1. Introduction

West Java is Indonesia's most populous and densely inhabited province, consisting of 27 regencies and municipalities across an area of 35,377.76 square kilometers. Based on 2024 data from BPS, the total population of West Java reached 50.345 million. This figure confirms West Java as the most demographically concentrated province in the country. Such density has implications for unemployment levels, positioning West Java among the top contributors to Indonesia's open unemployment rate.

BPS-Statistics Indonesia (2024) reported that in early February, West Java's Open Unemployment Rate (OUR) stood at 6.91%, indicating that 7 out of every 100 labor force participants were jobless. This figure ranks West Java just below Riau Islands and Banten as one of the regions with the highest unemployment levels.

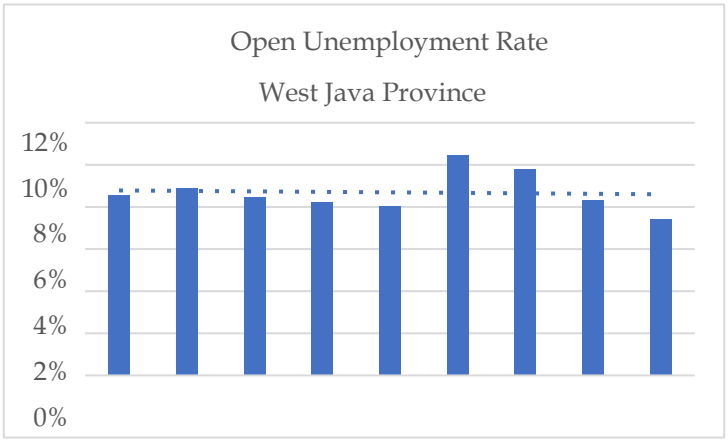

Figure 1. Open unemployment rate West Java Province 2015-2023
Source: BPS-Statistics Indonesia

Based on data published by BPS, the open unemployment rate in West Java Province fluctuated during that period (Figure 1). These increases and decreases tend to show a trend that tends to be stagnant or does not show significant changes during the period 2015-2023. Mahroji & Nurkhasanah (2019) state that open unemployment refers to the labor force that does not have a job, is trying to get a job (including those who have worked or have never worked), and those who are preparing to get a job. This phenomenon can be attributed to shrinking job opportunities compared to the increasing labor force (Muslim, 2014).

From an economic perspective, unemployment is the result of market failure to provide jobs that match labor force needs. Unemployment is the condition of productive-aged individuals who have the desire to work but have not achieved it. High unemployment rates have an unstable social impact, potentially leading to poverty and crime. In the economy, unemployment has a negative impact where society will feel less welfare desired due to the loss of opportunity to earn income (Atmodjo et al., 2023). High unemployment rates can also decrease human capital utilization and lower aggregate demand, which further slows down economic recovery (Cahyani et al., 2021; Yanti et al., 2020).

Investment or capital investment, both domestic and foreign, can be a solution to overcome the unemployment problem in West Java Province. According to (Humaini et al., 2017) investment in an economy can provide a stimulus for economic growth in terms of increasing production capacity; increased production capacity can open up job opportunities and improve the welfare of society. Besides stimulating growth, investment has a multiplier effect on employment, particularly in infrastructure and labor-intensive sectors (Fauzi, 2024; Ningrat et al., 2025).

The persistent unemployment issue in West Java correlates with the region's annual population growth. Population growth enlarges the labor force and may trigger demographic challenges such as poverty, housing scarcity, and limited employment. Population density is also identical with high crime rates, because the rate of unemployment continues to increase in densely populated areas where the availability of jobs cannot accommodate the needs of the labor force, causing people to seek alternative solutions, one of which is engaging in crime to meet life needs (Regina et al., 2024).

Research results by Pandiangan (2021) found that capital investment has an effect on the unemployment rate in Indonesia. Similar findings were found by Putri & Ash Shidiqie (2022), who found that capital investment has an effect on the unemployment rate. Muminin & Hidayat, (2017); Syam, (2015), found that population density significantly impacts unemployment rates, particularly in Makassar and East Java regencies/cities. The persistently

high unemployment rate in West Java calls for an in-depth investigation into the contributing factors particularly capital investment and population density and their individual and combined effects on open unemployment between 2019 and 2023.

2. Research Methods

This study adopts a quantitative method, utilizing panel data regression and processed using EViews 12 software. Data were sourced from the Central Statistics Agency (BPS) of West Java Province for unemployment and population indicators, and from the provincial Investment and One-Stop Integrated Services Agency for capital investment figures, covering the years 2019–2023.

Classical assumption tests are used to produce a BLUE (Best Linear Unbiased Estimation) model estimate or regression results that do not contain bias so that their validity can be trusted. Sugiyono (2013) states that classical assumption tests are intended to inform the clarity of the regression equation obtained for accuracy in an estimation, which is unbiased and consistent. This study uses multicollinearity test and heteroskedasticity test as means to obtain a BLUE model estimate.

The heteroskedasticity test examines the difference or inconsistency of variance in one observation with another (Basuki, 2021). Variance of inconsistent residual values can be a problem for the estimation model; this problem can be called the heteroskedasticity problem. An optimal estimation model has variance values that have the same tendency or in other words, are homoskedastic. There are several tests that can be done to detect heteroskedasticity, namely the Glejser test. The Glejser test transforms the residual values into absolute values and includes these values in the estimation model. According to Sugiyono (2013), if the p-value > 0.05, the model is free from heteroskedasticity; otherwise, if < 0.05, heteroskedasticity is present.

According to Juliandi et al., (2014), multicollinearity is intended to determine the existence of high correlation among predictor variables. The multicollinearity test is conducted when there is more than one predictor variable in the estimation model. Its purpose is to identify any excessively strong correlations between predictors, which may indicate redundancy. A correlation coefficient > 0.80 suggests strong multicollinearity, while < 0.80 indicates it is likely absent.

To evaluate the influence of capital investment and population density on unemployment, panel data regression was employed. Panel data, as described by Basuki (2021), merges cross-sectional and time-series dimensions. The panel data estimation model is used to examine the effect of predictor variables on the response variable. The equation can be calculated using the formula below:

$$TPT\ it = \alpha + \beta 1 PNMit + \beta 2 KPit + \varepsilon$$

Legend:
TPT : Dependent Variable (Open Unemployment Rate)
α : Constant Variable
β1 β2 : Regression Coefficients
PNM : Capital Investment
KP : Population Density
ε : Error Terms
i : Cross-section Data
t : Time Series Data

There are three commonly applied approaches in panel data regression for estimating models, namely:

2.1. Common Effect Model

One approach to estimating panel data models is the common effect approach. It merges time series and cross-sectional data using the ordinary least squares (OLS) technique to estimate parameters. The pooled regression method does not account for individual or time components, or in other words, it is assumed that the characteristics of each cross-section data are the same as the time series.

2.2. Fixed Effect Model

The fixed effect incorporates dummy variables to account for differing intercepts across cross-sectional units. This approach assumes that there are differences in each cross-section and assumes similarity among cross-sections.

3.3. Random Effect Model

The Random Effect Model (REM) presumes that slope coefficients are constant across entities and time, but the intercept varies randomly. The general approach includes dummy variables with the assumption of uncertainty in the original model. This assumption causes a decrease in degrees of freedom, which impacts efficiency reduction. However, this condition is prevented by including nuisance variables by considering that the error value can be correlated with time series data and cross-section data.

To identify the most appropriate model, several selection tests are conducted among the three estimation strategies:

1) Chow Test

The Chow test evaluates whether CEM or FEM provides a better fit for the data. The initial assumption proposed is that the CEM model is as good as the FEM. With the Chow test, the initial assumption changes to H0 = CEM and H1 = FEM. The criteria for deciding the result of the Chow test are:

a) When the Prob value is greater than the critical limit (>0.05), then H0 can be accepted, in other words, the CEM model can be used.
b) When the Prob value is less than the critical limit (<0.05), then H1 can be accepted, in other words, the FEM model can be used.

2) Hausman Test

The Hausman test compares FEM and REM to determine which one is more suitable based on consistency and efficiency. The initial assumption proposed is that the FEM model is as good as the REM. With the Hausman test, the initial assumption changes to H0 = FEM and H1 = REM. The criteria for deciding the result of the Hausman test are:

a) When the Prob value is > critical limit (>0.05), then H0 can be accepted, in other words, the FEM model can be used.
b) When the Prob value is < critical limit (<0.05), then H1 can be accepted, in other words, the REM model can be used.

3) Lagrange Multiplier Test

The Lagrange Multiplier (LM) test is applied to choose between the Random Effect Model and the Common Effect Model. The initial assumption proposed is that the REM model is as good as the CEM. With the LM test, the initial assumption changes to H0 = REM and H1 = CEM. The criteria for deciding the result of the Chow test [typo for LM] are:

a) When the Prob value is > critical limit (>0.05), then H0 can be accepted, in other words, the CEM model can be used.
b) When the Prob value is < critical limit (<0.05), then H1 can be accepted, in other words, the REM model can be used.

This study applies hypothesis testing through partial (t-test), simultaneous (F-test), and R^2 tests. The t-test examines the individual influence of predictor variables on the dependent variable within the model. According to Riyanto & Hatmawan (2020), "the t-test is generally

used in multiple regression and is useful as a test to determine whether a variable in the regression model has a significant effect on the dependent variable or not." This test operates at a 5% significance level, corresponding to a 95% confidence interval. The decision rules for the t-test are stated as follows:

a) When the p-value is below 0.05, it indicates that the independent variable significantly affects the dependent variable.
b) When the p-value is above 0.05, it suggests that the independent variable does not have a statistically significant effect on the dependent variable.

The F-test evaluates the collective influence of all independent variables on the dependent variable. Sugiyono, (2013) "simultaneous testing is a test that can be used to investigate the overall capacity of predictor variables in influencing the response variable." The rules for deciding the result of the F-test are as follows:

a) If the significance level is equal to or below 0.05, it can be inferred that the independent variables jointly influence the dependent variable.
b) If the significance level is greater than 0.05, it can be inferred that the independent variables do not collectively affect the dependent variable.

The R^2 test measures the proportion of variance in the response variable explained by the predictors in the model. According to Basuki (2021), the R^2 test is used to estimate the capacity of the estimation model in explaining the variability of the predictor variables. An R^2 value near zero indicates weak explanatory power, while a value near one suggests strong model accuracy

3. Results and Discussion

Data for this study were sourced from the Investment and One-Stop Integrated Service Agency as well as BPS West Java, covering capital investment, population density, and unemployment rates across 27 districts and cities from 2019 to 2023. The following section presents test outcomes and interpretation of the analysis results.

3.1 Model Selection Test

To determine the most suitable panel data model, the study employs three key tests: Chow, Hausman, and Lagrange Multiplier. The results of the above tests are explained below.

Table 1. Model Selection Test Results Summary

No.	Test	Model Testing	Prob. value	Desicion
1	Chow Test	CEM dan FEM	0.0000	FEM
2	Hausman Test	FEM dan REM	0.0001	FEM
3	Langrange Multipler Test	CEM dan REM	0.0000	REM

Source: Eviews 12 Output Results

The results of the model selection tests show that the fixed effect model approach is the most suitable approach to be used and interpreted. Based on this, this research uses the fixed effect model in conducting panel data regression estimation.

3.2 Classical Assumption Tests

3.2.1. *Heteroskedasticity Test*

Table 2. Heteroskedasticity Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.248560	2.250491	0.554794	0.5802
PM	0.003719	0.011827	0.314488	0.7538
KP	-0.144698	0.290423	-0.498231	0.6194

Source: Eviews 12 Output Results

he heteroskedasticity test showed that the p-values for each variable exceeded the 0.05 threshold, indicating homoskedasticity. This indicates that the variance in the regression model has similarity or is homoskedastic, or in other words, no heteroskedasticity problem is found in this model.

3.2.2. Multicollinearity Test

Table 3. Multicollinearity Test Results

Variable	PM	KP
PM	1	0.1077
KP	0.1077	1

Source: Eviews 12 Output Results

This research uses 2 predictor variables, namely the level of capital investment and population density. Multicollinearity test results show that correlation coefficients remain well below 0.9. This shows that there is no interaction among the predictor variables used in this research, or in other words, the predictor variables do not contain multicollinearity.

3.3. Panel Data Regression Analysis

Table 4. Panel Data Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.820138	2.236351	-1.708202	0.0905
REALISASI_PNM_DAN_PMA	-0.041080	0.011753	-3.495375	0.0007
KEPADATAN_PENDUDUK	0.310628	0.288599	1.076331	0.2842

Root MSE	0.222960	R-squared	0.672864
Mean dependent var	-2.549795	Adjusted R-squared	0.586451
S.D. dependent var	0.391271	S.E. of regression	0.251618
Akaike info criterion	0.265981	Sum squared resid	6.711009
Schwarz criterion	0.890077	Log likelihood	11.04627
Hannan-Quinn criter.	0.519596	F-statistic	7.786597
Durbin-Watson stat	2.276349	Prob(F-statistic)	0.000000

Source: Eviews 12 Output Results

From the Fixed Effect model test, the panel data regression equation performed on the independent variables in this research is obtained as follows:

TPT = -3.84392607474 - 0.0411049766651 PM + 0.313846206465 KP

1) The coefficient value from the panel data regression equation is found to be -3.84392607474. This indicates that if the predictor variables are constant, the open unemployment rate is -3.84392607474.
2) The coefficient value for the level of capital investment is found to be -0.0411049766651. This indicates that if the level of capital investment increases by 1 unit, it will decrease the open unemployment rate by -0.0411049766651.
3) The coefficient value for population density is found to be 0.313846206465. This indicates that if population density increases by 1 unit, it will increase the open unemployment rate by -0.313846206465.

3.4. Hypothesis Testing

3.4.1. *Partial Test*

The partial t-tests were conducted to determine the significance of each independent variable on the unemployment rate:

1) The results of the partial test for the capital investment variable show a probability value

of 0.0007 and a t-statistic of 3.495375. This probability value is not greater than the critical limit (0.0007 < 0.05), and the t-statistic exceeds the t-table value (3.495375 > 1.656); therefore, it can be concluded that capital investment has an effect in decreasing the open unemployment rate.

2) The results of the partial test for the population density variable show a probability value of 0.2842 with a t-statistic of 1.076331. This probability value is not less than 0.05 (0.2842 > 0.05) and the t-statistic does not exceed the t-table value (1.076331 < 1.656); therefore, it can be concluded that population density does not have a significant effect on the open unemployment rate.

3.4.2. *Simultaneous Test*

The results of the simultaneous test show a probability value of 0.000000 with an F-statistic of 7.786597. This value shows that the probability value is less than the critical limit (0.000000 < 0.05), and the F-statistic is greater than the F-table value (7.786597 > 3.06). This indicates that the predictor variables have a simultaneous effect on the response variable.

3.4.3. *Coefficient of Determination Test*

The adjusted R^2 value of 0.586 indicates that approximately 58.6% of the variation in unemployment is explained by capital investment and population density. This value can be interpreted that the variables used in this research have an effect of 58.65% on the open unemployment rate, while 41.35% is influenced by variables outside those used.

The partial test results indicate that capital investment negatively correlates with the open unemployment rate in West Java Province. In essence, as the amount of capital investment increases, the open unemployment rate tends to decline accordingly. It is evident that capital investment in West Java has consistently experienced annual growth, which reflects growing inflows of both foreign direct investment (FDI) and domestic direct investment (DDI) into the region. According to the Report on the Realization of PMA and PMDN Investment in West Java Province (2023), there are several industrial sectors that are channels for foreign and domestic capital investment, namely transportation & warehousing industry, real estate, construction, and food and beverage processing industry. This condition indicates that capital investment is largely channeled to labor-intensive industries, which require a relatively high number of workers, so that the increasing investment value in West Java Province can increase job opportunities and have an impact on reducing the open unemployment rate. This is also in line with Esquivias & Harianto (2020), who found that foreign direct investment can improve industrial efficiency in Indonesia, which has the potential to reduce unemployment.

Capital investment is one of the important factors for economic growth and labor absorption. According to Humaini et al., (2017) & Susilo et al., (2023), investment in an economy can provide a stimulus for economic growth in terms of increasing production capacity, and increased production capacity can open up job opportunities and improve the welfare of the community. Investing capital will increase production capacity and create greater demand. With the increasing capacity of the production line, there will be a greater need for labor, so this will absorb the labor force in an investment area and reduce the open unemployment rate. The results of this research are also consistent with the research conducted by Pandiangan (2021), Putri & Ash Shidiqie (2022), & Agustina et al., (2023), who found that capital investment has an effect on the decrease in the unemployment rate.

The partial test results show that population density in West Java does not significantly influence unemployment levels. In line with the study by Hidayat et al., (2018), population density does not always have a significant effect on unemployment, depending on the distribution of economic sectors in the region. The inability of population density to influence

the unemployment rate is because the density is not evenly distributed. Population density in West Java Province only occurs in some cities and regencies such as Bekasi Regency, Bogor Regency, West Bandung Regency, Bandung City, Depok City, Bogor City, and Bekasi City, which are relatively higher compared to other cities and regencies. This condition indicates the existence of a pattern of population movement in various large cities and regencies in West Java Province. This condition can be caused by differences in more adequate facilities and accessibility, better investment flow, and the concentration of industry and trade in large cities/regencies. According to Laksono et al., (2018), a negative relationship between cities/regencies has an impact on the shift of labor to areas with better economies. This relationship occurs due to the tendency for better investment, more advanced industries, and more adequate access in some regencies/cities in a province. Hidayat et al., (2020) added that infrastructure development can reduce inter-regional inequality in Riau Province, which in turn contributes to a decrease in unemployment.

The condition of population density's inability to influence the unemployment rate will form a pattern of population movement with the motive of seeking job opportunities in various large cities to obtain a better life compared to their hometowns. Population movement will trigger an increase in the labor force in a city/regency; when the labor force increases imbalanced with job opportunities, it will trigger an increase in the unemployment rate in certain cities/regencies in West Java Province. However, on the other hand, migration will reduce population density in the cities/regencies left behind, causing uneven population density. Large cities/regencies in West Java Province tend to be more densely populated compared to other cities/regencies. The results of this research are consistent with (Mulatsih, 2015), who found that population density in Indonesia does not have an effect on the unemployment rate in Indonesia. However, the findings differ from research by (Syam (2015), who found that population density has an effect on the unemployment rate in Makassar City. The difference in these research results may be due to the difference in the scale of the case study examined.

3. Conclusion

The results of this study indicate that capital investment has a significant effect in reducing the open unemployment rate in West Java during the 2019–2023 period. This suggests that increased investment can contribute to job creation and economic growth in the region. On the other hand, population density did not have a statistically significant impact on the open unemployment rate during the same timeframe, implying that density alone may not directly influence employment levels without being supported by other economic factors.

Furthermore, when tested simultaneously, capital investment and population density were found to jointly influence the open unemployment rate, indicating a possible interaction or combined effect. Based on these findings, it is recommended that future research expand the time frame and incorporate additional macroeconomic variables to gain a deeper understanding of the factors affecting unemployment. This approach could provide a more comprehensive picture of the dynamics influencing labor market conditions in West Java.

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