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Empirical Analysis of Human Capital Convergence in Indonesia

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Abstract

This research analyzes the convergence hypothesis that applied to human capital which is one of important factor for economic development. This model *applied to analyze the condition of* provinces in Indonesia that have different conditions of human capital between regions for 33 provinces in Indonesia for two period between 2004 to 2010 and 2010 to 2016. This study uses data panels in estimating with fixed effects model as the best model choice. The result of the analysis for sigma convergence model is a decrease of global dispersion of human capital growth in Indonesia for the both periods. The results of beta convergence confirm the existence of absolute and *conditional convergence model* for the both periods. The determinants of human capital convergence in first period are economic growth, poverty, illiteracy, access to sanitation, access to clean water, number of health centers, and number of universities. Meanwhile different conditions are shown in the second period where the determinants of conditional convergence of human capital are determined only by economic growth, poverty, and sanitation access.

Key words: human capital, convergence, panel data, Indonesia

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INTRODUCTION

Economic development provides an important emphasis on human capital because it has the accumulative and sustainable aspects. The concept of human capital develops especially in economic studies, it indicated by the explanation of economists about the concept of human capital such as human capital has a meaning as a workforce which is a property conceptualized into human productive capacity (Schultz, 1961) and interpreted as knowledge, ideas, ability and individual health (Becker, 2006). Investing in human capital becomes important because it will have an effect in the future (Becker, 1962) and overall economic development (Becker, 2002). Human capital becomes an important factor developed a country because with exist quality human capital will increase productivity that has implications for economic development. The mutual relationship between economic growth and human capital growth as the important key to sustainable economic growth (Mincer, 1995).

The relationship between human capital and economic growth is an interesting study in the study of economic development. Initial research focusing on education was undertaken by (Mankiw, Romer and Weil, 1992) using augmented Solow growth model with human capital as an additional factor while by applying endogenous growth models (Lucas, 1988) and (Romer, 1990) human capital and technology adoption as an important factor in promoting growth. Meanwhile, (Benhabib and Spiegel, 1994), have found a weak relationship between growth and improvement of human resources measured in terms of educational attainment. Direct research that indicates the effect of human capital on economic

growth (Hanushek, 2013) while the indirect conditions affect economic growth through making better of labor quality (Hanushek and Kimko, 2000). Diverse results show that empirically there is still room to explore the role of human capital in influencing the economic conditions of a country.

Regional analysis at the regional level in a country becomes an important study conducted to analyze the condition of inequality of human capital development. Early research from some researcher such as (Pritchett, 2001), explains that there are different variations in the impact of education on economic growth because of the institutional environment, the supply of educated workers increases but demand tends to remain, and there is a difference quality of education. Analysis of educational inequality by (Castelló and Doménech, 2002) between countries indicates a reduction inequality of education between countries. Analysis at the regional level is shown by (Manca, 2012) in Europe which concludes the role of secondary level education has implications for economic growth, and (Ramos, Surinach and Artís, 2012) for the region in Europe indicates that there is an over-education that affects economic growth.

Early indications of the conditions of regional development of human capital can be observed in the figure 1 and 2 that indicate the growth of human capital development in the 5 Big Island in Indonesia between two period there are 2004 -2010 and 2011-2016. The 2004-2010 period shows that in 2005 there was a significant increase for the entire region, while post-year it tended to have a relatively evenly distributed growth between regions. An interesting condition is shown by the relatively higher accumulation in regions outside Java and Bali, thus indicating that

these regions experience better human capital growth than in the central regions of Java and Bali.

The conditions that are not too different are shown in Figure 2 below which gives an overview of the condition of human capital growth for the period 2011-2016. The general condition is evenly shown by all regions in Indonesia with fluctuating conditions from year to year. In 2011-2014 the same conditions still occur with better human capital accumulation in areas outside Java and Bali while for the 2015-2016 period tend to have balanced growth between regions in the entire Indonesian island.

The conditions in the figure above provide an initial analysis that the accumulation of human capital in areas that were initially low such as outside Java and Bali actually occurred. The dominance of Java and Bali which is the center of population and economic activity makes the condition of human capital development tend to be better than other regions. The implication is that the accumulation of high human capital growth tends to occur outside of Java and Bali so that it is possible for the condition of human capital in areas outside Java and Bali to experience better conditions.

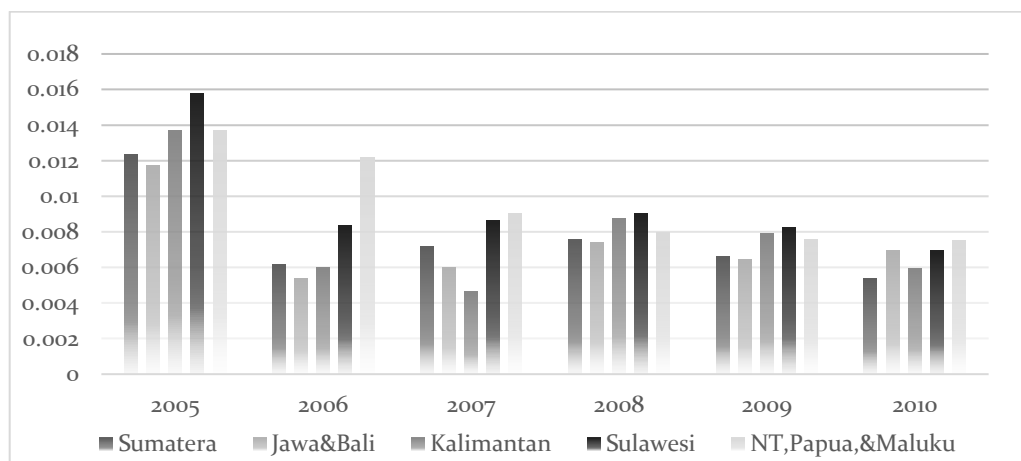


Figure 1. The Growth Rate of Human Development Index 5 Big Island in Indonesia 2004-2010
Source: Indonesia Central Bureau of Statistics, 2018

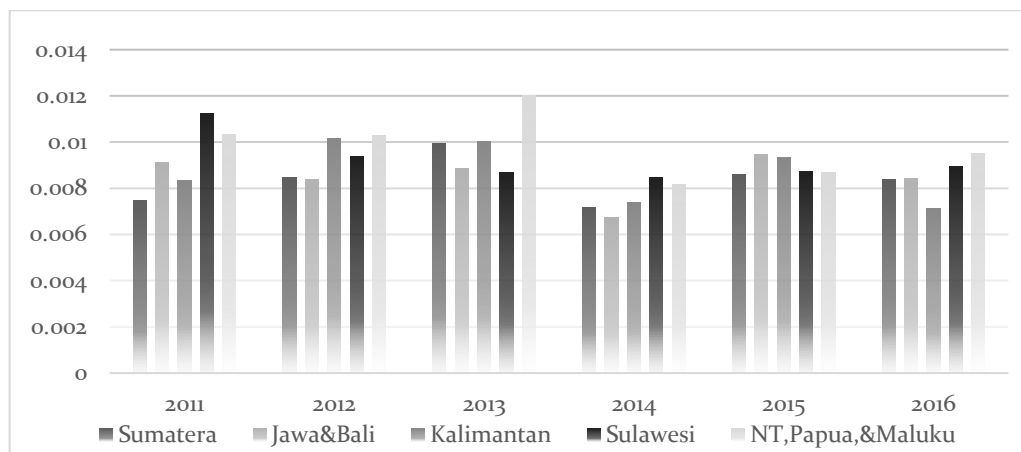


Figure 2. The Growth Rate of Human Development Index 5 Big Island in Indonesia 2010-2016
Source: Indonesia Central Bureau of Statistics, 2018

Further empirical studies were carried out to analyze specifically the main determinants of human capital in a country because of the existence of these implications for the development of policies carried out by the government in terms of the development of human capital which has implications for economic factors. The next analysis (Shuaibu and Oladayo, 2016) show the role of health, infrastructure, and institutions as determinants of human capital in African countries. Research conducted by (Wolf and Zohlnhöfer, 2009) analyzed the determinants of educational spending policies in OECD countries. Research in Indonesia that has been done to analyze the determinants of human capital is (Mirza, 2011), (Bhakti, Istiqomah and Suprpto, 2011), and (Farah and Puspita Sari, 2014). The result of (Mirza, 2011) in Central Java shows the negative effects of poverty and the positive impact of capital investment on human capital development. Another study conducted by (Farah and Puspita Sari, 2014) which shows the role of human capital in productivity. Positive effects of gross domestic product and health spending on human capital development in Indonesia (Bhakti, Istiqomah and Suprpto, 2011).

The concept of convergence seeks to explain for accelerate growth on the issue of disparity because the main analysis that becomes a point in the theory of convergence is the smaller gap between regions in terms of the disparity. The empirical analysis that applies convergence theory shown by converging of economic growth and income. The basic empirical research of convergence seen in some major literature such as (Mankiw, Romer and Weil, 1992), (Barro and Sala-i-Martin, 1995), and (Islam, 1995) that found different results on the concept of convergence. Some of these preliminary

studies empirically provide empirical studies and development of models on convergence, especially income and economic growth.

Preliminary research in Indonesia begins with the same concept of trying to get empirical evidence about catch up hypotheses which have implications for policies that can be taken by the government. Research in Indonesia on convergence done by several pieces of research such as (Wibisono, 2005), research from (Sodik, 2006), (Firdaus and Yusop, 2009), (Kharisma and Saleh, 2013), and (Vidyattama, 2013). Some of these studies focus on the existence of regional income gaps in Indonesia so that they empirically try to prove the occurrence of income convergence in Indonesia at the regional level.

The development of the convergence model provides a broader scope in understanding the existence of inequality and the concept of catch up hypotheses for other contexts. This provides the development of a convergence model to analyze non-economic sectors such as the main factors that have an impact on the economy. One of the developments of the convergence model is the concept of convergence model application for human capital. The earliest studies that have undertaken research by adopting the concept of convergence applied to other conditions such as convergence of human capital (Sab and Smith, 2002) to inter-country, (Afzal, 2012) apply regional models in Pakistan, and (Liaskos and Papadas, 2009) in Greece. Some of these preliminary studies provide empirical evidence of the convergence of human capital.

Further research was carried out by (Christopher R Berry and Glaeser, 2005) in the USA and (Kim, 2016) in South Korea which gave different conclusions, namely the

occurrence of human capital divergence in the USA and South Korea. One research of human capital convergence in Indonesia conducted by (Syukriyah, 2016) that analyze absolute convergence between provinces. Based on these preliminary studies and empirical data, this research empirically attempts to provide evidence related to the convergence model applied to human capital in the regional context in Indonesia.

RESEARCH METHODS

This study is an empirical quantitative research using secondary data obtained from the Central Bureau of Statistics (BPS) and the National Development Planning Agency (BAPPENAS). The unit of analysis used in this study is at the provincial level. The data used for this study are 33 provinces in Indonesia for two periods, namely the period 2004-2010 and the period 2010-2013. The division of these two time periods is based on a change in the method of calculation conducted by the Central Statistics Agency (BPS) on the value of the Human Development Index (HDI). The difference of the method used in the calculation of HDI cannot be combined between two periods because of differences used in terms of the composition of variables and calculation methods, so that this study divides the time period of the study into two periods. The use of HDI variables for the period 2004-2010 is used by the old method and the 2010-2016 period is used a new method.

This research uses social condition variable in the region and accessibility to

education and health facility. In detail the definition and explanation of the variables in this study show in the table 2.

This study develops the basic model of (Sab and Smith, 2002) and (Afzal, 2012) that apply absolute and conditional convergence models for human capital. This model developed in the context of data panels for regions in Indonesia. The first model as the analytical tool of this research is the absolute convergence model in which the absolute convergence model assumption that the initial condition for the area is the same. The equations that analyze the absolute convergence model are as follows:

$$\frac{1}{\tau} \ln\left(\frac{HDI_{i,t}}{HDI_{i,t-\tau}}\right) = \alpha_t + \beta_1 HDI_{i,t-\tau} + \mu_i + \varepsilon_{it}$$

The next model shows a conditional convergence model that has different assumptions with absolute convergence, where the determinants of human capital growth conditions in the model include in different regions. It showed the existence of different initial conditions between regions. The model interprets as a conditional convergence model as intended in the model below:

$$\begin{aligned} \frac{1}{\tau} \ln\left(\frac{HDI_{i,t}}{HDI_{i,t-\tau}}\right) = & \alpha_t + \beta_1 \ln HDI_{i,t-\tau} \\ & + \beta_2 Growth_{i,t} + \beta_3 \ln Pov_{it} \\ & + \beta_4 Gini_{i,t} + \beta_5 Ilit_{i,t} \\ & + \beta_6 Imnz_{it} + \beta_7 Water_{it} \\ & + \beta_8 Electr_{it} + \beta_9 Sant_{it} \\ & + \beta_{10} \ln Puskes_{it} + \beta_{11} \ln RS_{it} \\ & + \beta_{12} \ln Univ_{it} + \mu_i + \varepsilon_{it} \end{aligned}$$

Table 2. Operational Definition of Variabel

| Variables | Symbol | Units | Explanation |
|----------------------------------|--|---------|---|
| HDI Growth | $\ln\left(\frac{HDI_{i,t}}{HDI_{i,t-\tau}}\right)$ | Index | Growth value of HDI between period $t - 1$ and t |
| Initial Condition of HDI | $HDI_{i,t-\tau}$ | Index | Initial value of HDI at $t - 1$ |
| Economic Growth | $Growth_{it}$ | Rupiah | Value of Regional Domestic Product with constant value 2010 |
| Poverty | Pov_{it} | People | Number of people in poverty condition |
| Inequality | $Gini_{it}$ | Index | Gini Ratio |
| Illiteracy | $Illit_{it}$ | Percent | Percentage Illiterate Population by Age Group 15 Years and Over |
| Immunization Coverage | $Imnz_{it}$ | Percent | Percentage of under fives Completely Immunized |
| Access to Clean Water | $Water_{it}$ | Percent | Percentnnage of Households by Drinking Water Sources |
| Access to Electricity | $Electr_{it}$ | Percent | Percentage of Households by PLN Power Source |
| The Condition of Sanitation | $Sant_{it}$ | Percent | Percentage of Households by Sanitation Feasibility Criteria |
| Numbers of Local Health Facility | $Puskes_{it}$ | Unit | Number of health facilities (PUSKESMAS) in Province |
| Numbers of Hospital | RS_{it} | Unit | Number of health facilities (Hospital) in Province |
| Numbers of University | $Univ_{it}$ | Unit | Number of educational facilities (Universities) in Province |

Based on the above model indication of the human capital convergence on the absolute and conditional model is the negative value on the coefficient β_1 is the initial condition value. The negative value for the initial condition of the model gives an explanation that there is a dispersion or a decline in the value of initial human capital condition on the growth of human capital for the next period. The alleged value for other coefficients is that β_3 , β_4 , and β_5 are suspected to have negative values, while for β_2, β_6 to β_{10} is expected to have a positive value.

A further implication in the convergence model is the estimation of the speed of convergence and half lifetime. Based on the results of beta convergence analysis can be known as the speed of convergence, which is

the low growth of the province in the growth of human capital that will equal the province that has a high condition in the growth of human capital. The speed of convergence can be calculated by the following formula:

$$\lambda = -\frac{\ln(1 + \beta)}{\tau}$$

The value λ is the speed of convergence, β is the value of regression coefficient and τ is the period of observation. Associated with the speed of convergence, there will be a concept in assessing the convergence of half-lifetime, which is the time required to eliminate half of the initial gap. To calculate half lifetime used the following formula:

$$t_{half-life} = \frac{\ln(2)}{\lambda}$$

The process of data analysis in this study using econometrics method is panel data model analysis which is a combination of cross-section data and time series. Using a data panel means doing an analysis on an observation on some units with a certain time range. According to (Baltagi, 2005) using panel data provides several advantages: controlling individual heterogeneity, providing more informative data, more variability, decreasing collinearity between variables, degrees of freedom and better efficiency. According to (Widarjono, 2013), when using the panel data it will produce a combination of estimations such as intercepts and slopes of different coefficients. The three main approaches in the panel data model used in this study are Common Effects, Fixed Effects, and Random Effects.

Based on three main approaches in panel data model that is Common Effect, Fixed Effect, and Random Effects, then further according to (Widarjono, 2013), about panel data model explained as follows. The first approach in panel data is common effect that the simplest technique to estimate panel data because it only combines time series and cross-section data. Next approach used in this estimation is fixed effect because the characteristics in each cross-section of the common effect model cannot be captured in the model because it assumes the same intercept and slope across the entire cross-section. The last approach use in this research is random effect to estimate panel data where the intercept difference is accommodated by the error terms of each cross-section.

The model specification test on the data panel is required to obtain the best model that can represent the condition of the data. In model panel data test model specification

done through 3 test that is F- Test, LM Test, and Hausman Test. F-Test Statistic is used to test the difference between two regression that is a regression with fixed effect and regression with common effect. The null hypothesis for this test is that intercepts are the same. The LM test is used to decide whether the Random Effect model is better than the Common Effect (OLS) method used. The null hypothesis is common effect. The selection of the last model is to choose between the best random effect or fixed effect as a tool for estimating. The null hypothesis for the Hausman test is based on the idea that both methods are OLS and GLS consistent but OLS is inefficient.

RESULTS AND DISCUSSION

The preliminary analysis of this research explains the characteristics and conditions of the data so that data analysis obtains valid data conditions and gives the best conclusions. Table 2 shows the overall condition of the data considering the conditions of the mean, standard deviation, minimum, and maximum value.

The first analysis as a simple model of convergence is sigma convergence that analyze to prove the convergence based on Coefficient of Variation (CV) values for human development Index over the time span. This convergence value is called the sigma convergence analysis in which the convergence occurs by decreasing the dispersion the value of human capital over time. The results are shown in Figure 3 that divide for two periods of time between 2004-2010 and 2010-2016.

The first period (2004-2010) showed that the disperse condition occurred, it can be observed that there was a gradual decline in value from 2004 to 2010. The decline in value

Table 2. Descriptive Statistic

| Variable | 2005-2010 | | | | 2010-2016 | | | |
|-----------------------|-----------|----------|--------|--------|-----------|----------|--------|---------|
| | Mean | Std. Dev | Min | Max | Mean | Std. Dev | Min | Max |
| HDI Growth | 0.0083 | 0.0045 | 0.0012 | 0.0310 | 0.0089 | 0.0027 | 0.0029 | 0.0173 |
| Initial HDI | 4.2478 | 0.0470 | 4.1042 | 4.3484 | 4.2040 | 0.0654 | 3.9972 | 4.3693 |
| Economic Growth | 11.321 | 1.2715 | 8.8653 | 14.136 | 11.7276 | 1.1681 | 9.6805 | 14.2473 |
| Poverty | 6.2919 | 1.0788 | 4.2166 | 8.9461 | 6.1209 | 1.0596 | 4.2404 | 8.5860 |
| Inequality | 0.3299 | 0.0363 | 0.260 | 0.430 | 0.7446 | 0.0740 | 0.558 | 0.8850 |
| Illiteracy | 7.4076 | 5.9528 | 0 | 31.73 | 5.4483 | 5.8433 | 0.2100 | 35.920 |
| Immunization Coverage | 49.050 | 14.493 | 0 | 78.15 | 73.390 | 15.9240 | 0 | 105.300 |
| Access to Clean Water | 45.0044 | 10.144 | 0 | 65.61 | 64.470 | 12.0452 | 31.618 | 93.397 |
| Access to Electricity | 74.7210 | 19.570 | 0 | 99.59 | 91.956 | 10.9616 | 39.40 | 100.00 |
| Access to Sanitation | 41.3224 | 16.247 | 0 | 84.57 | 58.273 | 15.223 | 16.120 | 91.1270 |
| Number of Puskesmas | 3.2947 | 0.9727 | 0 | 5.3423 | 5.4242 | 0.6799 | 4.0604 | 6.9565 |
| Numbers of Hospital | 5.2326 | 0.7487 | 3.7135 | 6.9354 | 3.7697 | 0.8975 | 1.9459 | 5.9322 |
| Numbers of University | 3.8582 | 1.0728 | 0 | 6.0591 | 4.0893 | 0.9878 | 2.0794 | 5.9915 |

was seen to show that the existence of sigma convergence for 2004-2010 period occurred.

The tendency to decrease the value of the CV for the 2004 period was 0.050 and decreased continuously for seven years to 0.041. This shows that the disperse value between the period 2004-2010 shows a decrease of 0.009.

The result of sigma convergence for the second period of 2010-2016 shows that condition of sigma convergence occurs. This is indicated by the decreasing CV value which has decreased from 2010 to 2016. In this period, it was shown in 2010 that the value was 0.067 and experienced a slow decline so that in 2016 the value was 0.061. The difference in value that occurs in this

period is 0.006. The dispersion of CV values for this period is smaller than the previous period.

This is a sign that the dispersion of human capital development value in Indonesia as a whole has decreased. Empirically it is shown that the existence of sigma convergence for the two periods of 2004-2010 and 2010-2016 is proven to occur. This condition reflects that globally dispersion for the development of human capital in Indonesia is greater and dominant in the first period (2004-2010). This condition inline with (Syukriyah, 2016) that give same prove about sigma convergence in Indonesia for period 2004-2013.

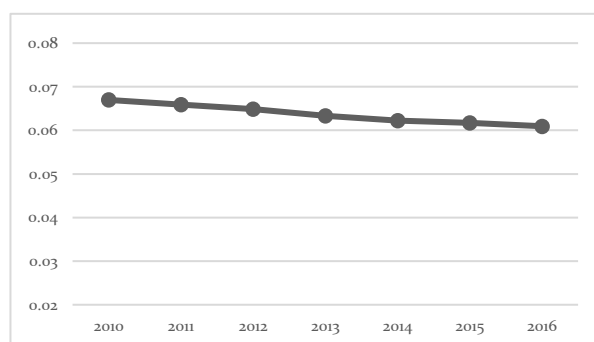
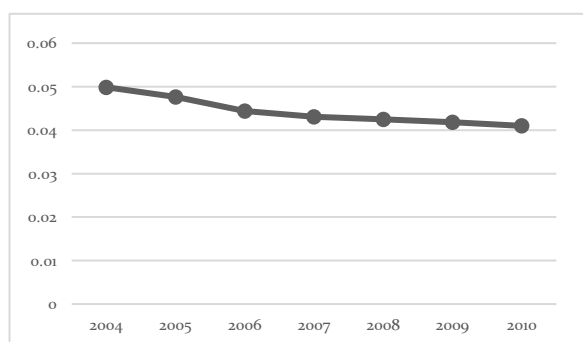


Figure 3. Sigma Convergence of Human Capital Between 2004-2010 & 2010-2016

The initial analysis of the occurrence of sigma convergence conditions provides preliminary evidence for further analysis that the condition of human capital values between provinces in Indonesia can occur absolute convergence and conditional convergence. The further analysis of convergence model to give more evidence about catch up hypothesis in the context of human capital was estimated by absolute and conditional convergence. These two analyzes were conducted to explain the different conditions in the assumptions of economic models on convergence models. The assumption of this condition is expressed in the presence of the same and different initial conditions.

The first regression model is the absolute convergence model based on strict assumptions. Absolute convergence model is performed to analyze the convergence by assuming that the initial conditions for each region are considered under the same conditions. The first step to before interpreting the model is tested models to get the best model. This step is done by using the LM-test to

choose between common effect and random effect models, the F-test to choose common effects and fixed effects, and the Hausman test to choose random effects and fixed effects. Regression results for the absolute convergence model are divided into two periods.

The results of the analysis in first Period are shown in table 4. From these results testing of the first model with LM-Test obtained value 1.730 with p-value 0.0941 that means it reject the null hypothesis at the level of 10 percent so that it chose the random effect model, the next step of the test was F-test that shows the value of F-test is 3.54 with a p-value of 0.000 which means it fails to reject the null hypothesis so choose the fixed effect model. The last test of specification model is Hausman Test that give value 58.62 with a p-value of 0.000 which means it reject the null hypothesis at the level of 1 percent so it can be concluded that the best model for first period (2004-2010) is a panel model with a fixed effect.

Table 4. Absolute Convergence of Human Capital

| Variables | Dependent Variables ($\ln\text{HDI}_{i,t}/\ln\text{HDI}_{i,t-\tau}$) | | | | | |
|----------------------|--|-------------------------|------------------------|--------------------------|--------------------------|--------------------------|
| | 2004-2010 | | | 2010-2016 | | |
| | Common Effect | Random Effect | Fixed Effect | Common Effect | Random Effect | Fixed Effect |
| Initial HDI | -0.0459*** (0.00602) | -0.0540*** (0.00725) | -0.1599*** (0.0156) | -0.01613*** (0.00270) | -0.01660*** (0.00315) | -0.03281*** (0.01078) |
| Constant | 0.2031*** (0.0256) | 0.2376*** (0.0308) | 0.6875*** (0.0664) | 0.07669*** (0.01135) | 0.07872*** (0.01325) | 0.14682*** (0.04534) |
| Speed of Convergence | 0.0449 | 0.0526 | 0.1483 | 0.0160 | 0.0165 | 0.0323 |
| Half Life | 15.445 | 13.180 | 4.673 | 43.318 | 42.102 | 21.471 |
| LM Test | 1.730 | | | 2.110 | | |
| Prob> chibar2 | 0.0941 | | | 0.0733 | | |
| Hausman Test | 58.62 | | | 2.470 | | |
| Prob>chiz | 0.0000 | | | 0.1162 | | |
| F- Tests | 3.54 | | | 1.550 | | |
| Prob-F | 0.000 | | | 0.0411 | | |
| Observation | 198 | 198 | 198 | 198 | 198 | 198 |
| R-squared | 0.228 | 0.228 | 0.390 | 0.1541 | 0.1541 | 0.1541 |
| Numbers Prov. | 33 | 33 | 33 | 33 | 33 | 33 |

The numbers in parentheses are standard error, sign *** p<0.01, ** p<0.05, * p<0.1.

The best model based on specification model test for period 1 (2004-2010) on table 4 shows that fixed effect model is the best model so that it becomes a reference in analyzing the regression result of human capital absolute convergence. The analysis of this absolute convergence model shows that the conditions between regions are considered to have the same initial condition, so other aspects are not considered in the model. The result of absolute convergence indicates that the convergence of human capital among provinces in Indonesia is proven to occur, there were indicated by negative values of initial variables coefficient of HDI is -0.1599 with p-value 0.000 and statistically significant at 1 percent of level significance. The result shows the proves that human capital gap between provinces in Indonesia is getting smaller and there is an absolute convergence. The value of convergence speed for this absolute model is 14.83 percent with half-life convergence is 4.67 years. This condition proves that in Indonesia regional human capita have high convergence speed for the absolute convergence model. Based on the estimation results it can be predicted that Indonesia human capital will reach half of the gaps that occur can now be catch up in the past 8.56 years.

The Results for the second period (2010-2016) are shown in Table 4. The process of testing the model was carried out to initiate the analysis of the second period of absolute convergence model. The result value of LM-test showed that the value is 2.110 with a p-value of 0.0733 which means that it rejects the null hypothesis at the 10 percent significance level so that the common effect model was chosen. The next test result is testing with an F-test that shows a value of 1,550 with a p-value of 0.0411 which means that rejecting the null hypothesis at a significance

level of 1 percent. The last test of specification model is Hausman Test that give value 2.470 with a p-value of 0.1162 which means it failed to reject the null hypothesis at the level of 10 percent so that it can be concluded that the best model in the absolute convergence model for the second period (2010-2016) is a model with random effects.

Analysis of the second absolute convergence model (2010-2016) was carried out based on the random effect model. In the random effect column, the estimation results show that the initial value of HDI is -0.01660 with a p-value 0.000 indicating a significant value at the level of 1 percent. Based on the estimation value, it can be shown that empirically there is absolute human capital convergence for the second period (2010-2016). The convergence velocity value for this period is shown at 1.65 percent which indicates a relatively slow condition so that the tendency of other regions that have relatively small low values to pursue high areas can be proven to occur. Further analysis for this convergence model is the existence of half life of 42,102 which means that in order to be able to pursue the condition of human capital in Indonesia so as to overcome half the gap in human capital between regions within 42,102 years.

The existence of absolute convergence of human capital in Indonesia is evident for the period between 2004-2010 and 2010-2016. This confirms previous research conducted by (Syukriyah, 2016) as a same result for first period. The next period (2010-2016) result give different condition because the rate of convergence have low rate value than in first periode (2004-2010). Comparative analysis on the first and second period models shows that the coefficient value for the first period is much greater than the value of the second

period. This condition shows that the first period has a better speed of convergence and the achievement of half life convergence than the second period. This situation can be observed from the different focus of development carried out during the second

period. In the first period the focus on the development of human capital was carried out intensively. The second period illustrates that the focus on physical development is more dominant than the development of the non-physical sector.

Table 5. Conditional Convergence of Human Capital

| Variables | Dependent Variables ($\ln\text{HDI}_{i,t}/\ln\text{HDI}_{i,t-\tau}$) | | | | | |
|-----------------------|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 2004-2010 | | | 2010-2016 | | |
| | Common Effect | Random Effect | Fixed Effect | Common Effect | Random Effect | Fixed Effect |
| Initial HDI | -0.03721*** (0.01046) | -0.05198*** (0.01279) | -0.52741*** (0.03832) | -0.01959*** (0.00690) | -0.01979*** (0.00706) | -0.21867*** (0.04396) |
| Economic Growth | 0.00114** (0.00057) | 0.00123* (0.00069) | 0.03107*** (0.00645) | 0.00014 (0.00035) | 0.00014 (0.00035) | 0.01656*** (0.00590) |
| Poverty | 0.00121** (0.00061) | 0.00122* (0.00073) | -0.01132*** (0.00304) | -0.00018 (0.00049) | -0.00017 (0.00050) | -0.00628* (0.00374) |
| Inequality | 0.00015 (0.00921) | -0.00090 (0.01009) | 0.00292 (0.00909) | 0.00106 (0.00280) | 0.00112 (0.00285) | -0.00223 (0.00591) |
| Illiteracy | 0.00003 (.00007) | -0.00002 (0.00008) | -0.00074*** (0.00024) | 0.00008 (0.00005) | 0.00008 (0.00005) | -0.00033 (0.00033) |
| Immunization Coverage | -0.00000 (0.00003) | -0.00002 (0.00003) | -0.00001 (0.00005) | 0.00003* (0.00001) | 0.00002* (0.00001) | 0.00003 (0.00002) |
| Access to Clean Water | 0.00003 (0.00004) | 0.00002 (0.00004) | 0.00009* (0.00005) | -0.00006** (0.00003) | -0.00006** (0.00003) | 6.10e-06 (0.00007) |
| Access to Electricity | -0.00003 (0.00003) | -0.00004 (0.00003) | 0.00005 (0.00005) | 0.00006 (0.00003) | 0.00006 (0.00004) | -1.06e-06 (0.00010) |
| Access to Sanitation | -0.00002 (0.00004) | 0.00001 (0.00004) | 0.00015*** (0.00005) | 0.00003 (0.00003) | 0.00003 (0.00003) | 0.00008** (0.00004) |
| Numbers of Puskesmas | -0.00011 (0.00099) | -0.00014 (0.00110) | -0.00289** (0.00144) | 0.00018 (0.00085) | 0.00018 (0.00087) | -0.00401 (0.00659) |
| Numbers of Hospital | -0.00304*** (0.00114) | -0.00332*** (0.00126) | 0.00138 (0.00167) | 0.00069 (0.00089) | 0.00069 (0.00090) | 0.00355 (0.00252) |
| Numbers of University | 0.00022*** (0.00074) | 0.00050 (0.00080) | 0.00573*** (0.00102) | -0.00053 (0.00041) | -0.00054 (0.00041) | -0.00129 (0.00083) |
| Constant | 0.16283*** (0.04490) | 0.22594*** (0.05449) | 1.9391*** (0.12825) | 0.08341*** (0.02850) | 0.08422*** (0.02916) | 0.78205*** (0.16063) |
| Speed of Convergence | 0.0365 | 0.0507 | 0.4236 | 0.0194 | 0.0196 | 0.1978 |
| Half Life | 18.972 | 13.679 | 1.636 | 35.728 | 35.371 | 3.505 |
| LM Test | 0.780 | | | 0.600 | | |
| Prob> chibar2 | 0.1885 | | | 0.2184 | | |
| Hausman Test | 290.04 | | | 35.450 | | |
| Prob>chiz | 0.0000 | | | 0.0002 | | |
| F- Tests | 8.810 | | | 2.030 | | |
| Prob-F | 0.0000 | | | 0.0024 | | |
| Observation | 192 | 192 | 198 | 198 | 198 | 198 |
| R-squared | 0.298 | 0.287 | 0.2385 | 0.2384 | 0.2385 | 0.2208 |
| Numbers Prov. | 33 | 33 | 33 | 33 | 33 | 33 |

The numbers in parentheses are standard error, sign *** p<0.01, ** p<0.05, * p<0.1.

The next analysis of the regression model on convergence is the conditional convergence model that tries to make the conditions more realistic by assuming differences in the initial conditions of each region. This is done because in fact each region has different characteristics and conditions that need controlling to produce better convergence model results. The estimation results on the conditional convergence model are shown in table 5. The first analysis of the conditional convergence conducted to analyze the existence of human capital convergence and the determinant of the convergence process into two periode between 2004-2010 and 2010-2016.

Preliminary analysis was conducted to decide the best model that can be used as a reference in the analysis of regression results. The first periode shows that the value LM-test 0.780 with p-value of 0.1885 which means that failed to reject null hipotesis at significance level of 10 percent, so that it chooses common effect model. The next specification model is F-test that show value 8.810 with p-value 0.0000 which means that rejecting null hypothesis, the Hausman test show that have value 290.04 with p-value 0.000, so this confirms the previous tests which concluded that the best model chosen was a panel model with fixed effects.

The specification model test for second period is based on table 5. The result of estimation shows that the value of LM-test 0.600 with p-value of 0.2184 which means that failed to reject null hypothesis, so that it chooses common effect model. The F-test have a value 2.030 with p-value of 0.0024 which means that rejecting null hypothesis so so choose the fixed effect model. The last specification test is Hausman test with a value of 35.450 and p-value 0.0002 which

means it reject the null hypothesis at the level of 1 percent so it can be concluded that the best model for second period is a panel model with a fixed effect.

The specification test of the model concludes that panel with fixed effect is the best model for two period to analize convergence of human capital. Based on the fixed effect model, the estimation results provide an explanation of the conditional convergence of human capital. In the first period (2004-2010) the existence of human capital convergence was proven to occur with a negative value on the Initial HDI coefficient of -0.52741 and statistically significant at the 1 percent level, this indicates that the convergence of human capital in Indonesia for the period 2004-2010 proved to occur.

The results of this estimate also show that the value of convergence speed for this conditional model is 42.36 percent. This result was giving a high value of convergence speed which means that in the conditional convergence model the convergence speed is greater than in the absolute model estimate. Convergence velocity values for the conditional model are twice as large as the absolute convergence model. The implication of this great value of convergence speed is that human capital gap between provinces in Indonesia can be overcome more quickly. Convergent half-life values write down the number of 1.636 years, which means the achievement of half of the human capital gap between regions can be achieved in the period of 1.636 years. The speed and achievement of this gap decrease can occur if the main factors determining this convergence condition can be improved especially by policymakers such as the government. The results of this study analysis are in line

with cross-country research conducted by (Sab and Smith, 2002) and (Afzal, 2012) in Bangladesh in the case of conditional convergence.

Conditional convergence analysis for the second period (2010-2016) is shown in table 5 where the best model as the reference in the interpretation of results is the panel model with fixed effects. In the fixed effect column, the negative value for initial HDI is -0.21867 and is significant at the level of 1 percent. This condition shows the same conditions as the previous period where the existence of conditional convergence of human capital is proven to occur. This result has implications for the value of convergence speed and the achievement of half the gap from the steady state condition. The convergence speed value for the second period was 19.78 percent with half life convergence of 3.505 years. This value is relatively large but not as large as the value for the first period, so that for the second period the achievement of half the difference between developed regions and regions with low conditions at the beginning can be achieved within a period of 3.505 years.

Further can be analyzed that the study of human capital convergence that occurs for between countries in the initial period awal (Sab and Smith, 2002), as well as several studies in developing countries such as (Afzal, 2012) in Pakistan, (Liaskos and Papadas, 2009) in Greece, and (Syukriyah, 2016) in Indonesia shows that regional convergence of human capital is evident. Different things are shown in studies in developed countries (Christopher R. Berry and Glaeser, 2005) in the USA and (Kim, 2016) in South Korea which provides empirical evidence of the condition of inter-city divergence. di USA dan (Kim, 2016)

The comparison between the results of absolute and conditional convergence shows that controlling the social and economic aspects to estimate the convergence model gives a greater coefficient value than when the initial condition assumption of each region is the same. This shows that the determinant development of human capital has good conditions so that it demands an increasingly good convergence position seen from the speed of convergence and half life convergence. In the first period for absolute convergence, the convergence velocity value was 14.83 percent with half life of 4.673 years, while during conditional convergence the velocity value was 42.36 percent and half life of 1.636 years. In the second period, it was also shown that the value was relatively small, namely absolute convergence with a convergence speed of 3.23 percent and half life of 21.471 years, while the conditional convergence velocity was 19.78 percent and half life of 3.505 years.

The idea of conditional convergence in addition to analyzing the occurrence of convergence is to analyze the dominant factors that influence the existence of convergence. in this study some basic factors included in the model are factors that have contributed to the formation of human capital on various sides. The contribution of economic growth can be analyzed as an economic contribution. On the other hand, the socio-economic conditions, the fulfillment of basic facilities and the conditions of government policies related to the formation of human capital can be analyzed.

The determinants of human capital convergence in Indonesia are determined by several factors such as socioeconomic conditions and access to the infrastructure of a region. In the first period the determinants

of human capital convergence in Indonesia are determined by economic growth, poverty, illiteracy, access to clean water, access to sanitation, number of puskesmas, and numbers of university. But, in the second period the determinant of human capital convergence influence by economic growth, poverty, and access to sanitation.

Further analysis of conditional convergence shows that for the first and second periods there is a positive and significant effect on economic growth. In the first period results the role of regional economic growth has a positive value of 0.00123 and significant at the level of 1 percent. In the second period results the role of regional economic growth has a positive value of 0.01656 and significant at the level of 1 percent. This result shows that the economic development sector is one of the important sectors which has implications for the development of human capital. Theoretically there is a reverse causality between human capital and economic growth (Bils and Klenow, 2000). Under these conditions better economic development will have implications for the development of better human capital.

Empirical evidence shows that in line with income convergence and economic growth (Firdaus and Yusop, 2009), (Kharisma and Saleh, 2013), and (Vidyattama, 2013), one of the driving factors is human capital, the more regions experience income convergence then it will also be useful for other factors such as human capital. Based on the results of the estimation of this study, the correlation is empirically proven, but the speed and half life values of human capital convergence tend to be greater than income convergence between regions.

The next analysis shows that poverty is also a factor that has implications for the convergence of human capital development. In the first period results the estimated value shows that there is a negative relationship of -0.01132 and is significant at the level of 1 percent. In the second period results the estimated value shows that there is a negative relationship of -0.00628 and is significant at the level of 10 percent. The results for both periods statistically and the estimated values of the two periods have different values but the result indicate that the contribution of poverty reduction is an important factor in the formation of human capital because of the tendency of the development of human capital which in poor areas tends to be smaller and hampered. Social aspects such as poverty affect the growth of human capital is also in line with the research by (Mirza, 2011) in Central Java.

The illiteracy rate as one factor that determine human capital convergence in first period but insignificant at the second period. In the first period the value of illiteracy is -0.00074 and significance at the level of 1 percent. The negative value of illiteracy indicates that the reduction of the people who cannot read can increase the capacity to develop human capital in the region. The policy makers must be giving the access and opportunity making the community more educated with the provision of facilities and easy access.

The social conditions of accessibility that have influence on human capital growth are the access of households to clean water, the condition of household sanitation. In the first period is shown the positive value of access of households to clean water with a coefficient value of 0.00009 and significant at level of 10 percent. The condition of house-

hold sanitation also has a value of 0.00001 and significant at level of 1 percent. In the second period, only significant values were obtained for access to sanitation with a value of 0.00008 and significant at level 5 percent.

One of the direct interventions that can be done by the government is to provide facilities and accessibility to the community. The result of the estimation shows that improving health and education facility will have positive impact for human capital development. The result of the first period provide evidence that number of health facility (PUSKESMAS) has a negative coefficient value of -0.00289 and significant at level 5 percent. This result for this health facility is not in line with the hypothesis that is made, that should be the value of health facility (PUSKESMAS) has a positive value. The other facilities that have a positive and significant value is numbers of university with a coefficient value 0.00573 and significant at level 1 percent. This result has significant impact that improved number and access of the health and education facilities will improve human capital development. In the second period the estimation results show that health and education facilities do not provide empirical evidence. This result inline with (Bhakti, Istiqomah and Suprpto, 2011) study that analyzes the role of government through the effects of health expenditures and education on human capital as the direct state of government's role in providing access to facilities for the people.

CONCLUSION

Based on the estimation results for the whole model, it can be concluded that the conditions of sigma, absolute beta, and conditional beta convergence are empirically

occurring in Indonesia. This condition shows that the inequality of human capital between regions is one of the problems that actually occurs in Indonesia.

The results of the sigma convergence show that globally the dispersion of human capital development in Indonesia actually occurs, where the period of 2004-2010 shows a better dispersion decline compared to 2010-2016. This indicates that there is a decline in the acceleration of human capital development for this period of time which shows the focus of government performance in the development of human capital in general has decreased. This condition does not mean that the government denies the development of human capital but what happens is a shift in the focus of development from the non-physical sector to the physical sector.

The empirical results for the absolute convergence model show conditions that are in line with sigma convergence where the convergence actually occurs in Indonesia. Absolute convergence results indicate that for the period 2004-2010 Indonesia has the ability to accelerate human model development faster with high convergence speeds so that in a short span of time capable areas that have low human capital conditions at the beginning will be able to have the same conditions in short time. Meanwhile for the period 2010-2016 empirically there is absolute convergence but has a lower acceleration value compared to the previous period, so this shows that the future of human capital accumulation tends to be smaller. This should be a concern for the government in increasing the capacity of human capital, especially in regions that have low conditions so as to accelerate the development of human capital and have implications for development in other sectors.

The results of analysis for conditional convergence show that for both periods empirically there has been a convergence of human capital. Convergence speed value for the conditional convergence model proves that the value of convergence speed is better than absolute convergence. This condition indicates that the difference of regional condition is an important cause in achieving the condition of the better regions. This explains the generally common form of convergence and implicates for further analysis through absolute and conditional convergence. The role of social condition and access to infrastructure become the main part that contributes to the attainment of convergence among the better regions. The right policy in providing public facilities, especially education and health can offer an improvement in the quality of human capital.

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REFERENCES

- Afzal, U. (2012) 'Human Capital Convergence: Evidence from the Punjab', *Lahore Journal of Economics*, 17(1), pp. 45-61.
- Baltagi, B. H. (2005) *Econometric Analysis of Panel Data*. 3rd edn. West Sussex: JohnWiley & Sons Ltd.
- Barro, R. J. and Sala-i-Martin, X. (1995) 'Economic Growth', *The Quarterly Journal of Economics*, (2).
- Becker, G. S. (1962) 'Investment in Human Capital: A Theoretical Analysis', *Journal of Political Economy*, 70(5, Part 2), pp. 9-49.
- Becker, G. S. (2006) 'The Age of Human Capital', in *Education, Globalization and Social Change*, pp. 292-294.
- Benhabib, J. and Spiegel, M. (1994) 'The Role of Human Capital in Economic Development', 4(3), pp. 101-110.
- Berry, C. R. and Glaeser, E. L. (2005) 'The Divergence of Human Capital Levels Accross Cities', *Regional Science*, 84(3), pp. 407-444.
- Bhakti, N. A., Istiqomah and Suprpto (2011) 'Analysis of Factors that Influence the Human Development Index in West Java', *Ekuitas : Journal of Economics and Development*, 18(4), pp. 452-469.
- Bils, M. and Klenow, P. J. (2000) 'Does schooling cause growth?', *American Economic Review*, 90(5), pp. 1160-1183.
- Castelló, A. and Doménech, R. (2002) 'Human Capital Inequality and Economic Growth: Some New Evidence', *The Economic Journal*, 112(478), pp. C187-C200.
- Farah, A. and Puspita Sari, E. (2014) 'Human Capital and Productivity', *Jejak*, 7(1), pp. 22-28.
- Firdaus, M. and Yusop, Z. (2009) 'Dynamic analysis of regional convergence in Indonesia', *International Journal of Economics and Management*, 3(1), pp. 73-86.
- Hanushek, E. A. (2013) 'Economic growth in developing countries: The role of human capital', *Economics of Education Review*. Elsevier Ltd, 37, pp. 204-212.
- Hanushek, E. A. and Kimko, D. D. (2000) 'Schooling , Labor-Force Quality , and the Growth of Nations', *The American Economic Review*, 90(5), pp. 1184-1208.
- Islam, N. (1995) 'Growth Empirics : A Panel Data Approach', *The Quarterly Journal of Economics*, *Oxford University*, 110(4), pp. 1127-1170.
- Kharisma, B. and Saleh, S. (2013) 'Convergence of Income Among Provinces in Indonesia 1984-2008: A Panel Data Approach', *Journal of Indonesian Economy and Business*, 28(2), pp. 167-187.
- Kim, W.-Y. (2016) 'Can the Difference in Ageing Across Cities Explain the Divergence of Human Capital Across Cities in Korea?', *Applied Economics Letters*, 23(13), pp. 958-964.
- Liaskos, G. and Papadas, C. (2009) *Human Capital Convergence in Greece: A Panel Data Analysis*, *Working Papers*.
- Lucas, R. E. (1988) 'On the mechanics of economic development', *Journal of Monetary Economics*, 22(1), pp. 3-42.
- Manca, F. (2012) 'Human Capital Composition and Economic Growth at the Regional Level', *Journal of European Public Policy*, 19(9), pp. 1367-1388.
- Mankiw, N. G., Romer, D. and Weil, D. N. (1992) 'A Contribution to the Empirics of Economic-Growth', *Quarterly Journal of Economics*, 107(2), pp. 407-437.
- Mincer, J. (1995) 'Economic Development , Growth of Human Capital , and the Dynamics of the Wage Structure by by', *Journal of Economic Growth*, 48(744), pp. 29-48.

- Mirza, D. S. (2011) 'Influence of Poverty, Economic Growth and Capital Expenditure on the Human Development Index in Central Java', *Jejak*, 4(2), pp. 102–113.
- Pritchett, L. (2001) 'Where Has All the Education Gone?', *The World Bank Economic Review*, 15(3), pp. 367–391.
- Ramos, R., Surinach, J. and Artís, M. (2012) 'Regional Economic Growth and Human Capital: The Role of Over-education', *Regional Studies*, 46 (November 2008), pp. 1389–1400.
- Romer, P. M. (1990) 'Human Capital And Growth: Theory and Evidence', *Carnegie-Rochester Conference Series on Public Policy*, 32, pp. 251–286.
- Sab, R. and Smith, S. C. (2002) 'Human Capital Convergence: A Joint Estimation Approach', *IMF Staff Papers*, 49(2), pp. 200–211.
- Schultz, T. W. (1961) 'Investment in Human Capital', *The American Economic Review*, 51(1), pp. 1–17.
- Shuaibu, M. and Oladayo, P. T. (2016) 'Determinants of Human Capital Development in Africa: A Panel Data Analysis', *Oeconomia Copernicana*, 7(4), pp. 523–549.
- Sodik, J. (2006) 'Regional Economic Growth: Case Study of Inter-Province Convergence Analysis in Indonesia', *Journal of Development Economics*, 11(1), pp. 21–32.
- Syukriyah, A. (2016) 'The Analysis of Absolute Convergence of Human Development Inter Provinces in Indonesia', *Economics Development Analysis Journal*, 5(4), pp. 362–367.
- Vidyattama, Y. (2013) 'Regional convergence and the role of the neighbourhood effect in decentralised Indonesia', *Bulletin of Indonesian Economic Studies*, 49(2), pp. 193–211.
- Wibisono, Y. (2005) 'Sources of Regional Economic Growth: Empirical Study Between Provinces in Indonesia, 1984-2000', *Indonesian Journal of Economics and Development*, 5(2), pp. 91–120.
- Widarjono, A. (2013) *Econometrics: Introduction and Application*, Yogyakarta: UPP STIM YKPN.
- Wolf, F. and Zohlnhöfer, R. (2009) 'Investing in human capital? The determinants of private education expenditure in 26 OECD countries', *Journal of European Social Policy*, 19(3), pp. 230–244.