

Analysis of Growth and Convergence among Islands in Indonesia (Neoclassical Model)

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Abstract. *This study aims at analyzing (1) does the growth of real income per capita generate absolute convergence among islands in Indonesia, (2) is there conditional convergence among islands in Indonesia by adding real investment, number of labor, export, and import value as control variables (3) is there a decline disparity of real income per capita among islands in Indonesia over time. The data used were secondary data of BPS and BI publication since 1995 to 2015 paneled with data from six islands (Sumatera, Java, Bali & Nusa Tenggara, Kalimantan, Sulawesi, and Maluku & Papua) involving real income per capita, real investment, number of labor, export, and import value. Barro Salai Martin convergence model was used to test the convergence hypothesis. The results of the study show that (1) the growth of real income per capita does not generate absolute convergence among islands in Indonesia because the correlation between the growth and real income per capita in the previous period is positive and significant (2) there is not conditional convergence among islands in Indonesia, but real income per capita, real investment, and the number of labor are significant in affecting the growth, while export and import variable are not significant (3) the disparity of income per capita among islands in Indonesia does not decrease over time measured through the improvement of standard deviation. Divergence among islands in Indonesia occurs due to the performance of investment and the quality of labors among islands which is very different. Besides, the ownership of natural resources and infrastructure among island is very unequal. The conclusion of this research is that the growth of real income per capita among islands in Indonesia does not lead to equity. Government's policy is required to move investments into areas that cannot invest efficiently by prioritizing the development of infrastructure in such regions, boosting the improvement of labors quality in regions with poor society, social modal, politic stability, and trade among islands in order to the inequality does not widened.*

Keywords - *growth, convergence, investment, islands*

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I. INTRODUCTION

1.1. Background

Geographically, Indonesia has six islands in which each has natural resources, superiority in producing certain commodity as well. Besides, the combination of several tribes that live on each island produces social uniqueness and culture which could be used as capital to prosper the society such as (1) Sumatera has coal, natural gas, and crude oil (49.89 percent, 31.65 percent, 66.71 percent, respectively) of the total national reserve. (2) Java is the center for industry and services which have enough facilities to drive the economic potential and a producer of fuel. (3) Bali and Nusa Tenggara are a gate for tourism and national food producer. (4) Kalimantan has forests which produce 29.9% of the national production forest and large reserve of natural gas, coal, and others. (5) Sulawesi is the largest nickel producer in Indonesia and gold reserve as well as asphalt in addition to producing agricultural products, plantation and fishery. (6) Papua and Maluku have forest which produces 30,90% of the total national, the largest gold reserve in Indonesia, BBM producer and natural gas (14.93 percent) of the national reserve (BAPENAS, 2013).

The pace of Indonesia's income growth is high enough namely around 5 percent (BPS, 2016). However, the distribution is still uneven, even inequality is getting bigger, which is usually followed by social gap causing complex problems (Nasution, 2017). It could split this country if it is not immediately solved. In 1995, East Nusa Tenggara as the poorest province in Indonesia had income per capita 1/10 of the income obtained by East Kalimantan as the richest province. Such condition is farther from improvement. In 2015, the poorest province East Nusa Tenggara got income per capita 1/15 of the income obtained by D.K.I Jakarta as the richest province. The researchers have not achieved agreement that whether or not the inequality in Indonesia increases because many researchers found that there has been a convergence towards equalization as Wibisono (2005), Kuncoro (2008) and Marianingsih (2014). On the other hand, some other researchers found that that there was not convergence in Indonesia, as Yulianita (2005), Sodik (2006) dan Heriqbaldi (2009).

The difference in the performance of production factors and international trade can affect the pace of income growth among regions which consequently could accelerate the process of convergence. Investment affects economic growth through acceleration strategy by increasing the production capacity and through multiplier strategy by increasing the demand. The accumulated capital and labor will boost the economic growth in which technology used will be reflected in the total factor productivity which is accommodated by residue based on Solow's theory. While international trade is proven empirically to have positive correlation with convergence (Viner, in Salvatore, 1997). However, Krugman (1991) states that integration could cause divergence of income per capita. It is confirmed by Quah's study (1993) who concludes that income per capita in the world tends to diverge. However, several empirical researches show that the openness of a country could accelerate the pace of convergence despite the existence of lots of debate about it (Ben-David & Louwy, 2003). Therefore, research on convergence is interesting to be investigated as it is related to Indonesia's stability and unity.

2.1. Research questions

Based on the background aforementioned, the research questions addressed in this study are as follows (1) is the growth of income per capita among islands in Indonesia followed by absolute convergence? (2) is there conditional convergence by adding control variables as real investment, number of labor, export value, and import value? (3) Does the disparity of income per capita among islands in Indonesia decrease over time (Sigma Convergence)?

II. LITERATURE REVIEW

2.1. Theoretical Framework

This research is based on Neoclassic theory (Solow-Swan) in which the growth of income is influenced by the accumulation of strategy production capital factors, labor, and technology which is considered exogenous. The analysis is by using Cobb-Douglas constant return to scale (Mankiw, 2007).

$$Y = f(K, L)$$

$$\frac{Y}{L} = f\left(\frac{K}{L}, 1\right)$$

$$y = f(k), \quad f(k) = F(k, 1)$$

where $k = \frac{K}{L}$ (capital per labor), $y = \frac{Y}{L}$ (output per labor), $Y = Lf(k)$, and $y = f(k)$.

Slope of the production function shows the additional units of output produced by a labor when gaining one additional capital unit (MPK) with a mathematical equation as follows;

$$MPK = f(k + 1) - f(k)$$

In the initial period the capital per worker (k) is still small causing the value is very worth with one additional capital unit could increase the income per labor. The next one additional unit of capital will decrease an additional output. Over a period of time, the accumulation of capital is no longer able to increase production ($MPK = 0$), the so-called steady state because the accumulation of capital is equal to depreciation in which the depreciation of capital will follow the age of the capital. Barro and Sala-i-Martin (1992) hypothesize convergence as follows: the growth rate of income per capita tends to inversely related to income per initial capita. Thus, poor countries with low income per capita tend to grow faster than rich, high-income countries (Absolute Convergence); assuming that economy among regions has similarity in economical structure, demography, the level of savings, and other economic variables. Conversely, if the region cannot converge absolutely, it is possible to converge conditionally; assuming that the structural characteristics of each region are dissimilar. Thus, convergence is affected by the structural characteristics of each region by controlling the variable as the differentiator between one region and another. If there is a convergence among regions as the time goes by, the income disparity per capita decreases (Convergence Sigma).

From the demand side, income is used for consumption and investment which could be written as follows:

$$Y = C + I, \frac{Y}{L} = \frac{C}{L} + \frac{I}{L}, y = c + i$$

Each year's saved income (s) and consumed ($1-s$),

$$s = \frac{I}{Y}, 0 < s < 1$$

$$y = (1 - s)y + i, i = sy \quad (\text{investment=saving}).$$

Capital Stock is a determination of output growth. So, a change in the capital stock is determined by investment and depreciation.

$$y = sf(k), i = sy \quad (i \text{ equals to investment per worker and } i \text{ equals to } sy).$$

So the investment per labor is a function of capital per labor ($i = sf(k)$).

To include depreciation in the model, it is assumed a fixed depreciation per year.

$\Delta k = i - \delta k$ (changes in capital = investment minus depreciation)

The greater the capital stock, the greater the amount of output, investment, and depreciation.

The increase of the income will boost investment which implies an increase in the capital stock as well, in long term up to approaching steady state (k^*) where investment = depreciation ($i = \delta$). Whatever the early economic condition, steady state will be achieved; time required depends on the economic performance.

$\Delta k = s f(k) - \delta k$, at steady state $\Delta k = 0$, so

$0 = s f(k^*) - \delta k^*$, $\frac{k^*}{f(k^*)} = \frac{s}{\delta}$, k^* = (capita/labor) steady state

Based on the classical theory, investment is equal to saving which could increase production and encourage discovery of new technologies and could improve the productivity of production factors and market developments. According to Keynes, the level of investment is determined by the marginal efficiency of capital which is influenced by investor's positive expectations about the expected return, while Harrod-Domar theory stresses the importance of investment in the process of economic development. Acceleration principle which requires investment is similar to savings ($I = S$) in order to achieve economic development, where $S = f(Y)$ and $I = f(Y)$. (Jhingan, 2003). According to Neoclassical theory, investment is equal to saving where saving functions as interest and income. Technological advances impact on increasing the opportunities to invest which consequently boost the interest rate. Thus, saving also tends to increase. Despite limited natural resources, it could be resolved by the expertise of the labor and the development of technology which is also followed by the development of demand leading to the increasing of the total productivity. Neo classical theory assumes that population growth is constant if greater investment is not needed to serve the improvement of labor. The development of technology could increase investment because of their efficiency which leads to increased income and expansion of the endeavor. On one sides, the increase of investment will encourage higher interest rates. However, on the other sides, it will be followed by increased savings through increased income (Suparmoko, 2007).

The productivity of the labor is a determinant of the real wage in which the marginal product of the labor is similar to labor productivity. Thus, the wage depends on the productivity of the labor. Unemployment is potential to increase national production, provided that the mobility is high. Hence, labors will try to get into area or economic sector that offers relatively high wages or can be substituted from one sector to another. It can also reduce income disparity and stimulate convergence among regions or among economy sectors (Mankiw, 2007). Solow's model estimates that countries with high rate of population growth tend to have low income per capita due to small ratio of labor. (Simons and Eberstadt in Todaro, 2003) dispute Neo classical theory which argues that free market and human expertise will overcome all the problems including the explosion of population and employment (Todaro, 2003). The pace of investment growth in Harrod-Domar can solve the problem of unemployment as a result of the decline of effective demand or due to low investment. However, in countries as Indonesia, unemployment occurs due to a lack of capital compared to the amount of labor (Kurihara, in Jhingan 1993).

According to Mankiw (2012), higher income growth than employment growth indicates that the income growth is a result of total productivity

Theoretically, free trade accelerates the technological advance in developing countries, research and innovation from developed countries to developing countries, boosts the improvement of economies scale, stimulates the improvement of investment in developing countries, reduces distortions leading to the improvement of efficiency, and increases more efficient specialization production. Hence, resources in developing countries could be utilized optimally to improve the economic growth, (Salvatore, 1994). Yet, Krugman (2012) states that international trade can lead to divergence.

2.2. Previous Studies

Barro & Sala-i-Martin (1992) conducted a study in United States of America for 48 states using data period 1880-1990, Uni Eropa since 1955-1990, and in Japan across provinces period 1950-1990 by using OLS method. Variable used was income per capita, migration, population density, dummy district. The results of their research show that absolute convergence for AS is 1.75%, Japan is 1.25%, Uni Eropa is 1.9%, while conditional convergence for AS is 2.1%, Japan is 2.7% and Uni Eropa is 3.0%.

Barro, Mankiw, & Sala-i-Martin (1995) who investigated 129 countries in the world found that opened countries under go a faster convergence than closed countries. Barro & Lee (1993) who investigated 119 countries by using Summer – Hoston's data (1965-1985) concluded that there is divergence with regression coefficient +1.7. Zhou & Biswas (2002) examined OECD countries, developed and developing countries by using data from 1950 to 1992 and OLS method, income per capita variable, as well as export and import value. The result of their study showed that conditional convergence exists, but income disparity is higher. Matkowski & Prochniak (2004) investigated economic convergence of countries joining EEC and Uni Eropa by using data

from 1993-2004. Based on the findings, it was concluded that convergence tends to close the gap of income among countries. Zhang (2004) who used Granger-causality in Uni Eropa, ASEAN and NAFTA concluded that there is a long-term relationship and causality between trade and convergence. Jianyang Hu (2011) concluded that conditional convergence only occurred in OECD countries and conditional convergence for steady state occurred in 157 non-oil producer countries, 28 OECD countries, and 23 markets of developing country. Convergence is faster if transparency is higher and government intervention is lower. Frankel & Romer (1999) conclude that in any increase in one point of the trade ratio to GDP will increase 1.5 percent of the income per capita. Lihagen & Rickne (2014) found that there is divergence among regions in China and club convergence conditionally.

Wibisono (2005) who studied convergence by elaborating neoclassical and endogen theory, panel data 1984-2000 and across provinces concluded that the convergence of neoclassical theory has low pace. Because of technological differences, the pace of the convergence is higher. Sodiks (2006) study showed that variable income per capita, inflation, net exports, population density, and labor determine the growth and the unavailability of convergence in Indonesia. Muslim (2015) examined cross ASEAN countries, data period 1993-2013, the income per capita variable, export and import. He concluded that there was not convergence among ASEAN countries. Anwar (2014) who investigated the convergence among cities in Java for 2003-2013 concluded that sigma convergence existed in Java and income disparity were smaller. Wahyunadi (2015) concluded that there was convergence in N.T.B with the value of Barro-Salai-Martin model β is 0.03 Thus, government policy is required to accelerate the convergence. Sugiharti (2012) used data from 2001 to 2010 in East Java concluded that absolute converge occurred ($\beta = 0.99$) and it took 72 years to cover half of the initial inequality.

Investment differences among regions indicate society's saving behavior and the amount of income differences, so it can affect convergence. Kuncoro's (2008) and Marianingsih's (2014) study concluded that investment has positive effects on convergence in Indonesia, while Sodik's (2006) and Yulianita's (2005) study found that investment does not have a significant effect on convergence among regions in Indonesia.

Labor is a production factor other than capital that usually has a 2/3 share of income, an increase in the number of labors 10 percent will double 6.7 percent of the income. Sodik (2006) found that labor significantly affects the growth of income per capita across provinces in Indonesia. The result of ILO (2013) concludes that there is a positive correlation between the share of labors to the labor force and the country's income per capita. The greater the share of labors in the labor force, the greater the country's income per capita. It means that a higher share of labors is required to stimulate the improvement of income per capita. Therefore, the disparity of income per capita among regions could be reduced by encouraging employment opportunities in areas with low income per capita through the expansion of production base in rural areas by creating a quality economic growth (Susilo, 2011). World Bank (2010) concluded that before the monetary crisis, employment elasticity of the formal sector in Indonesia reached 0.40 which means that for 5 percent of the economic growth in Indonesia will only absorb 2 million labors, while the increase of labor force in Indonesia each year reaches 2.57 million people. Thus, there will be an increase in unemployment namely 0.57 million people per year. After the monetary crisis, the quality of Indonesia's economic growth worsened, with the decline of formal sector employment elasticity to 0.25. It means that every 5 percent of the economic growth, there is only 1.25 million labor absorption. The increase of 2.5 million labor force, the unemployment will be 1.25 million every year. They usually work in the informal sector with low incomes. Thus, the income inequality will be sharper.

Studies of international trade relations with convergence have been conducted by many researchers; Barro, Mankiw, and Salai martin (1995), Quah (1996), Ben-David (1997), Frankel and Romer (1999) and Jianyang HU (2014). They found a positive correlation between trade reform and convergence. So that, the lost of trade barriers impacts on income convergence among countries. A country's income is affected by trading partner's income. Hence, there is a positive and significant correlation between trade and convergence. According to Ben-David & Bohara (1997), Ben-David & Kimhi (2003), Ben-David & Louwy (2003), there is a significant correlation between international trade and convergence of income per capita among countries involved in the trade by calculating the degree of openness, the level of R & D spillovers from abroad, and the level of productivity. Zhou & Biswas (2002) concluded that countries that are relatively open could achieve a higher growth rate than closed countries. With the same degree of openness, poor countries tend to grow faster than rich countries.

III. METHODOLOGY

Data used in this study consisted of secondary data of BPS publication, BI, and other sources in the year 1995-2015 at constant price 2000, paneled with six islands, such as (1) Sumatera, (2) Java, (3) Bali & Nusa Tenggara (BNT), (4) Kalimantan, (5) Sulawesi, (6) Maluku & Papua (Ma.Pap). Software used to analyze the data are Microsoft Excel 1997-2003 dan EViews 8.

Regression analysis Barro-Salai Martin (1992) model was used to test the first and second hypothesis (is there absolute and conditional convergence among islands in Indonesia).

Absolute convergence:

$$\text{Log} \left(\frac{Y_{it}}{Y_{it-1}} \right) = b_0 - (1 - e^{-\beta}) \text{Log}(Y_{it-1}) + \varepsilon_{it} \quad (1)$$

where:

Y_{it} = island i income per capita in year t (in thousand Rupiah)

Y_{it-1} = island i real income per capita in year $t - 1$

β = coefficient of absolute convergence

ε_{it} = island i reside year t

Conditional convergence:

$$\text{Log} \left(\frac{Y_{it}}{Y_{it-1}} \right) = b_0 - (1 - e^{-\beta}) \text{Log}(Y_{it-1}) + b_1 \text{Log} I_{it} + b_2 \text{Log} L_{it} + b_3 \text{Log} X_{it} + b_4 \text{Log} M_{it} + \varepsilon_{it}$$

(2)

where:

Y_{it} = island i real income per capita in year t (thousand Rupiah)

Y_{it-1} = island i real Income per Capita in year $t - 1$

I_{it} = island i real investment in year t (trillion Rupiah)

L_{it} = island i number of labor in year t (thousand people)

X_{it} = island i export value in year t (million USD)

M_{it} = island i import value in year t (million USD)

The third hypothesis (is there a decrease in the income disparity among islands in Indonesia over time) is tested using the following formula:

$$Sd = \sqrt{\frac{1}{n} \sum_{i=0}^n (\bar{Y} - Y_{it})^2} \quad (3)$$

where: Sd = standard deviation of income per capita

n = amount of data

\bar{Y} = the average of income per capita among island in year t

Y_{it} = island i income per capita in year t

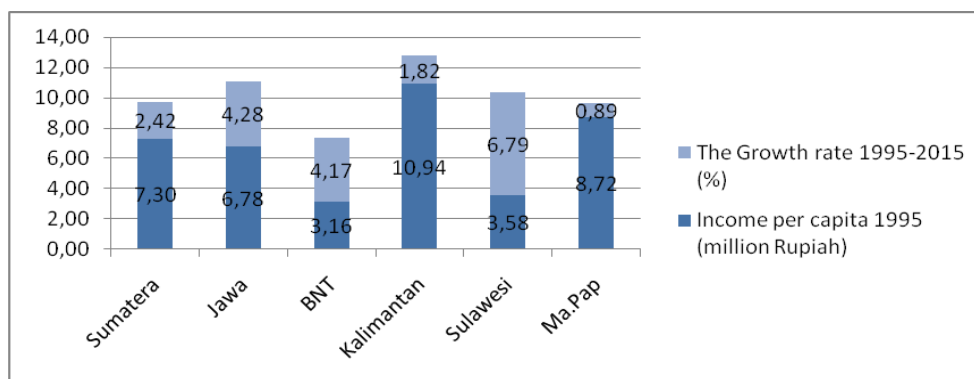
The use of panel data provides alternative model namely common effect, fixed effect, and random effect (Gujarati and Porter, 2012). The testing procedures are as follows; first, the data were processed by using the three approaches. Then, it was tested based on the criteria of the use of one of the appropriate methods. F test was used to determine the choice between common effect and fixed effect. If F value is significant, fixed effect is selected, vice versa. Hausman test was used to determine the choice between fixed Effect and random effect. If the value of Chi² is significant, fixed effects is better than random effects because random effects are possibly correlated with more independent variables.

IV. RESULT AND DISCUSSION

4.1 The Growth and Convergence among Islands

During 1995-2015, the highest growth rate of real income per capita is Sulawesi reaching 6.09 percent, although this area does not have the lowest income per capita i.e. 3.68 million dollars. This achievement is caused by a high performance of investment in which every one percent increase in investment could increase 0.78 percent of the real income. This outstanding investment performance occurs because almost all provinces in Sulawesi have mines, especially Central Sulawesi and Southeast Sulawesi. There are investments for the rapid construction of nickel mine, impacting positively on the development of other economical sectors. Mining is an economic activity which has a relatively high return of investment. In other words, a high performance investment in Sulawesi is caused by nickel mining. The growth of real income per capita in Java is in the second highest order, reaching 4.28 percent, with the fourth highest income per capita, reaching 6.78 million dollars. It is caused by the labors' high capabilities. Every one percent addition of the labors could increase 0.83 percent of the real income. This indicates that expert and skilled labors are focused on Java. The average of income per capita in Bali and Nusa Tenggara is in the third order, reaching 4.17 percent. In fact, those regions have the lowest income per capita namely 3.16 million dollars. This unexpected condition is caused by the low performance of investments. Every one percent increase of the investment can only increase 0.34 percent of the real income, while mining activity is focused on West Nusa Tenggara, tourism sectors in Bali are only focused on Denpasar and two other regions. Other areas in Bali and East Nusa Tenggara belong to poor rural areas. The low growth of income per capita in Maluku & Papua is caused by the labors' low ability. Every one percent increase in the labors can only increase 0.10 percent of the real income. This situation indicates the low quality

of labors in Maluku and Papua, not to mention the less conducive social and security conditions. Thus, investors have to be cautious in investing in those areas. Kalimantan has the highest initial income per capita namely 10.94 million dollars, but it grows 1.82 percent higher than Maluku and Papua. The income per capita in Sumatra is medium namely 2.42 percent with initial income per capita also being medium namely 7.30 million rupiah. The findings of research indicate that the pattern growth of income per capita among islands in Indonesia will not produce absolute convergence.



Source (BPS, processed)

Figure 1 Average Growth Rate of Income per Capita 1995-2015 and Income per Capita 1995

4.2 Absolute Convergence

Based on the data analysis, it was found that there is a positive correlation between the growth of income per capita and income per previous capita.

Table 1. The Regression Value of Absolute Convergence

Common Effect			Fixed Effect			Random Effect		
Variable	Cooff.	Prob.	Variable	Cooff.	Prob.	Variable	Cooff.	Prob.
C	-0.015	0.775	C	-0.390	0.0005	C	-0.077	0.224
$LogY_{t-1}$	0.006	0.646	$LogY_{t-1}$	0.104	0.0004	$LogY_{t-1}$	0.022	0.173
R-square	0.002	-	R-square	0.169	-	R-square	0.014	-

As could be seen in Table 1, the best alternative of the three panel regression, namely common effect, fixed effect, and random effect is fixed effect because the coefficient regression for income per capita ($LogY_{t-1}$) is statistically significant with probability value 0.0004 (<0.05), while common effect and random effect is not statistically significant with probability value 0.646 (>0.05) and 0.173 (>0.05), respectively. The biggest value for coefficient determination ($R^2 = 0.169$) is fixed effect, followed by common effect ($R^2 = 0.002$) and random effect ($R^2 = 0.014$). The 21-year period of the study across six islands ($21 > 6$) indicates that the best alternative is fixed effects (Nachrowi, 2006).

Based on the redundant fixed effect (Chow test), it was found that the value of cross-section F with probability is 0.0008, the value of cross-section χ^2 with probability is 0.0005. It suggests that fixed effect is better than common effect because the constant for common effect is not stable. Then, fixed effect is also better than random effect because the result of Hausman test shows that χ^2 random effect is significant with probability 0.005. Thus, based on Hausman test, the best method is fixed effect.

Hypothesis:

$$H_0: b_0 > 0$$

$$H_1: b_0 < 0$$

Since the result of coefficient regression ($b_1 = 0.104$) is positive, there is a significant correlation between income per previous year real capita and the growth of income per capita, with confidence level $\alpha=5\%$. It means that H_0 is accepted and H_1 is rejected.

Thus, it signifies that there is not absolute convergence among islands in Indonesia. However, each island's constant difference illustrates the conditions affecting the growth of income per capita of each island. If it is continued to the calculation of coefficient convergence, positive score will be obtained $\beta = 0.1094$ (positive). It means that there is not absolute convergence among islands in Indonesia.

This finding is in line with Barro & Lee (1995), Yulianita (2005), Sodik (2006), Heriqbaldi (2009), Richy & Lihagen (2014), Muslim (2015). Convergence will not occur if the condition of each region is very diverse. Some regions have a better investment performance than other regions despite the relatively high

income per capita. Others have more productive labors. The others have economical sectors dominated by industry, services, agriculture and mining.

Barro & Salai Martin (1995), Matkowski & Prochniak (2004) have different findings with this study because their study were conducted in developed countries, such as USA, Europe, Japan, and OECD countries where those countries are more homogeneous compared to Indonesia. Wibisono (2005) found that there was convergence with low pace during 1985-2000, Indoneisa is complex country.

1.1. Conditional Convergence

Conditional convergence is significant for the first difference data. The result of regression analysis is as follows.

Table 2.The Regression Value of Conditional Convergence

Common Effect			Fixed Effect			Random Effect		
Variable	Coeff.	Prob.	Variable	Coeff.	Prob.	Variable	Coeff.	Prob.
C	-0.5630	0.0000	C	-0.5614	0.0000	C	-0.5627	0.0000
$LogY_{t-1}$	0.0951	0.0000	$LogY_{t-1}$	0.0942	0.0000	$LogY_{t-1}$	0.0948	0.0000
$LogI_t$	0.0301	0.0002	$LogI_t$	0.0304	0.0002	$LogI_t$	0.0302	0.0002
$LogL_t$	0.0252	0.0006	$LogL_t$	0.0265	0.0004	$LogL_t$	0.0250	0.0005
$LogX_t$	0.0033	0.5117	$LogX_t$	0.0017	0.7486	$LogX_t$	0.0034	0.5077
$LogM_t$	0.0010	0.8606	$LogM_t$	0.0018	0.8005	$LogM_t$	0.0011	0.8593
F-Stat = 47.140		0.000	F-Stat = 24.275		0.000	F-Stat = 47.140		0.000
R-square = 0.686		-	R-square = 0.706		-	R-square = 0.686		-

Based on the calculation using first difference data, the value of coefficient determinant suggests to use Fixed Effect model ($R^2=0.71$) and the number of significant variable is constants, Y_{t-1} (real Income per capita), real investment (I_t), and number of labor (L_t). Export (X_t) and import (M_t) variable do not have statistically significant effect.

The considerations for choosing fixed effect regression panel data are that the amount of time that is greater than the number of individual ($21 > 6$), the largest coefficient determination value despite only significant with probability 0.22, based on Chow test, that fixed effect is better than common effect and Random effect generates zero for the value of all islands' residue. Hence, Hausman test is not required. It is suggested to use fixed effect to test hypothesis regarding the existence of conditional convergence among islands in Indonesia.

Hypothesis:

$$H_0: b_0 > 0$$

$$H_1: b_0 < 0$$

Base on table 2. The analysis indicates that there is a significant positive correlation between the growth of real income per capita and income per capita previous year capita among islands in Indonesia. It means that H_0 is accepted and H_1 is rejected. In other words, there is not conditional convergence of income per

capita among islands in Indonesia, despite controlling the investment difference, number of labors, export and import value of each island. It is confirmed by Yulianita (2005), Sodik (2006), Heriqbaldi (2009), Lihagen & Rickne (2014), Muslim (2015). It is different with Wahyunadi's study (2014) in West Nusa Tenggara and Sugiharti's study (2012) in East Java who found that there is conditional convergence. This difference might be possibly caused by West Nusa Tenggara economical characteristics which is almost homogeny, while in East Java use different approach namely club convergence.

Although investment, number of labors, export and import could not stimulate the existence of conditional convergence, investment and number of labors are significant in affecting the growth of income per capita among islands in Indonesia, with probability value 0.0002 and 0.004. while export and import variable are not significant with probability value 0.7486 and 0.8005, respectively. According to Barro, Mankiw, & Salai martin (1995), Quah (1996), Ban-David (1997), Ban-David & Bohara (1997), Frankel dan Romer (1999), Ban-David & Louwy (2003) Jianyang HU (2014,) there is a significant correlation between international trade and convergence among countries because import and export of the industrial sectors are only focused on Java, while export in other regions is only natural resources commodity which depends entirely on world demand with sharp fluctuations.

4.3. Sigma Convergence

Theoretically, if the convergence is absolute or conditional, it will be followed by a decline in income disparity per capita which means that standard deviation of income per capita is getting smaller over time. It signifies that the income disparity per real capita among islands in Indonesia declines.

Hypothesis:

$$H_0: Sd_1 < Sd_2 < \dots < Sd_n$$

$$H_1: Sd_1 > Sd_2 > \dots > Sd_n$$

Table 4. Standard Deviation of Real Income per Capita among Islands in Indonesia from 1995 to 2015

Year	Standard Deviation PDRB (S.d)
1995	2,988
1997	3,491
1999	3,256
2001	3,206
2003	3,156
2005	3,056
2007	3,056
2009	3,167
2011	3,330
2013	3,488
2015	3,453

Source: BPS various editions (processed)

As could be seen from Table 4, the result of standard deviation shows that H_1 is accepted and H_0 is rejected. It means that statistically there is not decreased in the income disparity among islands in Indonesia during 1995-2015. Since the value of standard deviation of PDRB per real capita among islands is bigger as the time goes by, the variance between each island's income per capita and the average income is bigger. It is consistent with the hypothesis of absolute and conditional convergence which states that if there is no absolute or conditional convergence, the decreased of income disparity is not going to happen. The other way round, there is an increase in the income disparity per capita.

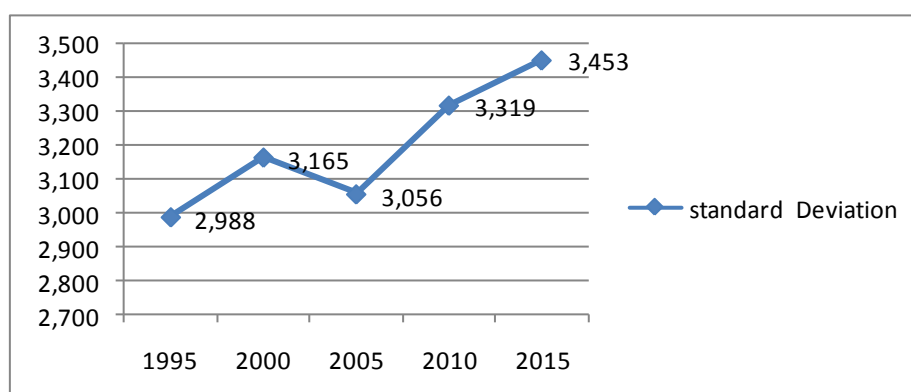


Figure 1. Standard Deviation Real Income per Capita Among islands in Indonesia from 1995 to 2015

V. CONCLUSION

The growth of income per capita among islands in Indonesia during 1995-2015 does not lead to convergence where regions with low income per capita do not develop faster than that high income per capita. The performance difference of productivity factors inhibits convergence among islands in Indonesia

There is not absolute and conditional convergence among islands in Indonesia because the correlation between the growth of income per capita and previous income per capita is positive. It means that low-income areas do not develop as fast as that high income per capita. However, unlike export and import value, real income per capita, real investment, and number of labor have a significant effect. From the analysis of standard deviation, the income per capita among islands in Indonesia increases over time which means that the disparity of income per capita among islands in Indonesia widened. It suggests that there is not Sigma Convergence among islands in Indonesia

VI. LIMITATION

This study suffers from several limitations. Firstly, data used were islands, while the income per capita of some provinces might be bigger. Secondly, factor of production investment variable in which the actual variable should be capital stock. Nevertheless, capital stock is not available for every region and it is difficult to calculate it because there is not information regarding the actual capital depreciation for each region. Besides, modal goods, especially old machines whose economic value is zero are still operated. Indonesian imported commodities are also dominated by raw materials and modal goods that are focused on Java. There is not

information regarding the exact value of export because the productivity of some regions is noted as other regions' export because it is noted based on loading port. Trade variable among island is not calculated. Furthermore, labor variable is only calculated by the amount of people working without calculating the labors' quality due to unavailability of the data.

VII. REKOMENDATION

Government, both central and local governments as policy makers, has the ability to boost the performance of investment because investments are significant in affecting the growth of economic by repairing or improving the quality of infrastructure and easing the investors, as easing license, dried taxes, solve the cause of high economy cost so that the investment is not only focused on Java. The poor regions' inability to invest more efficiently causes the lost of investment opportunities which consequently double their weaknesses in catching up their lag. Further, central and local governments have to build industrial sectors in district. Hence, employment opportunities with a relatively high wage equal in each region and ultimately convergence could be achieved. Since labor significantly affects the growth of real incomes, the government ideally should give priority to the development of human capital through increased quantity and quality in education, skills, and health in the areas where the labor productivity is low.

For further researchers, it is suggested to add control variable which approach Indonesia's actual conditions, such as human capital, social capital, and politic stability, presence of mine, society's livelihoods, and other relevant variables. The approach for further convergence research in Indonesia should be at the club, including West and East Indonesia club, as well as producing mining and non-mining areas.

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