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The Impact of Human Capital on the Economic Growth: An Education Approach

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***Abstract*— One of the successes of the country's economy is determined by economic growth. This measure emphasizes its attention to the increase in GDP (Gross Domestic Product). There are many approaches to find out the determinants of economic growth, one of which is through human capital. This study aims to know the human capital factors that determine economic growth especially from education approach. The research analysis used panel data regression, with the data used were 32 provinces in Indonesia during 2013-2017. The model revealed a positive relationship, statistically significant between GDRP per capita and expenditure of education (EXP), domestic investment (INV), and technological literacy (PHN).**

Keywords*— Economic growth, Education, Gross Regional Domestic Product, Human Capital, Panel Data

I. INTRODUCTION

One of the successes of the country's economy is determined by economic growth. This measure emphasizes its attention to the increase in GDP (Gross Domestic Product). Economic growth is the increase in goods and services produced in society due to the development of economic activities. The ability of a country to produce goods and services will increase along with various problems of economic growth which are considered as macroeconomic problems in the long run [21]. GDP growth rates, as a whole and per capita are a measure of the success of economic development.

While per capita income is one indicator that determines community prosperity. Per capita income is obtained from income in a given year divided by the number of population of a country that year. If the community has high income or salary, the community can live their lives and save for future costs. If people's income decreases, it is difficult for the community to fulfill their daily needs.

Per capita income is a measure used to describe the standard of living. Countries that have high per capita income generally have a high standard of living as well. Differences in income reflect differences in quality of life; rich countries have a better quality of life than poor countries.

According to the Mankiw [12], the main factor influencing the difference in standard of living (indicated by the difference in income per capita) between rich countries and poor countries is the level of productivity. Productivity refers to the amount of goods and services a worker can produce in every hour. Thus, a country can enjoy a high standard of living if the country can produce goods and services in large quantities. Governments that want to improve growth in living standards should aim to increase national productivity capabilities by encouraging the rapid accumulation of production factors and ensuring that these factors are used as effectively as possible.

A study by Liang, Liu, and Li [10] found that city-level of human capital has a significant positive effect on individual income. Chang and Shi [24] states that human capital as measured by years of education, primary and advanced can encourage economic growth, but work in different ways. Primary human capital has a direct impact, while advanced human capital impacts through technological innovations similar to Huang, et al. [8]. In addition, Nelson and Phelps [14] mention that investment in human, in this case education can increase economic growth.

The ability to use information and communication technology (ICT) can also be one of the factors that can increase economic growth. Information and communication technology infrastructure is now increasingly advanced, almost everyone from various circles has been able to use it. Sepehrdoust [20] concluded in his research that ICT increases economic growth. This is also in accordance with Pradhan, Mailik, and Bagchi's [19] study, which said that ICT's technology can drive an increase in income per capita. Hwang and Shin [9] in their study concluded that ICT can improve the economy in Korea and regulations regarding ICT investment are needed to continue sustainable growth.

By looking at the average per capita income, the government makes policies to improve the quality of human resources. Quality human resources are the basic capital in implementing development, whereas if human resources have low quality it will hamper the implementation of development. Improving the quality of human resources by improving education in Indonesian society. Through education, one's knowledge will increase which will be useful for

learning skills that are useful in the world of work. Improving the quality of human resources can increase productivity in producing goods and services.

Research conducted by Adam [1] found that domestic investment has a positive and significant influence on economic growth. Investment is a change in the form of wealth from money capital into production tools that can be used for the production process [11]. So that investment is a determining factor in increasing per capita income.

Based on this background, this study aims to know the human capital factors that determine economic growth. The human capital variable used is not only in terms of education but also the ability to use communication tools. In addition, many of the previous studies used foreign direct investment variables [17]; [23]; [5]; [2], but in the research used domestic investments which is not widely studied [1]. The research analysis used panel data regression, with the data used were 32 provinces in Indonesia during 2013-2017. Data usage is limited by the availability of data, so that only 32 of 34 provinces in Indonesia are used. This research is expected to provide an overview of the determinants of economic growth in terms of human capital. The results of the study can be used as one of the considerations of the government in making regulations in order to maximize sustainable economic growth.

II. METHOD

This study uses panel data which is a combination of five-year time series data from 2013-2017 and cross section data in the form of provinces in Indonesia. The data collected is secondary data obtained from the Statistic Central Beruau (BPS) [3], Director General of Financial Balance of the Republic of Indonesia (DJPK) [4], and the Indonesian Ministry of Education and Culture. The data limit in this study was 32 out of a total of 34 provinces in Indonesia due to limited information on the availability of these data. Because the data in this study are panel data, so panel data regression is used to determine the variables that influence economic growth.

Quality of human capital can be seen from several dimensions as used in the measurement of the Human Development Index. These dimensions are seen in terms of health, education, and expenditure. In this research, the quality of human capital in terms of education is used. The variables used refer to several journals by Pelinescu [18], Mariana [13], Pradhan, Mailik, and Bagchi [19] regarding the effects of human capital, education, and technology information on economic growth. Therefore the variables used in this study are in Table 1.

Table 1. Variables for Data Panel Regression

Variables	Definition	Unit
Dependent		
GDRP	Gross Domestic Regional Product per capita	Rupiah
Independent		
EXP	Government Expenditure on Education	Rupiah
PHN	Percentage of households owning/using cell phones (technological literacy)	Percentage
SCH	School enrollment rate aged 16-18 years	Percentage
INV	Domestic investment	Rupiah
LIT	percentage of illiterate population aged 45+	Year

Panel data regression is a method used to determine the effect of human capital on economic growth. Greene [7] states that panel analysis is a subject that is one of the most active and innovative bodies of literature in econometrics, partly because panel data provides a rich environment for the development of estimation techniques and theoretical results. However, in more practical terms, researchers have been able to use time-series cross-sectional data to examine problems that cannot be studied in just cross-sectional or time-series settings. The basic advantage of panel data is that it allows researchers to model behavioral differences in individuals. The basic framework for this is a regression model like the following.

$$y_{it} = x_{it}'\beta + z_i'\alpha + \varepsilon_{it}$$
$$= x_{it}'\beta + c_i + \varepsilon_{it}$$

There is a K regressor on x_{it}', but it does not include constant terms. The heterogeneity or individual effect is $z_i'\alpha$ where z_i contains a constant term and a set of individuals or specific groups of variables studied.

There are 3 structure models in panel data regression, namely pooled regression, fixed effect model, and random effect model. The following is an explanation of the three models based on Greene [7].

a. Pooled regression: If z_i only contains constant terms, ordinary least square provides efficient and consistent estimates of the common α and the slope vector β.
b. Fixed effect: If z_i is unobserved, but correlated with x_{it}, then the least squares estimator of β is biased and inconsistent as a consequence of an omitted variable. The model
$$y_{it} = x_{it}'\beta + \alpha_i + \varepsilon_{it}$$
where $\alpha_i = z_i'\alpha$ embodies all the observable effects and specifies an estimable conditionalmean. This **fixed effects** approach takes α_i to be a group-specific constant term in the regression model. It should be noted that the term "fixed" as used here signifies the correlation of c_i and x_{it}, not that c_i is nonstochastic.
c. **Random Effects:** If the unobserved individual heterogeneity, however formulated, can be assumed to be uncorrelated with the included variables, then the model may beformulated as

$$y_{it} = x'_{it}\beta + E[z'_i\alpha] + \{z'_i\alpha - \mathrm{E}[z'_i\alpha]\} + \varepsilon_{it}$$
$$= x'_{it}\beta + \alpha + u_i + \varepsilon_{it}$$

that is, as a linear regression model with a compound disturbance that may be consistently, albeit inefficiently, estimated by least squares. This random effects approach specifies that u_i is a group-specific random element, similar to εit except that for each group, there is but a single draw that enters the regression identically in each period. Again, the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not [7].

III. DISCUSSION AND RESULT

Based on the results of data analysis, it can be seen the estimation results of several approaches to the panel data regression model as follows:

Table 1. Results of Estimated Panel Data Regression Models

Variables	Common Effect	Fixed Effect	Random Effect
C	-31.93218	9.433	10.561
EXP	0.00325	0.001	0.001
PHN	0.13246	0.216	0.218
SCH	0.78626	0.097	0.084
INV	0.35611	0.163	0.162
LIT	-0.42631	-0.172	-0.206
Effects Specification			
R-squared	0.15	0.997	0.53
Adjusted R-squared	0.12	0.996	
F-statistic	4.93	1225.1	129.64
F-Prob	0.0003	0.000	0.000

To analyze how much influence EXP, PHN, SCH, INV, LIT has on GRDP, it is necessary to first estimate the panel data regression model. The panel data regression model testing is carried out by conducting the restricted F test to choose between the common effect model and the fixed effect model, and the Hausman test to select the fixed effect model with random effects.

The test results with the Restricted F test that compares between common and fixed effects can be seen from the results of the analysis above which shows the value of prob F of 0,000. Because the value of prob F is <0.05 or less than five percent, the model that is worth using is the fixed effect. Furthermore, based on the hausman test the chi square probability value of 0.996 is greater than five percent (0.996> 0.05), which means that the right model in this study is a random effect model.

Table 2. Hausman Test Results

Test Summary	Chi-Sq. Stat	Chi-sq d.f	Prob
Cross-section random	0.35	5	0.996

Show that three independent variables are used in accordance with the hypothesis, namely the EXP, PHN, and INV variables. While the SCH and LIT variables do not appropriate the initial hypothesis. From the results of the analysis in the table it can be seen that the independent variable EXP, PHN. and INV can partially affect the dependent variable, GDRP. While the SCH and LIT variables are not partially significant for the dependent variable. The results of calculations on random effects obtained a probability value of F 0,000 smaller than alpha five percent (0,000 <0,05), it can be stated that the independent variables together have a significant effect on the GDRP

Table 3. Appropriate Test

Variables	Hypotesis	Output	Note
EXP	(+)	(+)	appropriate
PHN	(+)	(+)	appropriate
SCH	(+)	[+]	appropriate, doesn't significant
INV	(+)	(+)	appropriate
LIT	(-)	[-]	appropriate, doesn't significant

Based on the results that have been processed using the STATA program, the regression data equation between EXP, PHN, SCH, INV, and LIT on GDRP in Indonesia for the period 2013 - 2017 is as follows:

GDRP=10,561+0,001EXP+0,218PHN+0,084SCH+0.162INV-0,206LIT+ε

The regression model of this study has a constant of 10,561 which means that, if the independent variable (EXP, PHN, SCH, INV, LIT) equals zero then economic growth in Indonesia increases by 10,561 percent.

The EXP variable has a positive coefficient of 0.001, which means that whenever there is an increase in the amount of EXP in each province amounting to one billion rupiah, it will cause an increase in the Indonesian GDRP of 0.1%. With a probability value of 0.0000 <α 0.05, it appears that EXP is positive and significant in influencing GDRP in Indonesia. The results of this study are reinforced by a study conducted by Mariana [13] which suggested that government spending on education in Romania would increase Economic Growth in Romania.

PHN variable has a positive coefficient of 0.218, which means that every one percent increase in PHN in each province will cause an increase in Indonesia's GDRP

of 0.218%. With a probability value of 0.002 <α 0.05, it appears that PHN is positive and significant in influencing GDRP in Indonesia.

Based on the results of panel data regression, it was found that the probability value is 0.449 <α 0.05 with the coefficient value of the SCH variable of 0.846, which means that statistically the SCH does not significantly influence the increase in GDRP. This is because the data used are SCH ages 16 to 18 or only high school graduates

INV variable has a positive coefficient of 0.162 which means that every increase in the number of INV in each province by one trillion rupiah will cause an increase in the Indonesian GDRP of 0.16%. With a probability value of 0.0000 <α 0.05, it appears that INV is positive and significant in influencing GDRP in Indonesia. The results of this study are supported by Chang and Shi [24] who suggest that domestic investment can increase GDRP in China. Based on the results of panel data regression, it was found that the probability value is 0.388 <α 0.05 with the coefficient value of the LIT variable of -0.2, which means that statistically the SCH does not significantly influence the increase in GDRP.

IV. CONCLUSION

In summary, this paper highlighted the importance of human capital in ensuring economic growth expressed as gross domestic regional product per capita. The model revealed a positive relationship, statistically significant between GDRP per capita and expenditure of education (EXP), domestic investment (INV), and technological literacy (PHN). Thus the government needs to consider increasing government spending on education and domestic investment. Through this, the government is expected to be able to make regulations that can bring Indonesia into a country with ever-increasing and sustainable economic growth.

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