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ANALYSIS OF THE POVERTY LEVEL AND HUMAN DEVELOPMENT INDEX IN CENTRAL JAVA FOR THE 2016-2021 PERIOD

Abstract. *This study aims to analyze the influence of the Open Unemployment Rate, Gross Regional Domestic Product, Investment, and Poverty variables on the development of the Human Development Index. This study used a quantitative method involving. The population of this study was related to the Human Development Index in Central Java Province recorded by Statistics Indonesia (BPS). This study used panel data from 29 districts and 6 cities in Central Java Province. The data were taken from the Central Java Statistics Agency from 2016 to 2021. The variables used for the study were the Human Development Index, Open Unemployment Rate, Domestic Investment, Gross Regional Domestic Product, and Poverty. The results of the study showed that the open unemployment rate and the Gross Regional Domestic Product variables had a significant effect on the Human Development Index. Meanwhile, both the Investment and Poverty variables had a significant negative effect on the Human Development Index.*

Keywords: *Human Development Index, Open Unemployment Rate, Investment, Gross Regional Domestic Product, Poverty.*

Introduction

The Human Development Index (HDI) was first initiated and proposed in the 1990 Human Development Report by the United Nations Development Program (UNDP). This report was prepared by a Pakistani economist, Dr. Mahbub ul Haq, with the collaboration of other economic and social experts, including Amartya Sen, an Indian economist, and philosopher winning the Nobel Prize for Economics (Quinn, 2017). The human development index can be measured by 3 (three) basic dimensions: a long and healthy life, being knowledgeable, and having a decent standard of living. In its development, the Human Development Index changed to adjust the indicators that are no longer appropriate such as literacy rate and gross income per capita. Besides indicators, the arithmetic average formula used is also changed. The new indicators used are the average length of schooling and the expected years of schooling to replace literacy rates, while Gross National Income is to replace Gross Domestic Income (BPS Indonesia, 2021).

Administratively, Central Java Province is divided into 29 districts and 6 cities. The picture of human development varies according to the number, of economic, social, and cultural diversity in the region. One important indicator of successful development is the human development index represented by health, education, and economy. The data below illustrate the development of the human development index score for Central Java Province compared to 5 other provinces on Java Island.

Table 1 shows that the Human Development Index for Central Java Province has increased in the last three years. Central Java has a smaller HDI than DKI Jakarta and DI Yogyakarta. Meanwhile, East Java has the lowest DHI.

Table 1
Human Development Index by Province on Java Island

Number	Province	Year			Rank
		2020	2021	2022	
1.	DKI Jakarta	80,77	81,11	81,65	1
2.	Central Java	71,87	72,16	72,79	5
3.	West Java	72,09	72,45	73,72	3
4.	East Java	71,71	72,14	72,75	6
5.	Banten	72,45	72,72	73,32	4
6.	DI Yogyakarta	79,97	80,22	80,64	2

Source: (BPS-Statistics Indonesia, 2021)

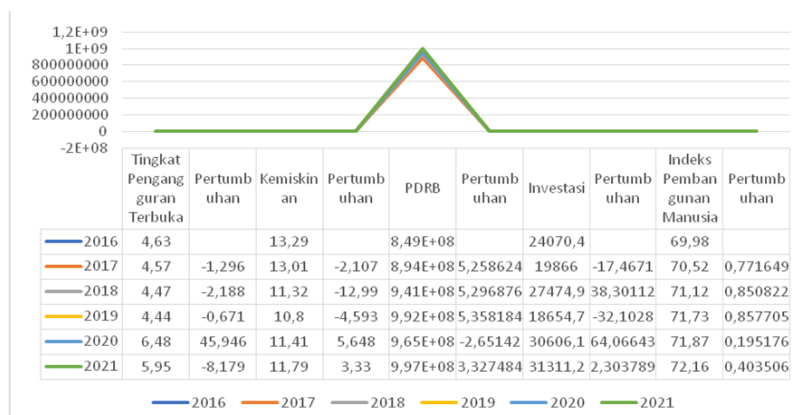|	Tingkat Pengang guran Terbuka	Pertumb uhan	Kemiskin an	Pertumb uhan	PDRB	Pertumb uhan	Investasi	Pertumb uhan	Indeks Pemban gunan Manusia	Pertumb uhan
2016	4,63		13,29		8,49E+08		24070,4		69,98	
2017	4,57	-1,296	13,01	-2,107	8,94E+08	5,258624	19866	-17,4671	70,52	0,771649
2018	4,47	-2,188	11,32	-12,99	9,41E+08	5,296876	27474,9	38,30112	71,12	0,850822
2019	4,44	-0,671	10,8	-4,593	9,92E+08	5,358184	18654,7	-32,1028	71,73	0,857705
2020	6,48	45,946	11,41	5,648	9,65E+08	-2,65142	30606,1	64,06643	71,87	0,195176
2021	5,95	-8,179	11,79	3,33	9,97E+08	3,327484	31311,2	2,303789	72,16	0,403506

Figure 1. Human Development Index in Indonesia

Source: (BPS-Statistics Indonesia, 2021)

Figure 1 shows the increase in the open unemployment rate, poverty, and investment with the high growth in 2020. Meanwhile, GRDP has decreased and the HDI shows positive growth. The poverty rate in Indonesia increased significantly in 2020. Referring to Statistics Indonesia, the poverty rate reached 9.78 percent or around 27.55 million people live below the poverty line in March 2020. This rate is higher than that in September 2019 with 9.22 percent or around 25.95 million people living below the poverty line.
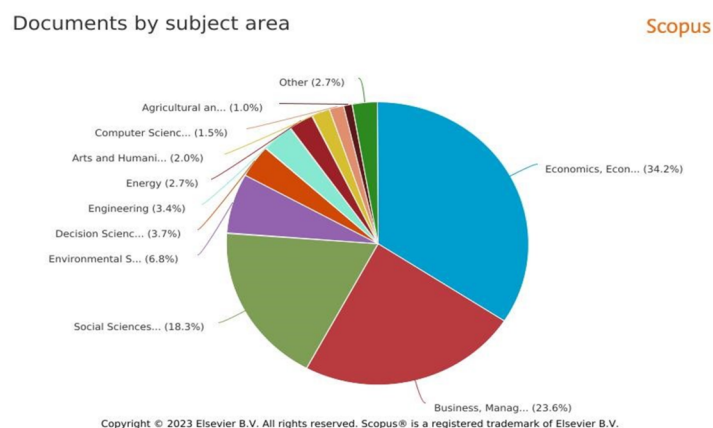
Figure 2. Themes of the Human Development Index by Field of Study

Human development has been widely studied. A search on the Scopus database over 10 years found 998 documents discussing human development. The document covers articles, books, editorials, and seminar papers. The document is dominated by articles (82.4 percent). Based on the

theme, most of the document discusses economics, business management, and social sciences. Scopus search recap can be seen in Figure 2.

The search on the Scopus database shows progress in the subject area in the Human Development Index, namely economics, business and management, social sciences, environmental science, decision science, engineering, energy, arts and humanity, computers, agriculture and others. Of the 11 subject areas above, the highest percentage is dominated by economics (34%), business management (23.6%), and social sciences 18.3%
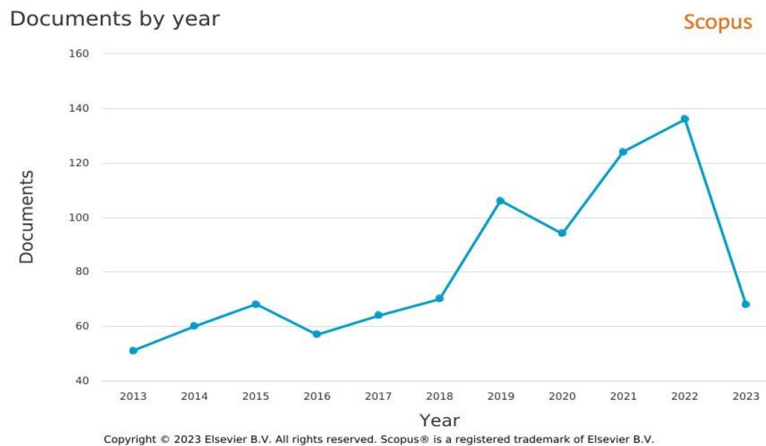

Figure 3. Annual Publication

Figure 3 presents the number of publications concerning HDI over 10 years. It can be seen that the highest number of publications is in 2020 – 2021 with 139 publications but in 2022 – 2023, it decreases to 68. This is an opportunity to develop the theme of human development. The human development index is influenced by many factors, namely Gross Regional Domestic Product (Kristiawan, 2020), poverty (Jasasila, 2020; Priambodo, 2021), investment (Pratama & Darsana, 2019), and the open unemployment rate (Priambodo, 2021; Sisnita & Prawoto, 2017). Some studies show a negative effect on the HDI, such as (Luckynuari, 2019; Utami, 2017) that the open unemployment rate has a negative effect on the human development index. Other studies (Fikri Zakiyudin; Amar Hattami, 2023; Nursiah Chalid & Yusbar Yusuf, 2014; Sulistio Mirza, 2012) found that poverty has a negative effect on HDI. Those findings indicate inconsistencies in the results or HDI still needs to be explained by the other variables. Therefore, this present study aims to examine factors influencing the Human Development Index by proposing the following research questions:

1. Does the Open Unemployment Rate variable affect Human Development Index?
2. Does the Investment variable affect Human Development Index?
3. Does the Gross Domestic Product variable affect Human Development Index?
4. Does the Poverty variable affect Human Development Index?

Literature Review

Concept of Human Development Index

One of the indicators of regional progress is human development. The United Development Program (UNDP) issued an indicator called the Human Development Index (HDI) to measure the success of human development as a benchmark for achieving higher quality human development in a country (Hasibuan et al., 2020).

HDI consists of some important indicators grouped into three main dimensions, namely 1) health, 2) education, and 3) decent standard of living. The first dimension includes life expectancy which is calculated based on the expected average age at birth and access to health services as measured by the mortality rate of children under five years and mothers at birth. The second dimension covers the literacy rate which is calculated based on the percentage of the adult population who can read and write and the school enrollment rate which is measured by the percentage of children who have received primary, secondary, and tertiary education. The last

dimension, namely decent standard of living includes gross national income per capita. This reflects the level of the economic welfare of the population of a country and is used as an indicator of a decent standard of living (Mahroji & Nurkhasanah, 2019).

The achievement of HDI between regions and over time can be measured using a tool called composite indicators of human development. The HDI score ranges between 0 and 1. The closer to 1, the higher the value of the HDI and the better quality of human resources and vice versa. UNDP categorizes HDI into four, namely (Budihardjo et al., 2020):

1. Very high HDI: HDI values ≥ 0.800
2. High HDI: 0.700 ≤ HDI value < 0.800
3. Medium HDI: 0.550 ≤ HDI value < 0.700
4. Low HDI: HDI value < 0.550

Effects of the Open Unemployment Rate on HDI

Unemployment is a condition when a person does not productive (Hasibuan et al., 2020). Unemployment can also be defined as a condition when a person at a productive age wants to get a job but has not obtained one yet. Unemployment occurs due to an imbalance between the workforce and the available job opportunities. High unemployment will cause people to be unable to improve their welfare. The increase in population will increase the number of people looking for jobs. If workers cannot find jobs, they will be included in the unemployed category. Unemployment problems become one of the most difficult problems to solve in every country.

A previous study (Ishak & Sy, 2018) reveals that unemployment is caused by some factors, namely economic conditions, government policies, development of the non-real economic sector, low education and skills, limited employment opportunities, and others. Unemployment is closely related to the termination of employment as companies will be closed or reduce their business fields due to an economic crisis or unfavorable security, regulations that inhibit investment, obstacles in the export and import process, and others. One of the indicators used to measure unemployment is the Open Unemployment Rate. Statistics Indonesia defines the open unemployment rate as the percentage of unemployed people in the total workforce. If high population growth is not accompanied by quality human resources, they will not be absorbed into the available jobs (Mahroji & Nurkhasanah, 2019).

The quality of human resources can be measured through HDI. A study (Mahroji & Nurkhasanah, 2019) regarding the relationship between HDI and the unemployment rate shows that HDI has a negative and significant influence on the unemployment rate in Banten Province. This indicates that the greater the HDI value, the lower the unemployment rate. Thus, it can be said that the government can provide more jobs by reviewing the use of budget allocations in order to reduce the open unemployment rate and eventually increase economic growth.

H1. Open Unemployment Rate affects Human Development Index

Effects of Domestic Investment on Human Development Index

Domestic investment plays an important role in a country's economic development, which in turn can affect HDI. Many studies have been conducted to evaluate the relationship between domestic investment and HDI. They reveal that there is a significant positive effect between the two. A study (Babalola et al., 2018) reveals that domestic investment directly influences important aspects of human development including education, health, and standard of living. Another study (Kee, 2015) focuses on the importance of domestic investment as a driving force for human development and reveals that domestic investment significantly increases people's access to quality education services, health facilities, and employment opportunities. This will increase overall human capabilities and contribute to an increase in HDI. Besides, effective domestic investment needs to be supported by government policies that pay attention to strategic sectors and protect labor rights in order to ensure equitable welfare.

Another study (Paolino, 2009) emphasizes the importance of domestic investment to build infrastructure in order to improve people's quality of life. Investments in infrastructure sectors such as transportation, electricity, and sanitation will open up accessibility to basic services that are

important for human development. Besides, domestic investment prioritizing rural infrastructure development can help reduce the development gap between urban and rural areas and then strengthen overall human development. Moreover, a previous study (Silvia, 2015) suggests that domestic investment focusing on knowledge-based sectors can have a positive impact on HDI. Investments in research and development, information technology, and creative industry sectors can drive innovation, increase productivity and create quality jobs. This has the potential to improve the standard of living of society as a whole and support sustainable human development.

Based on the explanation above, it can be said that domestic investment has a significant effect on HDI. Domestic investment affects important aspects of human development such as education, health, infrastructure, and knowledge-based sectors. Investments in the education and health sectors directly improve access and quality of services, while investments in infrastructure expand accessibility and reduce the development gap between urban and rural areas. Moreover, investments in knowledge-based sectors such as research and development, information technology, and creative industry sectors have a positive impact on human development. Investments in those sectors drive innovation, increase productivity, and create quality jobs. To achieve sustainable human development, governments and stakeholders need to promote effective domestic investment. This investment needs to be supported by policies that pay attention to strategic sectors, protect workers' rights, and pay attention to equitable development. Thus, significant domestic investment can become the driving force for increasing HDI and improving the welfare of society.

H2. Investment affects Human Development Index

Effects of Gross Regional Domestic Product (GRDP) on Human Development Index

Gross Regional Domestic Product (GRDP) is statistical data that summarizes the acquisition of added value from all economic activities in a region in a certain period. GRDP is an important measure in the regional economy to understand a region's economic growth, unemployment rate, per capita income, and overall economic progress (Todaro & Smith, 2014). On the other hand, HDI is a measure to describe the level of development of a country or region based on indicators of per capita income, life expectancy, and education level. The effect of GRDP on HDI has been widely discussed by economics and development experts. Many studies reveal the effect of GRDP on HDI. Experts have explained this relationship from various perspectives, for example, (Pugno, 2022) argued that high economic growth, which is reflected in GRDP, can increase people's per capita income and improve access to education and health care, thereby contributing to an increase in the HDI. Meanwhile, (Ranis et al., 2000) emphasized the importance of a balance between economic growth and a fair distribution of income so that the effect of GRDP on HDI is more positive. These factors indicate a complex relationship between GRDP and HDI.

A study (Saksena & Deb, 2017) revealed that GRDP has a positive impact on HDI through the mechanism of increasing income, the availability of education and health services, and the development of basic infrastructure. However, the impact of GRDP on HDI is not always consistent and can be influenced by economic inequality and unequal access factors. This is strengthened by another study from (Cabeza-García et al., 2019) that the quality of inclusive economic growth, which includes equal access to employment opportunities and social services, is a key factor in increasing the HDI. Moreover, a previous study (Wodon, 2017) emphasized the need to look at the qualitative dimension of the relationship between GRDP and HDI. Besides, gender equality, environmental protection, and community participation factors have an important effect on human development. Therefore, development policies focusing on economic growth should be balanced with efforts that involve these aspects to achieve a sustainable increase in HDI.

Moreover, another study (Corbridge, 2002) emphasized that human development must include broader aspects such as health, education, and individual freedom. (Ul Haq, 1996) revealed that strong economic growth must be followed by inclusive human development including fair income distribution, equitable access to basic services, and decent employment opportunities (Wodon, 2017). (Anand & Sen, 1994) showed that strong economic growth can have a positive impact on HDI dimensions such as income, life expectancy, and education. Meanwhile, t is important to look at the quality of economic growth, equitable distribution of income, and equitable

access to education, health care, and basic infrastructure services in assessing human development (Vanoli, 2012). Therefore, it can be said that GRDP plays an important effect in HDI. It is important to ensure that economic growth is followed by efforts that involve equal income, equitable access to basic services, and the availability of good job opportunities. Sustainable human development requires a comprehensive approach beyond economic aspects.

H3. Gross Regional Domestic Product affects Human Development Index

Effects of Poverty on Human Development Index

The concept of poverty varies. Poverty is no longer only defined as economically incapable but also as a situation where human resources cannot meet basic needs (Peter Saunders, 2004) which include food, clothing, shelter, education, and health. This is in line with (Corbridge, 2002) that poverty can be defined more broadly not based on insufficient income only. Poverty is a lack of one or some basic abilities needed to obtain a minimum function in social life. This is in line with (Hidayati, 2019) that poverty refers to people with lower income than the average income, so they do not have many opportunities to prosper as an individual. Statistics Indonesia defines poverty as an economic inability to meet the minimum standard of living needs as measured from the expenditure side. The minimum standard requirement is illustrated by the poverty line, namely the minimum spending limit per capita per month to meet minimum food and non-food needs. For food needs, the minimum expenditure value required is equivalent to 2,100 kilocalories per capita per day. Meanwhile, non-food needs include spending on housing, clothing, education, and health.

Poverty can be caused by needs that exceed the threshold of strength (Chambers, 2014). These needs are related to five aspects, namely customary obligations, calamities, physical incapacity, unproductive expenses, and marketing (Kadji, 2012). The causes of poverty can also be seen from three theories, namely 1) behavioral theory, related to individual behavior that is driven by incentives and culture; 2) structural theory, emphasizing the demographic and labor market contexts that cause behavior and poverty; and 3) political theory, arguing that power and policies cause poverty and moderate the relationship between behavior and poverty (Brady, 2019). Generally, HDI has a negative relationship with poverty levels. This means that the higher the HDI, the lower the poverty rate. Although not all regions have this correlation pattern, in which a high HDI value is accompanied by an increase in the number of poor people which is inconsistent with some experts (Lanjouw & Pradhan, 2002) that a high HDI will result in a poverty reduction. The low HDI will increase the number of poor people causing a decrease in productivity.

H4. Poverty has a negative effect on Human Development Index.

Methods

This study used quantitative methods. The population of this study was related to the Human Development Index of Central Java Province recorded by Statistics Indonesia (BPS). This study used panel data from 29 districts and 6 cities in Central Java Province. Data were taken from the Central Java Statistics Agency for the period 2016 to 2021. The variables used were Human Development Index, Open Unemployment Rate, Domestic Investment, Gross Regional Domestic Product, and Poverty. Data were taken from Statistics Indonesia based on the credibility of the independent and objective institution.

The stages of analysis covered:

1. Statistical Descriptive Analysis, to produce a graph of each existing variable, to find out the movement of each variable annually.

2. Panel Regression Analysis is based on panel data to observe the relationship between one dependent variable and one or more independent variables (Sunengsih, I Gede Nyoman Neneng, 2009).

Some alternative models that can be solved with panel data are:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots + \beta_5 X_5 + \varepsilon \tag{1}$$

Y = Human development index (HDI) variable,
β_0 = intercept,

$X1$ = Open Unemployment Rate variable,
$X2$ = Investment variable,
$X3$ = Gross Regional Domestic Product variable,
$X5$ = Poverty variable
With Hypothesis:
H0 = Random Effects Model,
H1 = Fixed Effects Model,
with a significance level = α, test statistics = p-value < significance value
4. Statistical Criteria Testing
a. F-test to see the effect of all independent variables in the model.
Hypothesis:
H0: β or $\beta 2 = 0$,
H1: $\beta 1$ or $\beta 2 \neq 0$.
Significance Level = α, the value can be fulfilled by the following formula:
where R^2 = coefficient of determination, k = the number of independent variables, n = the number of cross sections, and T = time series data (Chen et al., 2020).

If the F-count > F-table, then **H0** is rejected and **H1** is accepted. This means that the independent variables simultaneously affect the dependent variable.

b. Partial Significance Test (t-test), to show the effect of one explanatory or independent variable individually on the variation of the dependent variable (Ghozali, 2011).
Hypothesis:
H0: There is no effect of the i-th independent variable on the dependent variable partially.
H1: There is an effect of the i-th independent variable on the dependent variable partially.
Significance Level = α. The t-count can be found using the following formula (2):

$$t_i = \frac{bj}{se(bj)} \tag{2}$$

where bj = regression coefficient, and se = the standard error of the regression coefficient (Chen et al., 2020). If t-count > t-table, then the hypothesis is accepted so that the independent variables individually affect the dependent variable.

c. The coefficient of determination (R^2), to measure the goodness of fit of a model. The coefficient of determination provides the proportion or percentage of the total variation in the dependent variable (Y) which is explained by the independent variable (X) (Gujarati, 2003).

5. Classical Assumption

a. The normality test is to test whether the confounding variables in the regression model have a normal distribution or not. In this study, the J-B Test method will be used if J-B $cont < \chi^2$ tables (chi-square), then the residual values are normally distributed (Imam Ghozali, 2014). where N = amount of data, Sk = Skewness, and K = Kurtosis.

b. The multicollinearity test is to test whether the regression model found a correlation between the independent or independent variables.

c. The heteroscedasticity test is used to analyze whether the error variance is fixed/constant or changing.

Results

Data Analysis

Descriptive statistics are related to the process of describing or explaining the object of the study through sample or population data. This study used data from 2016 to 2021. Descriptive statistics provide an overview of the research variables focusing on the maximum value, minimum value, mean value, and standard deviation value. The complete description of the data is presented in the following Table 2.

Table 2 shows the HDI variable with a maximum value of 77.73 and a minimum of 68.6. Based on the measurement of HDI, some districts in Central Java province have good and moderate

HDI categories. The maximum open unemployment rate reaches 9.79% with a minimum of 1.9%, meaning that around 9.97% of the total workforce is currently unemployed and looking for work.The open unemployment rate is an important indicator in measuring the state of the labor market of a country or region. Investment has a minimum value of 0 which means that some districts do not have domestic investment value. This indicates that the level of investment realization in Central Java province has not been evenly distributed.

Table 2
Description of Research Variables

	IPM_Y	TPT_X1	INVESTASI...	PDRB_X3	KEMISKINA...
Mean	74.83607	5.078786	671814.4	36676200	11.41354
Median	74.80500	4.630000	97359.45	27782313	11.26000
Maximum	77.73000	9.970000	16418900	2.05E+08	20.53000
Minimum	68.61000	1.500000	0.000000	7023900.	3.980000
Std. Dev.	1.847619	1.905013	1862873.	32522259	3.750976
Skewness	-0.766399	0.620432	5.290621	3.006935	0.293198
Kurtosis	3.750884	2.794192	36.29766	12.92752	2.451768

Source: Processed Data

An increase in GRDP indicates economic growth which means increased production and income in the region. An increase in GRDP can have a positive impact on human development and societal welfare. The minimum GRDP value can be interpreted as uneven economic growth. The difference in poverty rates is quite high indicating that there are some poor districts.

Stages of Panel Regression

The selection of panel data in this study used the Chow Test and Hausman Test. The results of the 2 tests can be seen below:

1. Chow Test is to determine whether the right model is used in the study, namely the Common Effect Model or the Fixed Effect Model. If the probability value of the cross-section fixed effects is <0.05, then the estimation model uses the Fixed Effect Model. Based on the results of the Chow test, the probability value of cross-section F is 0.0000. As the probability value is <0.05, the estimation model uses the Fixed Effect Model.

2. Hausman Test is to determine the use of the right model, namely the Random Effect Model or Fixed Effect Model. Based on the results of the Hausman, the probability value of the random cross-section probability is 0.0000. As the probability value is <0.05, the estimation model used the Fixed Effect Model. Based on the results of the Chow test, the Fixed Effect Model was selected, and the Hausman test selected Fixed Effect Model. Thus, there is no need to proceed to the LM test and the selected model is the Fixed Effect Model.

Then the model obtained from the fixed effect is:

$$Y = 74.65 + 0.057\,X1 - 6.98\,X\,10^{-9}\,X2 + 1.48\,X\,10^{-8}\,X3 - 0.056\,X4 + \epsilon \tag{3}$$

Y = Human Development Index Variable,
X1 = Open Unemployment Rate Variable,
X2 = Investment Variable,
X3 = Gross Regional Domestic Product Variable,
X4 = Poverty Variable,

Based on these data, the equations used in this study are as follows:

$$HDI = 74.65 + 0.057\,\text{Open Unemployment Rate} - 6.98\,x\,10^{-9}\,\text{Investmen} + 1.48\,X\,10^{-8}\,\text{GRDP} - 0.056\,\text{Poverty} + \epsilon \tag{4}$$

Statistical Criteria Testing

a. *The f test is to determine whether the independent variables as a whole are statistically significant in influencing the dependent variable with the hypothesis*:

H0 ≥ 0.05 (rejected) the Unemployment Rate, Investment, GRDP, and Poverty variables have no simultaneous effect on the HDI variable.

H1 ≤ 0.05 (accepted) the Unemployment Rate, Investment, GRDP, and Poverty variables have a simultaneous effect on the HDI variable.

Based on Table 3, the Prob value (F-statistic) is 0.000 <0.05, so H0 is rejected and H1 is accepted. It can be said that the Open Unemployment Rate, Investment, GRDP, and Poverty variables have a simultaneous effect on the Human Development Index variable.

Table 3
Analysis of F-test

R-squared	0.996654	Mean dependent var	74.83607
Adjusted R-squared	0.995892	S.D. dependent var	1.847619
S.E. of regression	0.118418	Akaike info criterion	-1.260437
Sum squared resid	2.341803	Schwarz criterion	-0.630402
Log likelihood	168.8250	Hannan-Quinn criter.	-1.005630
F-statistic	1308.897	Durbin-Watson stat	0.926112
Prob(F-statistic)	0.000000		

Source: Eviews Data Processed, 2023

b. *Partial test (T-test)*

A partial test or t-test is a to determine the linear relationship between two or more independent variables with the dependent variable. Besides, it is to determine the effect of variable X (independent variable) on (Y) in companies in several countries. The partial test can be concluded based on the hypothesis as follows:

1) If the probability value is ≥ 0.05, then the Open Unemployment Rate, Investment, GRDP, and Poverty variables do not simultaneously affect the HDI variable.

2) If the probability value is ≤ 0.05, then the Open Unemployment Rate, Investment, GRDP, and Poverty variables have a simultaneous effect on the HDI variable (Table 4).

Table 4
Partial t-test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	74.65373	0.163337	457.0539	0.0000
TPT_X1	0.057264	0.008128	7.045366	0.0000
INVESTASI_DN_X2	-6.98E-09	5.36E-09	-1.302515	0.1945
PDRB_X3	1.48E-08	2.14E-09	6.931970	0.0000
KEMISKINAN_X4	-0.056698	0.010101	-5.613092	0.0000

Source: Eviews data processed, 2023

Based on Table 4, it can be said that:

1. Variable X1 (OUR) has a probability value of 0.000. Because the value is <0.05, so it can be concluded that X1 has an effect on Y with a positive direction (see the direction in the coefficient section).

2. Variable X2 (Investment) has a probability value of 0.1945. Because the value is > 0.05, it can be concluded that X2 does not affect Y with a negative direction.

3. Variable X3 (GRDP) has a probability value of 0.000. Because the value is <0.05, so it can be concluded that X3 has an effect on Y with a positive direction.

4. Variable X4 (Poverty) has a probability value of 0.000. Because the value is <0.05, it can be concluded that X4 has an effect on Y with a negative direction.

c. *Coefficient of Determination Test*

The coefficient of Determination is a value (proportion value) that measures the ability of the independent variables used in the regression equation in explaining the variation of the dependent variable. The value of the Coefficient of Determination is between zero and one. The small Adjusted R Square value means that the ability of the independent variables to explain the variation in the dependent variable is very limited. The small Adjusted R Square of the Coefficient

of Determination (close to zero) means that the ability of the independent variables simultaneously to explain the variation of the dependent variable is very limited. Adjusted R Square of Coefficient of Determination which is close to one means that the independent variables provide almost all the information needed to predict the variation of the dependent variable. Based on the results of panel data estimation using the Fixed Effect Model (FEM) in Table 5, the Adjusted R2 Weighted Statistics is 0.995892.

Table 5
Analysis of Coefficient of Determination

R-squared	0.996654	Mean dependent var	74.83607
Adjusted R-squared	0.995892	S.D. dependent var	1.847619
S.E. of regression	0.118418	Akaike info criterion	-1.260437
Sum squared resid	2.341803	Schwarz criterion	-0.630402
Log likelihood	168.8250	Hannan-Quinn criter.	-1.005630
F-statistic	1308.897	Durbin-Watson stat	0.926112
Prob(F-statistic)	0.000000		

Source: Eviews data processed, 2023

This means that 99.5892% of the HDI in districts/cities in Central Java Province can be explained by the independent variables, while the remaining 0.042% is explained by other variables outside the model.

The results of this estimation are strengthened by a significant F-statistical probability value at the 5% confidence level, namely 0.000000 which indicates that all independent variables have a significant effect on the dependent variable. Thus, the estimator model is feasible to estimate the parameters used.

Results of the Classical Assumption Test
The results of four-classical assumption tests are presented below:
1. Normality test
The normality test is to test whether the regression model of the confounding variables has a normal distribution. The normality test used the Kolmogorov-Smirnov test. One of the requirements of this test is the population data. A good normality test result shows a normal or nearly normal distribution. In this study, the normality test for confounding variables used the JarqueBera (J-B) test, with a significance level of $\alpha = 0.05$. The decision-making is based on the probability figures of the J-B statistics with the following conditions:
a. If the probability value is ≥ 0.05, then the normality assumption is fulfilled.
b. If the probability value is ≤ 0.05, then the normality assumption is not fulfillede.

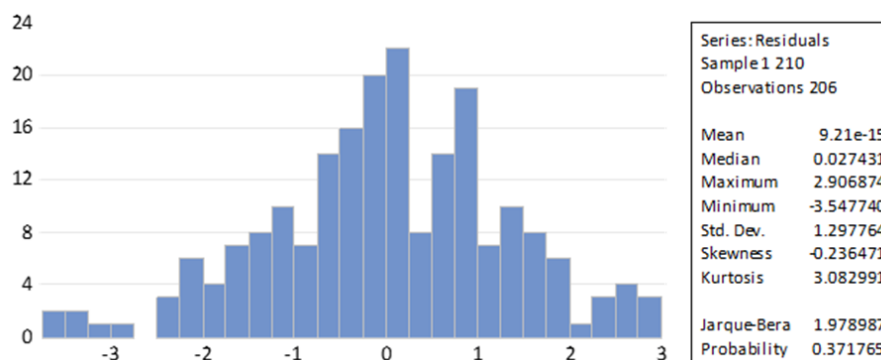|	
Series: Residuals	
Sample 1 210	
Observations 206	
Mean	9.21e-15
Median	0.027431
Maximum	2.906874
Minimum	-3.547740
Std. Dev.	1.297764
Skewness	-0.236471
Kurtosis	3.082991
Jarque-Bera	1.978987
Probability	0.371765

Figure 4. Results of Normality Test

Based on the figure above, the Jarque-Bera value is 1.97, while the probability value is 0.1565, which is greater than the significance level of 0.05. This means that the assumption of normality is fulfilled.

2. Multicollinearity Test

A multicollinearity test is a situation that indicates a strong relationship between the independent variables in a multiple regression model. Ghozali (2016) defines the multicollinearity test as a test that aims to find out whether the regression model found a correlation between the independent variables. The effect of this multicollinearity is to cause high variables in the sample. This means that the standard error is large, as a result when the coefficients are tested, the t-count will be smaller than the t-table. The results of the multicollinearity test are presented in Table 6 below:

Table 6
Results of Multicollinearity Test

	TPT_X1	INVESTASI...	PDRB_X3	KEMISKINA...
TPT_X1	1	0.16185992...	0.21884868...	-0.0577560...
INVES...	0.16185992...	1	0.36653541...	-0.1460016...
PDRB_X3	0.21884868...	0.36653541...	1	-0.3037564...
KEMISK...	-0.0577560...	-0.1460016...	-0.3037564...	1

Based on the table above, the correlation value between variables is less than 0.8. Therefore, it can be concluded that there are no symptoms of multicollinearity between the independent variables.

3. Heteroscedasticity Test

The heteroscedasticity test aims to determine whether there is an inequality of residual variance for all observations in the linear regression model. The heteroscedasticity test can be done with the Harvey test. The decision-making is based on the probability figures from the result of the Harvey test. The results of the heteroscedasticity test can be seen below.

Table 7
Results of Heteroscedasticity Test

Heteroskedasticity Test: Harvey
Null hypothesis: Homoskedasticity

F-statistic	1.079080	Prob. F(4,201)	0.3680
Obs*R-squared	4.330692	Prob. Chi-Square(4)	0.3631
Scaled explained SS	5.683492	Prob. Chi-Square(4)	0.2241

The table above shows that the prob F value is 0.3680 which is higher than 0.05, so the assumption of heteroscedasticity does not occur in the residual.

4. Autocorrelation Test

Based autocorrelation test obtained the Durbin-Watson value of 2.024639 with n = 40 and k = 3. The Durbin-Watson table value obtains dL = 1.119 and dU = 1.924. This shows that the Durbin-Watson is in the dU and 4-dU regions. Then, it can be concluded that the panel data regression model in this study has no autocorrelation.

Discussion

Effects of Open Unemployment Rate on Human Development Index

Based on the results of panel data regression with the Fixed Effect Model (FEM) approach, the Open Unemployment Rate has a significant positive effect on HDI. This result differs from (Todaro, 2000) that if HDI increases, the unemployment rate will decrease.

Effects of Domestic Investment on Human Development Index

Based on the results of panel data regression with the Fixed Effect Model (FEM), the domestic investment variable has a negative and non-significant effect on HDI. This means that domestic investment either high or low does not affect HDI. (Pratama & Darsana, 2019) revealed that the investment variable has no significant effect on economic growth. The insignificance of investment to economic growth indicates that the investment realized in North Kalimantan Province has not been able to optimally boost economic growth through the Gross Regional Domestic

Product. (BPS, 2020) reports that investment in North Kalimantan Province is dominant in the primary sector, namely the food crop, plantation, livestock, and mining sectors. This means that investment has not been evenly distributed in all sectors so that economic growth has increased but not significantly.

Another study (Dinarjito & Dharmazi, 2020) supports the results of this study with a negative and non-significant effect on regional economic growth. Based on the results of panel data regression using the Fixed Effect Model, the GRDP variable has a positive and significant effect on the human development index. This means that if GRDP increases, the human development index in Central Java Province will increase. It is in line with (Ansori; & Hasmarini, 2023; Maulida et al., 2022) that GRDP has a positive effect on the Human Development Index. Besides, (Sutejo Perangin Angin; Irsad Lubis; Ahmad Albar Tanjung; Aiyub Yahya, 2023) revealed that GRDP has a positive effect on HDI.

Effects of Gross Regional Domestic Product on Human Development IndexI

Based on the results of panel data regression using the Fixed Effect Model, the GRDP variable has a positive and significant effect on HDI. This means that if GRDP increases, the HDI in Central Java Province will increase. The results of this study are in line with previous studies (Ansori; & Hasmarini, 2023; Maulida et al., 2022) that GRDP has a positive effect on HDI. Besides, another study (Sutejo Perangin Angin; Irsad Lubis; Ahmad Albar Tanjung; Aiyub Yahya, 2023) revealed that GRDP has a positive effect on HDI.

Effects of Poverty Level on Human Development Index

Based on the results of panel data regression using the Fixed Effect Model, the Poverty variable has a negative and significant effect on HDI. This means that if poverty decreases, the HDI in Central Java Province will increase. Referring to (Lanjouw & Pradhan, 2002), a high HDI will result in poverty reduction. This means that the low HDI will increase the number of poor people and the decrease productivity of the population.

Conclusion

Based on the results of analysis and discussion, it can be concluded that:

1. Human Development Index is influenced by Open Unemployment Rate and Gross Regional Domestic Product.

2. The Open Unemployment Rate has a positive effect on the HDI in Central Java Province in 2016-2021. This means that an increase in Open Unemployment Rate in Central Java Province will increase the HDI by 0.057264%.

3. GRDP has a positive effect on HDI in Central Java Province in 2016-2021. This means that an increase in GRDP in Central Java Province can increase HDI by 1.48E08%.

4. Investment has a negative effect on HDI in Central Java Province in 2016-2021. This means that an increase in domestic investment in Central Java Province can reduce the HDI by -6.98E09.

5. Poverty has negative effects on HDI in Central Java Province in 2016-2021. This means that reducing poverty in Central Java Province can increase HDI by -0.056698.

6. A good model that can be used is the fixed effect model.

Limitations of the Study and Recommendation for Future Studies

The human development index is a variable that can influence and be influenced by other variables. This study uses four variables, namely the Open Unemployment Rate, Poverty, Investment, and GRDP to predict changes in the human development index in Central Java Province. Thus, the model cannot be used to measure and predict in other regions. This study provides information that the investment variable does not affect the Human Development Index. Meanwhile, the Poverty variable has a negative effect on the Human Development Index. Future studies are expected to focus on Investment and Poverty to explain why these two variables cannot predict the Human Development Index.

Conflicts of Interest: The authors declare that no potential conflicts of interest in publishing this work. Furthermore, the authors have witnessed ethical issues such as plagiarism, informed consent, misconduct, data fabrication, double publication or submission, and redundancy.

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