The Role of Human Capital on Growth in Central Java Province: Evidence from Panel Data

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Abstract. Economic growth in Central Java Province is still relatively low among the five other provinces on the island of Java. This research was conducted with the aim of determining the effect of investment, HDI, minimum wage, poverty and open unemployment rates on economic growth. The data used in this research is panel data or a combination of cross section data from 29 districts and 6 cities and time series data from 2017 to 2021 obtained from the official website of the Central Statistics Agency. The selected model is the Fixed Effect Model. The results of this research are that the investment variable has no effect on economic growth, the HDI variable has a significant positive effect on economic growth, the minimum wage variable has a significant negative effect on economic growth, the poverty variable has no effect on economic growth, and the open unemployment rate variable has a negative effect on economic growth.

Keywords: Economic growth; Investment; Human capital, Panel data.

1. Introduction

The success of economic development can be determined by measuring economic growth in a region. In economic growth, a close relationship is obtained from an increase in the number of produced goods and services in economic activities [18]. These activities illustrate the ability of a region to provide for the needs of its population which cannot be separated from economic progress. This increase can be seen through Gross Regional Domestic Product (GRDP) [21]. Economic growth that is relatively high and then sustainable is a form of success in economic development. Java Island is a region with six provinces in it, including the Special Region of Yogyakarta (DIY), DKI Jakarta, East Java, Central Java, West Java and Banten. The rate of economic growth in these six provinces is definitely different from one another. Economic growth depends on the conditions in a region itself.

Figure 1 shows how economic growth is in each province on the island of Java. During the five year period from 2017 to 2021, the highest economic growth rate was in the Yogyakarta Special

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Region province in 2019, valued at 6.59%. It can be seen that the Special Region of Yogyakarta and DKI Jakarta are dominant in the 2 highest rankings for their economic growth. In contrast to Central Java, its economic growth rate is still often near its lowest position. During 2017 to 2021, the highest economic growth value in Central Java only reached 5.36% in 2019. In the Harrord-Domar economic growth theory and the new economic growth theory, each states that investment and the role of human capital contribute to increasing production. influence on the economy. Economic growth can be influenced by several factors. The first step in implementing economic development cannot be separated from the interconnected role of investment in supporting economic growth. The dynamics of capital investment or what is usually called investment influences the levels of economic growth. [14] stated that there is a positive influence of investment on economic growth.

The Human Development Index (HDI) has a positive correlation with economic growth in a region. According to [14] stated that a high level of HDI will affect production which can increase economic growth. The components that form the Human Development Index are also called *Human Capital* which consists of the dimensions of education, health and living standards. If seen in general, *human capital* or what is usually referred to as human capital is defined as something possessed by humans that is related to economic activities such as skills, knowledge, competence and other characteristics. According to [6] the prosperity of a nation is determined by the main factor in the form of humans. It is said that because nature has no meaning if it is not in harmony with human resources who can use it well and wisely which will later determine increased economic growth.

Human capital can be obtained for all individuals in the form of knowledge and skills that are available to obtain maximum performance for oneself [3]. With maximum performance thanks to the contribution of each productive, creative, educated and healthy individual, this will have a long-term influence on the economic sector. Productivity resulting from good quality humans will provide quality goods and services of high value[13]. Therefore, *Human Capital* closely related to economic sustainability in a region. Achieving the HDI level in Indonesia with several indicators which are commonly referred to *human capital* as stated in the Central Statistics Agency, it was recorded that during the five years (2017-2021) there was an increase although there was a slowdown due to the impact of the Covid-19 pandemic. Judging from the health dimension in 2021, the value of growth in life expectancy of 0.14% has slowed compared to the previous year. The dimensions of education and decent living standards in Indonesia show an increase every year from 2017 to 2021. The expected length of schooling and the average length of schooling increase by 1.35% and 1.24% every year. The achievement of per capita expenditure in the dimension of decent living standards in Indonesia increased by 1.30% in 2021.

The Central Java Central Statistics Agency's HDI level from 2017-2021 shows an increase every year. So that in 2021 the percentage of HDI value will reach 72.16%, where this figure shows that this value is included in the high category. If we look at the three indicators that make up

the HDI, namely the level of health, education and decent living standards in Central Java, it increases every year. In the health dimension, life expectancy reached 74.47 years, while in terms of education, the expected length of schooling in 2021 reached 12.77 years, an increase of 0.07 years from the previous year. The average length of schooling also increased by 0.06 years in 2021 until the RLS reached 7.75 years. In terms of the dimensions of decent living standards in Central Java, it started to improve from the previous year, until in 2021 it increased again by 0.95%. The human capital possessed by each individual is related to each other, including health, education and a decent standard of living. According to BPS data, the increase in economic growth in Central Java is accompanied by good human capital conditions. When there was a decline in the rate of economic growth in 2020 due to Covid-19, the level of human capital achieved remained in good condition and increased until 2021, so that economic growth in 2021 improved again with the quality of human capital possessed by residents in Central Java Province.

Apart from investment and HDI, economic growth can also be affected by other factors such as minimum wages. [7] explain that salary levels influence production costs which in turn also influence economic growth. Higher production costs will have an impact on reducing the number of workers so that it will cause unemployment, with large numbers of unemployed resulting in poverty which ultimately affects economic growth. According to [1], economic development can be achieved as a multidimensional process related to major changes in social structure, population behavior, national institutions, accelerated economic growth, minimizing inequality, unemployment and poverty.

2. Literature Review

New Growth Theory

This theory is a form of criticism of the growth theory from [4] who explains the economic growth theory from Solow-Swan which considers neo-classical growth theory to have failed because the model specifications are wrong. It is stated in neo-classical growth theory that what is called capital is only production machines without paying attention to human capital. This new growth theory pays more attention to existence *learning by doing* which refers to the positive impact of accumulated knowledge and skills on the production process and other economic activities. It is possible that by paying attention to learning by doing, growth in a country will be high in a sustainable manner by including elements *physical capital* and *human capital*. The production function in the new growth theory can be written as follows:

$$Y = AND$$

Note:
A = factors that influence technology
K = physical capital and human capital

Progress in technology is said to have an endogenous nature, where economic growth is the action of economists in investing in the field of science. There are three basic elements in the endogenous growth theory, including: a) there is endogenous technological change through the process of knowledge accumulation and b) the creation of new ideas from a company due to the knowledge spillover mechanism [5]. Production of consumer goods resulting from scientific production factors will grow rapidly.

Table 1. Economic Growth Rate in Central Java Province (2017–2021)

Year	Economic growth (%)
2017	5,27
2018	5,30
2019	5,36
2020	-2,65
2021	3,33

Economic growth in Central Java has experienced fluctuations. It is said to fluctuate because it changes every year or can be said to be unstable. In 2017 Central Java's economic growth was 5.27%. The following year, economic growth in Central Java experienced a slight increase of 3% to show a value of 5.30% in 2018. In contrast to 2018, the increase in economic growth in Central Java in 2019 reached 6%, thus showing a value of 5.36 %. In 2020, there was a very drastic decline in economic growth in Central Java by 8.01%, which resulted in the economic growth value becoming negative, namely -2.65%. Conditions of decreasing economic growth values have indeed occurred in the national economy as well as in all districts or cities in Central Java due to the pandemic. The value of Central Java's economic growth in 2021 will increase by 5.98% so that economic growth is again positive at 3.33%.

Human Development Index (HDI)

UNDP (United Nation Development Program) explains the definition of human development as an effort to expand choices for the population, this means that every resident is given the choice to fulfill life needs related to the economy, social and culture. There are three indicators for measuring the Human Development Index (HDI), including long and healthy life, knowledge through education and a decent standard of living. According to BPS (2021), the Human Development Index assessment has a value of 0-100, in determining a respectable quality of life by calculating the purchasing power parity (PPP) of rupiah per capita and by calculating life expectancy at birth.

According to [11] HDI is an indicator used to measure the progress of a region in the field of human growth. The Human Development Index is a composite measure that takes into account three factors: healthy life expectancy, educational attainment, and income. The basic component that forms the Human Development Index can also be called Human Capital, which illustrates that humans are considered as capital or productive assets that can contribute to economic growth and productivity. HDI is a tool used to measure the magnitude of the influence resulting from human abilities. Human development is included in the building component through empowerment. Human development can be seen from the level of health, education and purchasing power. According to the United Nations Development Program (UNDP) standards, human development is grouped into four categories, as stated below.

1. Very high : IPM > 80
2. Height : IPM 70-79
3. Currently : IPM 60-79
4. Low : IPM < 60

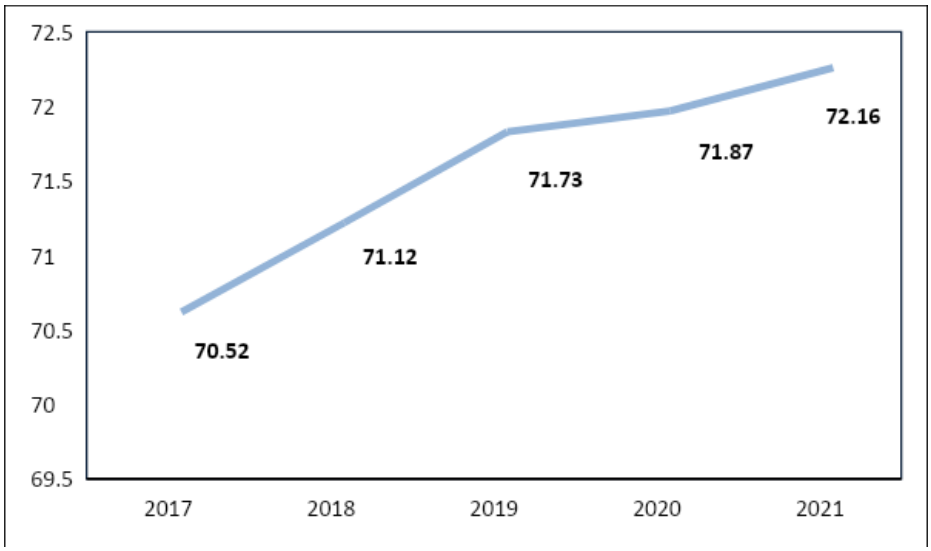

Figure 1. Human Development Index (HDI) Trend in Central Java Province (2017–2021)

Figure 1 shows that in the 5 years from 2017 to 2021, the percentage of Human Development Index (HDI) values has progressed every year. In 2017 the percentage value of the Human Development Index was 70.52%, which then increased by 0.6% to show a value of 71.12% in 2018. In 2019 the HDI rose by 0.61% to show a figure of 71.73% . As in previous years, the percentage of HDI values in 2020 and 2021 has increased, showing values of 71.87% and 72.16% respectively. If categorized according to the United Nations Development Program (UNDP) standards, the percentage of Human Development Index values in Central Java from 2017 to 2021 is included in the high category.

3. Research Methods

This research uses quantitative data, this research uses panel data. Panel data is a combination of time series data (*time series*) with cross data (*cross section*) [8]. The research uses cross-site data, covering 29 districts and 6 cities in Central Java Province, while the time series data is from 2017-2021. This data was obtained from the official website of the State of Indonesia, namely the Central Statistics Agency (BPS), including data on economic growth, investment, HDI, minimum wage, poverty and TPT. Data analysis in this research is by using panel data regression which is processed using the Stata application. The type of hypothesis is associative because this research aims to determine the relationship between variables. The panel data equation is as follows:

$$ON_{it} = \beta_0 + \beta_1 LogINV_{it} + \beta_2 IPM_{it} + \beta_3 LogMSE_{it} + \beta_4 KMS_{it} + \beta_5 TPT_{it} + \varepsilon_{it}$$

ON_{it} is Economic Growth; $\beta_0$is a Constant; $\beta_1\beta_2\beta_3\beta_4\beta_5$ is the coefficient value of the independent variable; INV is Investment (Million Rupiah); HDI is the Human Development Index (Percent); UMK is Minimum Wage (Rupiah); KMS is Poverty (Percent); TPT is the Open Unemployment Rate (Percent) and ε_{it} is the Error term.

4. Result And Discussion

The Economic Growth (PE) variable has a mean value of 3.586914 which is greater than the standard deviation value of 3.059086, which means that the economic growth variable is homogeneous. The lowest value for the economic growth variable is -10.28 percent, while the highest value is 6.98 percent. The Investment Variable (INV) has a mean value of 12.37913 which is greater than the standard deviation value of 1.721143. The lowest value for the investment variable is 7.816618 million rupiah and the highest value is 16.61443 million rupiah. The Human Development Index (HDI) variable has a mean value of 72.17577 which is greater than the standard deviation value of 4.437601, which means the HDI variable is homogeneous. The lowest value for the HDI variable is 64.86 percent, while the highest value is 83.6 percent.

Table 2. Descriptive Statistics of Research Variables

Variable	Mean	St. Dev	Minimum	Maximum
ON	3,586914	3,059086	-10,28	6,98
INV	12,37913	1,721143	7,816618	16,61443
IPM	72,17577	4,437601	64,86	83,6
MSE	14,40255	0,1384949	14,13032	14,8487

Variable	Mean	St. Dev	Minimum	Maximum
KMS	11,24543	3,67259	3,98	20,32
TPT	5,130171	1,922107	1,78	9,97
Obs	175	175	175	175

Based on table 4.3, testing has been carried out using the Fixed Effect Models (FEM) and Random Effect Models (REM) approaches. It can be concluded that through the results of the fixed effect test, there are three independent variables that have an influence on the dependent variable (Central Java Economic Growth), namely the HDI, UMK, and TPT variables, while from the results of the random effect test, only two independent variables have an influence on the dependent variable, namely UMK and TPT variables.

Table 3. Fixed Effect and Random Effect Model Estimation Results

Variable Dependent PE	Fixed Effect Models			Random Effect Models		
	Standard Error	Prob	Is	Standard Error	Prob	Is
INV	0,152909	0,229	Accept H_0	0,1257805	0,193	Accept H_0
IPM	0,3731455	0,002	Reject H_0	0,617079	0,246	Accept H_0
MSE	3,354259	0,000	Reject H_0	1,826629	0,000	Reject H_0
KMS	0,2555901	0,564	Accept H_0	0,076639	0,376	Accept H_0
TPT	0,2081275	0,000	Reject H_0	0,1128266	0,002	Reject H_0

To get the best results between fixed effects (FEM) and random effects (REM), a Hausman test was carried out to determine the model that will be used in this research. From the results of the Hausman Test in table 4.4, it can be seen that the probability value is 0.0000, meaning <alpha

(0.05), so the best regression model chosen to be applied in this research is Fixed Effect Models (FEM)

Table 4. Hausman Test

Prob > F
0,0000

Through test results *fixed effect models* It is known that the probability value of the investment variable is (0.229 > 0.05) and the coefficient value is 0.1847947, so it can be seen that the investment variable (INV) has no influence on economic growth in Central Java Province. The research results are in line with the study of [20] which states that investment has no effect on economic growth in Bali Province. In growth theory (Harrod-Domar) the level of investment will provide an increase in economic production, but if investment does not have an impact on economic growth then it can be said that total investment has not been able to drive the rate of economic growth in a region [16]. This can happen because investment in Central Java is only focused on certain sectors or regions, so it can cause economic inequality, ultimately the realization of existing investment has not been able to increase economic growth through GRDP values. In the Central Java investment realization statistics book until 2021, investment realization for both PMA and PMDN is still not evenly distributed when viewed from the business sector. There are 3 largest PMA investment sectors coming from the electricity gas and water sector worth US$ 120,929.30, the textile industry worth US$ 59,365.70 and the leather goods and footwear industry worth US$ 47,818.10. Meanwhile, the additional investment from PMDN which is quite high comes from the non-metallic mineral industry sector, namely Rp. 4,053,555, transportation, warehouse and telecommunications worth Rp. 983,428 as well as other services worth Rp. 588,658.

Table 5. Hausman Test Result

Variable	Coefficient	Standard error	t-statistics	Prob
C	175,5428	37,03232	4,74	0,000
INV	0,1847947	0,152909	1,21	0,229
IPM	1,190472	0,3731455	3,19	0,002
MSE	-17,5051	3,354259	-5,22	0,000
KMS	-0,1477377	0,2555901	-0,58	0,564
TPT	-1,245051	0,2081275	-5,98	0,000
R-square		0,6026		
F-statistic		5,25		

Variable	Coefficient	Standard error	t-statistics	Prob
Prob (F-statistic)		0,0000		

From the test results *fixed effect models* It can be seen that the probability value of the HDI variable is (0.002 < 0.05) and the coefficient value is 1.190472, so it can be interpreted that the human development index variable has a positive and significant impact on economic growth in Central Java. With a coefficient value of 1.190472, if the HDI level rises by 1 percent it will increase economic growth by 1.190472 percent. Similar research conducted by [5] stated that HDI has a positive influence on economic growth. In accordance with the new growth theory or *new growth theory* as explained by [9] in the rate of economic growth in a region, it is very important to pay attention to human capital. The quality of human capital is considered to have a good influence on sustainable economic growth. The Human Development Index can also be used by a region to measure the level of human development. There are components in IPM which can be called: *Human Capital* with the meaning of humans as productive capital assets that can contribute to economic growth.

The basic components that make up HDI in other words *Human Capital* divided into 3 dimensions, namely the health dimension represented by Life Expectancy (AHH), the education dimension represented by Average Years of Schooling (RLS) and Expected Years of Schooling (HLS), and the standard of living dimension represented by Per Capita Expenditure (PP) . This research proves whether or not there is an influence of several components in HDI:

Table 6. Fixed Effect Model Estimation Results for Economic Growth Determinants

Variable Dependent PE	Model	Coefficient	Prob	Is
AHH	Model 1 (FIVE)	3,815712	0,141	Accept H_0
RLS	Model 2 (FIVE)	2,069375	0,340	Accept H_0
HLS	Model 3 (FIVE)	3,469165	0,080	Accept H_0
PP	Model 4 (FIVE)	119,8834	0,000	Reject H_0

All variables included in *Human Capital* shows that overall there are some that have a positive impact and some that have no impact on economic growth in Central Java. In fact, the HDI level in Central Java increases every year starting from 2017-2021. This is certainly supported by several indicators that form the HDI as explained in table 4.6. It can be seen that the indicators that form the HDI have an influence on economic growth only from the dimension of a decent

standard of living (Per Capita Expenditure). [15] research shows that per capita expenditure has a (+) influence on economic growth. High people's income will encourage high consumption so that people tend to spend a lot of money. This increases the amount of demand for a company for the production of goods and services so that it will create more jobs in order to increase economic growth. The level of per capita expenditure can be used as an evaluation of the level of prosperity of society, the higher the value, the higher the prosperity. UNDP explains that human development and the quality of human resources are sustainable with economic growth. Humans are actors in the capital process in development to produce an advanced order of life in society which will later support the success of economic development in a region [12]

With a coefficient value of -17.5051, an increase of 1 rupiah in the district minimum wage will reduce the economic growth rate by 17.5051 percent in Central Java Province. The results of this research are in line with a study conducted by [20] where the district minimum wage had a negative impact on economic growth in Bali Province. The minimum wage can have a negative influence on economic growth because an increase in the minimum wage will affect the increase in production costs for a company. The higher the company's production costs, the more it can have an impact on reducing the workforce. If there is a reduction in labor, it will affect the amount of goods and services produced so that GRDP decreases and ultimately will have an impact on economic growth. Similar research conducted by [7] argues that the minimum wage has a negative influence on economic growth. In reality, there are still many informal industries in Central Java, the largest workforce absorption in Central Java Province is in the agricultural and trade sectors, so they do not use the UMK as a salary reference in particular. The lack of labor absorption in formal industry results in the possibility that workers have less access to training and skills development so that labor productivity is low and will hamper economic growth. Therefore, the minimum wage level in districts and cities in Central Java Province has a (-) influence on economic growth.

Based on the results of the fixed effect model test, it can be understood that the probability value of the poverty variable is (0.564 > 0.05) and the coefficient value is -0.1477377, so it can be said that the poverty variable (KMS) has no influence on economic growth in Central Java. The research results are in line with [2] study which states that poverty has no influence on economic growth in Indonesia. Poverty can be said to be a cycle that is difficult to break, someone who lives in poverty is often associated with difficulties or has limited access to health, education and living standards. This research has proven that in districts/cities in Central Java Province, investment in human capital from the elements of a decent living standard has a (+) influence on economic growth in Central Java. Per capita expenditure for each individual reflects the average income received by individuals in society. This means that the higher the per capita expenditure, it can be said that society is able to meet basic needs such as food, clothing and shelter. With this, the existing poverty level will not have any impact on economic growth in Central Java.

Through the FEM test results, it can be seen that the probability value of the open unemployment rate variable is (0.000 < 0.05) and the coefficient value is -1.245051, so it can be said that the open unemployment rate variable has a negative impact on economic growth in Central Java. With a coefficient value of -1.245051, an increase in the open unemployment rate of 1 percent can reduce the economic growth rate by 1.245051 percent in Central Java Province. This research is in line with a study conducted by [10] which states that TPT has a negative impact on economic growth. Unemployment is included in macroeconomic problems that can hinder economic growth in a region, not only that, unemployment will also cause other social problems [19]. From data obtained from BPS Central Java, several districts and cities in Central Java still have high unemployment rates. As in Cilacap Regency and Tegal Regency, the percentage of open unemployment is almost 10 percent. High levels of unemployment will reduce production in economic activities in a region. A lack of production of goods and services will lead to a reduction in economic output. Apart from that, the unemployment rate can potentially increase poverty due to the lack of wages a person receives from a job.

5. Conclusion

The test uses fixed effect models with the dependent variable, namely economic growth in Central Java province and independent variables including investment (INV), Human Development Index (HDI), Minimum Wage (UMK), poverty (KMS), and unemployment (TPT). The data used is for a period of 5 years, namely 2017 to 2021. The Human Development Index (HDI) variable has a significant (+) impact on economic growth in the province of Central Java in a period of five years, namely 2017 to 2021. In terms of the components that make up the Provincial HDI Central Java is proven only in terms of a decent standard of living which plays a role in economic growth. The minimum wage (UMK) variable has a significant (-) influence on economic growth in Central Java Province. The lack of labor absorption in the formal sector in Central Java will cause a decline in labor productivity which will reduce economic growth. The percentage of unemployment that continues to increase will result in many social problems and reduce productivity in economic activities in a region, thereby reducing the level of economic growth in Central Java.

To be able to improve the quality of life of the population, the government needs to make cross-sector efforts such as investing in education by improving infrastructure, training teaching staff and educational facilities. Increasing access to health services through training of health workers, health programs and adequate facilities. In improving the quality of life, economic stability needs to be maintained so that people can plan their spending well, it is necessary to control the prices of basic necessities so that they can remain affordable for people in all groups. The limitation of this research is that it only applies the influence of human capital on economic growth in Central Java.

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