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CONVERGENCE OF INCOME AMONG PROVINCES IN INDONESIA 1984-2008: A Panel Data Approach[1]

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ABSTRACT

This paper aims to analyze the income dispersion and test both absolute convergence and conditional convergence of income among 26 provinces in Indonesia during 1984-2008 using static and dynamic panel data approach. Using the σ convergence, it indicated that income dispersion measured by coefficient variation occurred in 1984-2008 generally experienced fluctuation. Factors influencing income dispersion rate were the impacts of the economic crisis, period of fiscal decentralization in Indonesia, Bali bombing, rising fuel prices in October 2005, and the earthquake in Yogyakarta and Central Java. Dynamic panel data estimation with system GMM produced an efficient and consistent estimator to overcome the problems of instrument validity. In addition, it is also dedicated to minimize the risk of bias due to endogeneity problem. There was a strong indication of the existence of absolute convergence and conditional convergence among 26 provinces in Indonesia during 1984-2008. Thus, there was evidence that the economy of poorer provinces tends to grow faster compared to the more prosperous provinces. The last suggests that there was a tendency to catch up. Based on the system GMM estimation, it is found that the provinces in Java have faster speed of convergence comparatively to those outside Java.

Keywords: *income dispersion, absolute convergence, conditional convergence, system GMM*

INTRODUCTION

One of the most debated issues in economic growth literature during the 1990s was whether income per capita in different countries or regions experienced convergence. The basic idea of convergence is resulted from neoclassical growth model (Solow & Swan, 1956), in which the importance of neoclassical growth model is its prediction about conditional convergence and absolute convergence.

There are two concept of convergence that appeared in the debate about economic growth across countries or regions. The first concept, convergence existed when poor economies tend to grow faster than rich ones so that the

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poor country tends to catch up to the rich one in terms of levels of per capita income or product, in which this concept is known as β convergence (Barro & Sala-i-Martin, 1991). The second concept is related to cross-sectional dispersion. In this context, convergence occurs if the dispersion-measured, for example, by the standard deviation of the logarithm of per capita income or product across a group of countries or regions—declines over time. This process is known as σ convergence (Barro & Sala-i-Martin, 1991). Convergence of the first kind (poor countries tending to grow faster than rich ones) tends to generate convergence of the second kind (reduced dispersion of per capita income or product), but this process is offset by new disturbances that tend to increase dispersion.

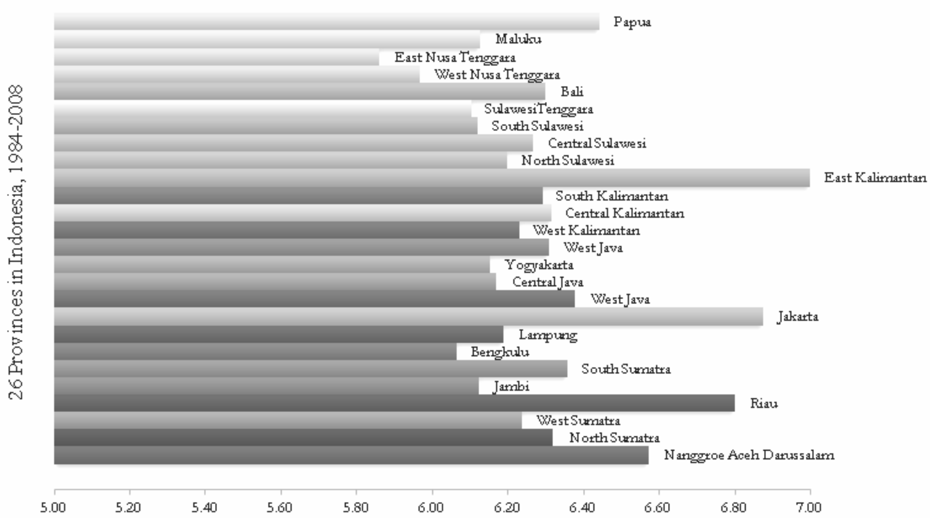
Concept of convergence is closely related to regional development policy implemented, where regional development is an integral part of national development. Development conducted in the area not only aims to increase per capita income and welfare of the local community, but also aims to catch up and align themselves with the areas that have been developed, both in terms of productivity, wages and other economic indicators. It is expected that the gap between the regions will be reduced. In this case, it is known as the "convergence between regions" (Saldanha, 1997). The condition was strengthened with the enactment of Law No. 22 and 25, 1999 which was subsequently revised into Law No. 32 and 33 of 2004 on Regional Autonomy. Those laws imply that the authority of regional development is the responsibility of local governments, while the central government only serves as a facilitator. Thus, each region should seek to optimize resources held to determine the direction and policy objective in order to improve economic development, including the catching-up of each region.

Dimensions of economic development in Indonesia are important for several reasons. First, for political reasons, in Indonesia - with such a diverse ethnic, there is no other issue is as sensitive as regional issues. Second, regional income disparities resulting from the distribution of natural resource revenues are suffered from highly uneven distribution. No wonder if the disappointment of resource-rich regions such as Aceh and Papua is unspeakable. Third, the region plays an important role in government policy related to spatial dynamics, such as population distribution. In connection with this emerging spatial dynamics, we asked fourth question, that is how should the relationship between central and local set? How much of decentralization should be given to the area so that it remains consistent with the purpose of safeguarding national unity (Wibisono, 2003).

All this time, one of the issues on regional economic development in Indonesia is the disparity or inequality of economic development for this area, which is a problem that remains unsolved and requires serious attention from the government, both central and local levels. It is considered serious because of the disparity between rich and poor regions could hinder national development in general and in particular regional development.

Figure 1 shows that the tendency of gap in average growth of real per capita income is relatively high among the provinces in Indonesia during the period 1984-2008. For example, the average growth rate of real per capita income in Jakarta during 1984-2008 had an average rating of 6.87 percent, where the value is almost 1.17 times greater than East Nusa Tenggara province reached 5.86 percent, even 1.20 times than the province of East Kalimantan which reached 6.99 percent. This indicates a tendency the gap between poor and rich provinces in Indonesia as well as disparities between provinces in Java and outside Java.

Different economic growth in a region is perhaps due to Indonesia situation, which has diversity in technology, population, geography, ethnicity, culture, and ecology of different and unique geography that is as the world's



Source: Central Bureau of Statistics, 1984-2008

Figure 1. The Average Growth Rate of Real Per Capita GRDP 26 Provinces in Indonesia, 1984 – 2008 (percent)

largest archipelagic state. This diversity resulted in each of the provinces that have the resources, both human and natural resources are different, so it is indirectly impacting on the difference in per capita GDP's different in each province. Therefore, to reduce the provincial inequality in Indonesia, it is recommended that each province should be able to plan its regional development in accordance with the conditions of their respective regions.

The study of the convergence between the province and the country has long been a matter of interest to economists and policy makers by using a variety of different analytical methods. Convergence studies were originally based on cross-sections and estimated using OLS (Barro & Sala-i-Martin, 2004). Later on, the framework of cross-sections studies was very criticized. Indeed, the initial level of technology, that should be included in a conditional convergence specification, is not observed. Since it is also correlated with another regressor (initial income), all cross-sections studies suffer from an omitted variable. Thus, Islam (1995) proposed to set up a convergence analysis in a panel data framework (within-group estimator) where it is possible to control for individual-specific time invariant characteristics of countries (like the initial level of technology) using fixed effects. However, whether the potential advantage can be realized largely depends on the panel data estimators used, and in the case of an endogeneity correction, the availability of feasible instruments. Meanwhile, Pekkala & Kangasharju (1998) utilized panel data model to check the robustness of their cross-section estimates. The paper analyses the connection between inter-regional migration and income convergence in Finland between 1975 and 1995. Their finding showed that migration had only small effects on the rates of convergence; it was relatively fast throughout the period, even though it did slow down after 1985.

Weeks & Yudong (2002) investigate the tendency towards income convergence across provinces of China during both the pre-reform period 1953-1977 and the reform period 1978-1997 utilizing the framework of the Solow growth model. The panel data method accounts for not only province-specific initial technology level but also the heterogeneity of the technological progress rate between the fast-growing coastal and backward provinces. The main empirical finding is that there is a system-wide income divergence during the reform period because the coastal provinces do not share a common technology progress rate with the backward provinces.

Based on regional economic development issues in Indonesia and debate about empirical studies that have been presented, the main purpose of this paper is to observe the income dispersion that occurred between the 26 provinces in Indonesia, to test for conditional convergence and absolute convergence of regional growth with major problems in 26 provinces in Indonesia and between provinces in Java and outside Java during the period 1984-2008.

The remainder of the paper is organized in the following way: Section 2 describes the theoretical background. Section 3 presents the previous empirical studies. Section 4 method and data. Section 5 results and discussion. Section 6 presents the conclusion and section 7 present the policy recommendation.

THEORETICAL FRAMEWORK

1. Concepts of Convergence

Two concepts of convergence appear in discussions of economic growth across countries or regions. In one view (Barro and Sala-i-Martin, 1991), convergence applies if a poor economy tends to grow faster than a rich one, so that the poor country tends to catch up to the rich one in terms of levels of per capita income or product. This property corresponds to our concept of *β convergence*. The second concept concerns cross-sectional dispersion. In this context, convergence occurs if the dispersion—measured, for example, by the standard deviation of the logarithm of per capita income or product across a group of countries or regions declines over time. We call this process *σ convergence*. Convergence of the first kind (poor countries tending to grow faster than rich ones) tends to generate convergence of the second kind (reduced dispersion of per capita income or product), but this process is offset by new disturbances that tend to increase dispersion.

To make the relation between the two concepts more precise, we consider a version of the growth equation predicted by the neoclassical growth model:

$$\log(y_{i,t} / y_{i,t-1}) = a_{it} - (1-e^{-\beta}).\log(y_{i,t-1}) + u_{it} \quad (1)$$

where the subscript t denotes the year, and the subscript i denotes the country or region. The theory implies that the intercept, a_{it}, equals x_i + (1– $e^{-\beta}$) * [log($\hat{y}_i^*$) + x_i .(t–1)], where $\hat{y}_i^*$ is the steady-state level of $\hat{y}_i$ and x_i is the rate of technological progress. It is assumed that the random variable u_{it} has 0 mean, variance σ^2_{ut}, and is distributed independently of log ($y_{i,t-1}$), u_{jt} for $j \neq i$, and lagged disturbances.

Random disturbance can be thought as reflection of unexpected changes in production conditions or preferences. This means that treating the coefficient a_{it} as the same for all economies so that $a_{it}=a_t$. This specification means that the steady-state value, $\hat{y}_i^*$, and the rate of exogenous technological progress, x_i, are the same for all economies. This assumption is more reasonable for regional data sets than for international data sets; it is plausible that different regions within a country are more similar than different countries with respect to technology and preferences.

If the intercept a_{it} is the same in all places and β>0, equation (1) implies that poor economies tend to grow faster than rich ones. The neoclassical growth models made this prediction. The *AK* model predicts, in contrast, a 0 value for β and, consequently, no convergence of this type. The same conclusion holds for various endogenous growth models that incorporate linearity in the production function. Since the coefficient on $\log(y_{i,t-1})$ in equation (1) is less than 1, the convergence is not strong enough to eliminate the serial correlation in $\log(y_{it})$. Put alternatively, in the absence of random shocks, convergence to the steady state is direct and involves no oscillations or overshooting. Therefore, for a pair of economies, the one that starts out behind is predicted to remain behind at any future date.

2. The First-differenced and System GMM estimator

In growth analysis, the GMM estimator was first applied in Caselli, *et al.* (1996). For simplicity, we consider an growth model with unobserved individual-specific effects:

$$\ln y_{i,t} = \beta \ln y_{i,t-1} + \delta \ln X_{i,t} + \eta_i + \gamma_t + v_{i,t}$$
$$\text{where } |\beta| < 1 \qquad (2)$$

where $y_{i,t}$ is the per capita income of region $i$at the date t, $X_{i,t}$ is a vector of economic growth determinants, i= 1,…., N and t=1,…., T, η_i is the individual specific effect, γ_t is a time constant and $v_{i,t}$ the standard error. The time index t refers to an interval of five years. Following hypothesis are respected: $E[\eta_i]=0$ and $E[v_{i,t}]=0$, $E[\eta_i v_{i,t}]=0$ for i=1,…, N and t=2,….,T.

We transform the entire variable as deviation from time means following Caselli, *et al.* (1996). This eliminates the need for time dummies. The first step in the estimation procedure is to eliminate the individual effects via a first-difference transformation:

$$\ln y_{i,t} - \ln y_{i,t-1} = \tilde{\beta}(\ln y_{i,t-1} - \ln y_{i,t-2}) + \tilde{\delta}(\ln X_{i,t} - \ln X_{i,t-1}) + (v_t - v_{t-1}) \qquad (3)$$

As instruments for the lagged difference of the endogenous variable or other variables which are correlated with the differenced error term, all lagged levels of the variable in question are used, starting with lag two and potentially going back to the beginning of the sample. Consistency of the GMM estimator requires a lack of second order serial correlation in the residuals of the differenced specification. The overall validity of instruments can be checked with a Sargan test of over-identifying restrictions (Arellano & Bond, 1991). We can also write equation (3) with the following form:

$$\Delta \ln y_{i,t} = \tilde{\beta} \Delta \ln y_{i,t-1} + \tilde{\delta} \Delta \ln X_{i,t} + \Delta v_{i,t}$$
$$\text{for } t=3,\dots,T \text{ and } i=1,\dots,N \qquad (4)$$

where $y_{i,t\text{-}2}$ and all previous lags are used as instruments for $\Delta\ln\ y_{i,t\text{-}1}$ assuming that $E[v_{it}v_{is}]=0$ for i=1,….,N and $s\neq t$ and that initial conditions on ln y_{i1} are predetermined as $E[\ln\ y_{i1}v_{it}]=0$ for i=1,…,N and t=2,…,T. Together, these assumptions imply the following m=0.5(T–1)(T–2) moment restrictions: $E[Z_t^i \Delta v_i] = 0$. Z_i is the (T–2) x m matrix given by:

$$Z_i = \begin{bmatrix} \ln y_{i,1} & 0 & 0 & \dots & 0 & \dots & 0 & \ln X_{i,1} \\ 0 & \ln y_{i,1} & \ln y_{i,2} & \dots & 0 & \dots & 0 & \ln X_{i,2} \\ \dots & . & \dots & \dots & . & \dots & . & . \\ 0 & 0 & 0 & \dots & \ln y_{i,1} & \dots & \ln y_{i.T-2} & \ln X_{i.T-2} \end{bmatrix}$$

where $Xi_{,T\text{-}k}$=openness$_{i,1}$,…,openness$_{i,t\text{-}k}$, education$_{i,1}$,…,education$_{i,t\text{-}k}$,health$_{i,1}$,…, health$_{it\text{-}k}$,ln(investment)$_{i,1}$,…, ln(investment)$_{i,t\text{-}k,}$ln(net migration)$_{i,1}$,…, ln(net migration)$_{i,t,k}$,1). Δv_i is vector ($\Delta v_{i,3}$, $\Delta v_{i,4}$,… $\Delta v_{i,T}$)' of (T–2) dimension. This yields a consistent estimator of $\tilde{\beta}$ as N→∞ with T fixed.

However, this first-differenced GMM estimator has been found to have poor finite sample properties, in terms of bias and imprecision, in one important case. This occurs when the lagged levels of the series are only weakly correlated with subsequent first-differenced, so that the instruments available for the first-differenced equations are weak. The GMM estimator in first-differenced has been criticized recently given that annual log of per capita GDP is likely to be persistent. Weak correlation exists between the growth rate of log per capita GDP and the lagged log of per capita GDP levels. Lagged levels of the series provide weak instruments for first-differenced in this case.

More recent studies (Bond, *et al*. (2001), Weeks & Yudong (2002)) obtain new results from dynamic panel data econometrics by using system GMM (GMM-SYS) estimators as proposed by Arellano & Bond (1991) to overcome the problem of weak instruments observed in GMM-DIFF. Arellano & Bond (1991) show that biases can be dramatically reduced by introducing lagged first-difference as instruments for equations in levels, in addition to the usual lagged levels as instruments for equations in first-differences. They propose a system GMM estimator, where a system of equations is estimated in first-differences and in levels. The (*T*-2) differences equations, given by (4) are supplemented by the following (*T*-1) levels equations:

$$\ln y_{i,t-1} = \beta \ln y_{i,t-1} + \delta \ln X_{i,t} + \eta_i + v_{i,t} \quad \text{with } t=2,\ldots,T \text{ and } i=2,\ldots N \qquad (5)$$

where lagged first differences are used as instruments for additional equations, based on two new assumptions. (1) $E|\mu_i \,\Delta\ln y_{i,2}|=0$ for $i = 1,\ldots,N$, stating that the dependent variable in first difference with t=2 isnot correlated with the individual effect; (2) $E|\mu_{it}\,\Delta\ln y_{i,t-1}|=0$ and $E|\mu_{it}\Delta\ln X_{i,t}|=0$ for i=1,….,N, t=3,4,….,T and $\mu_{it}=\mu_i+v_{i,t}$ indicating that first-difference regressors are not correlated with the error term. The condition (2) allows using first differences of the series as instruments for equations in levels (Arellano, 1991). The instrument matrix for equations in levels can then be written as:

$$Z_i^+ = \begin{bmatrix} \Delta\ln y_{i,1} & 0 & 0 & \ldots & 0 & \ldots & 0 & \Delta\ln X_{i,1} \\ 0 & \Delta\ln y_{i,1} & \Delta\ln y_{i,2} & \ldots & 0 & \ldots & 0 & \Delta\ln X_{i,2} \\ \ldots & . & \ldots & \ldots & . & \ldots & . & . \\ 0 & 0 & 0 & \ldots & \Delta\ln y_{i,1} & \ldots & \Delta\ln y_{i,T-2} & \Delta\ln X_{i,T-2} \end{bmatrix}$$

where $X_{i,T-k}$=Δopenness$_{i,1}$,…,Δopenness$_{i,t-k}$, Δeducation$_{i,1}$,…,Δeducation$_{i,t-k}$,Δhealth$_{i,1}$, …, Δhealth$_{it-k}$,Δln(investment)$_{i,1}$, …, Δln(investment)$_{i,t-k,}$Δln(netmigration)$_{i,1}$, …, Δln(net migration)$_{i,t,k}$,1). Hence, the complete instrument matrix for the GMM-SYS estimator is:

$$Z_i^s = \begin{bmatrix} Z_i & 0 \\ 0 & Z_i^+ \end{bmatrix}$$

where Z_i is given by matrix in first-differenced GMM and Z^s_i by matrix in system GMM. Instead of using robust variances from the first step for the second step of GMM-DIFF and GMM-SYS, a correction of the second step robust variance based on Windmeijer (2000) is used.

3. The Solow Growth Framework

Solow growth model continues to provide the theoretical basis for a large number of the cross-sectional studies of income convergence (Barro & Sala-i-Martin, 1991), and MRW. More recently, studies by Islam (1995), Caselli, *et al*. (1996), hereafter CEL, Lee, *et al*. (1997, LPS), have utilized both cross-section and time series observation to test income convergence and estimate the convergence rate. Using standard notation, a Cobb-Douglas production function is assumed with output (*Y*) and three inputs, capital (*K*), labour (*L*) and labour augmenting technological progress (*A*). Assuming constant returns to scale, then we can write

$$Y(t) = K(t)^{\alpha}(A(t)L(t))^{1-\alpha} \qquad (6)$$

where $0<\alpha<1$. Labor and technology grow at the following constant and exogenous rates

$$L(t) = L(0)e^{nt} \qquad (7)$$

$$A(t) = A(0)e^{gt} \qquad (8)$$

where *n* is the growth rate of the labor and *g* is the rate of technological progress. *L*(0) is the initial state of the labor and *A*(0) is the initial state of technology.

An expression of per capita output growth over the period t_2–t_1 is well known: we may write an autoregressive form of the growth model as

$$\ln y(t_2) = \zeta \ln y(t_1) + (1-\zeta)\ln A(0) + g(t_2 - \zeta t_1) + (1-\zeta)\frac{\alpha}{1-\alpha}\ln(s) - (1-\zeta)\frac{\alpha}{1-\alpha}\ln(n+g+\delta) \quad (9)$$

where $y(t)=Y(t)/L(t)$ stands for per capita output. The Solow model in equation (9) focuses upon the transitional growth dynamics of one economy to its steady state income path and represents a general dynamic framework within which to examine income convergence. Note that the intercept in (9) is additive in two constant terms: $(1–\zeta)$ $\ln A(0)$ and $g(t_2–\zeta t_1)$. However, with multiple observations per cross-sectional unit it is possible, through, respectively, the introduction of province-specific and time-specific effects, to relax the assumption of strict parametric homogeneity of both $\ln A(0)$, the initial technology state, and g, the technological progress rate. Using obvious notation, adding a disturbance term, (9) is now written in panel data form, then

$$y_{i,t} = by_{i,t-1} + \theta' x_{i,t} + T_t + \eta_i + v_{i,t} \quad (10)$$

where

$$x_{it} = (\ln(s_{it}), \ln(n_{it} + g + \delta))',$$

$$\theta = ((1-\zeta)\frac{\alpha}{1-\alpha}, -(1-\zeta)\frac{\alpha}{1-\alpha})',$$

$$\eta_i = (1-\zeta)\ln A(0),$$

$$T_t = g(t_2 - \zeta t_1),$$

$$b = 1 + \beta = \zeta$$

The effect of η_i is interpreted as a composite of unobservable province-specific factors, which include initial technology differences. Similarly, T_t captures the time-specific effects, which include the rate of technological change.

PREVIOUS EMPIRICAL STUDIES

Things became interesting about the study of convergence is still a wide-open debate, from theoretically to an empirical investigation. Barro & Sala-i Martin (1991) using the technique of cross-sectional analysis found a positive correlation between the growth rate of per capita GDP, initial per capita GDP, educational attainment, life expectancy, government spending on education, changes in the terms of trade, investment ratio and the rule of law. In addition, they also found a negative relationship between the growth rate of government consumption, market distortions, political instability, and the birth rate and population growth. By estimating the regression of 24 equations it is found that the rate of convergence varies between 1.4 percent and 2.8 percent, but the highest frequency varies between 2.5 percent and 2.7 percent. Meanwhile, Islam (1995) conducted a study in different countries, which is included in OECD countries using panel data found that human capital variables were negative and not significant in the study panel to sample different countries, while including human capital variables in the regression raises the level of convergence. Saldanha (1997) in Indonesia by using panel data, showed that the provinces in Indonesia tend to converge over the last twenty-five years. In addition, it was found that economic convergence is a phenomenon that occurred since the early years of economic development in Indonesia.

Garcia & Soelistianingsih (1998) explained that although provincial incomes increased and provincial income equality decreased in Indonesia during the 20 years period, disparities in personal and regional incomes persisted. In the paper, there is evidence that poor provinces tend to catch-up with rich provinces but the area is at a medium level of distribution in 1975. At the same position in 1993, investment in human resources (education and health) was important and effective way to increase revenue and lower the disparities in GDP per capita for provinces in Indonesia. Provinces that were poor and situated in rural areas can grow faster if it has the advantage of overall health conditions improve, fertility and mortality fall, human skills improve, and trade interventions fall.

Madariaga, *et al*. (2005) examined the regional convergence and agglomeration in Argentina over the period 1983-2002. The purpose of this work is to apply new estimation methods following two-step procedure. In the study, they combined a spatial filtering of variables to remove the spatial correlation and suitable estimators for first-differenced and system GMM estimators. Estimations on filtered variables reveal a conditional convergence process between Argentina provinces and a positive and significant impact of agglomeration variables on growth rate. The results showed that ignoring spatial distortions due to geographic proximity misled estimations and underestimated the speed of convergence specifically for provinces, which were distant from Buenos Aires. Moreover, estimations of agglomeration effects improved when spatial autocorrelation was removed.

Table 1 summarizes some studies of income convergence between provinces and within countries.

METHOD AND DATA

In this paper, research model is based on the equation (10).

$$y_{it} = \gamma_t + \alpha y_{it-1} + x'_{it}\beta + \eta_i + v_{it}$$

where y_{it} describes the log in per capita GRDP during 1984-2008 and divided into 5 years average data are used. Furthermore, $y_{it\text{-}1}$ is the log linier of initial per capita GRDP in the province *I* in year *t*. Meanwhile, x_{it} is represents a set of independent variables which includes economic, social and demographic indicators. Economic indicators are

Table 1. Empirical Research of Convergence Among Provinces and Within Country

No	Name	Country	Method	Convergence Existence
1.	Barro and Martin (1991)	USA	Cross-Sectional	Yes
2.	Islam (1995)	OECD	Panel Data	Yes
3.	Cashin and Sahay (1996)	India	Panel Data	Yes
4.	Madariaga et al (2005)	Argentina	Panel Data	Yes
5.	Persson (1997)	Sweden	Time-series	No
6.	Funkie (1999)	West Germany	Cross-Sectional	Yes
7.	Bernat (2001)	USA	Time-series	Yes/No
8.	Jian (1996)	China	Time-series	Yes/No
9.	Pekkala and Kangasharju (1998)	Finland	Cross-sectional	Yes
10.	Saldanha (1997)	Indonesia	Panel Data	Yes
11.	Yudong and Weeks (2002)	China	Panel Data	Yes
12.	Bownman (2000)	South America	Time-series	Yes
13.	Yusuf Wibisono (2005)	Indonesia	Panel Data	Yes
14.	Tansel and Gungor (1999)	Turkey	Panel Data	Yes
15.	Shankar and Shah (2004)	Asia	Index	Yes/No
16.	Gezizi and Hewings (2004)	Turkey	Panel Data	Yes
17.	Kawakami (2004)	China	Panel Data	Yes
18.	Choi (2004)	USA	Cross-sectional	Yes
19.	MukeshRalhan (2005)	Canada	Panel Data	Yes
20.	Garcia and Soelistiangsih (1998)	Indonesia	Panel Data	Yes

Source: Summary of various articles that are relevant to the plan of research conducted measured by regional investment gross fixed capital formation and the degree of openness as measured by export plus import to GRDP. While social indicators is the level of education as measured by the percentage of high school graduation and junior of the population aged over 10 years. The level of health as measured by life expectancy, while the demographic indicators as measured by net migration. All data are real and measured in 2000 prices, and computed from BPS. In this case interpret the effects η_i as a composite of unobservable province-specific factors, which include initial technology differences. Similarly, γ_t captures time specific effects which including the rate of technological change. All models using panel data consisting of 26 provinces (after decentralization, Banten province merged with West Java, Bangka Belitung joined with South Sumatera, Gorontalo province with North Sulawesi, the provinces of Maluku joined with North Maluku, and West Irian Jaya joined with Papua).

RESULTS

This section will discuss the results and discussion in the form of statistical and economic analysis of the results of the model estimation is several variables that affect the convergence of economic growth in the provinces in Indonesia by using a panel data regression model. The data used are observational data 26 provinces in Indonesia during the period 1984-2008. For data processing, the tools used were Microsoft Excel software. In addition, Stata 12.1 is used to estimate the models (Rodman, 2009).

1. Sigma Convergence Analysis (σ-Convergence)

Sigma convergence is measured by calculating the standard deviation of real per capita GRDP divided by the average real per capita GRDP among the provinces in Indonesia 1984-2008. If the income dispersion among the provinces in Indonesia fell from time to time, the sigma convergence has occurred among the 26 provinces in Indonesia. In contrary, if the income dispersion among the provinces in Indonesia has increased from time to time that the divergence occurred in Indonesia.

Based on the Figure 2, it is shown that income dispersion as measured by the coefficient of variation during the period 1984-2008 in general fluctuated. In the period from 1984 up to 1996 σ convergence has occurred. That is, the per capita income gap between provinces in Indonesia improved, from 0.0579 in 1984 fell to 0.0418 in 1996. This is consistent with research conducted by Saldanha (1997), which states that σ convergence has occurred in Indonesia from 1971 to 1994. In addition, Garcia & Soelistianingsih (1998) stated that the dispersion of GDP per capita has decreased during the period 1975 to 1993. However, in 1997 to 1998 income dispersion increased from 0.0416 in 1997 to 0.0420 in 1998. An increase in income dispersion is more driven by the impact of the economic crisis in Indonesia. This is consistent with a study by Aritenang (2008) which stated that during the economic crisis, income disparities between provinces in Indonesia increased.

Basically, during the era of the leadership of president Soeharto particularly in period 1984-1996, per capita income disparity between provinces is relatively low, but since the onset of the Asian financial crisis that led to weakening of Indonesia's economy and the impact on inter-regional income inequality has increased. In addition, public discontent was growing against the Soeharto’s government. The economic crisis triggered President Suharto resignation as president on May 21, 1998 which was later replaced by B.J. Habibie. In his tenure, Habibie succeeded in providing a foundation for Indonesia with regional autonomy law No. 22/1999 and Law No.25/1999. Regional autonomy law is expected to withstand the turmoil that has been inheriting disintegration since the New Order era.

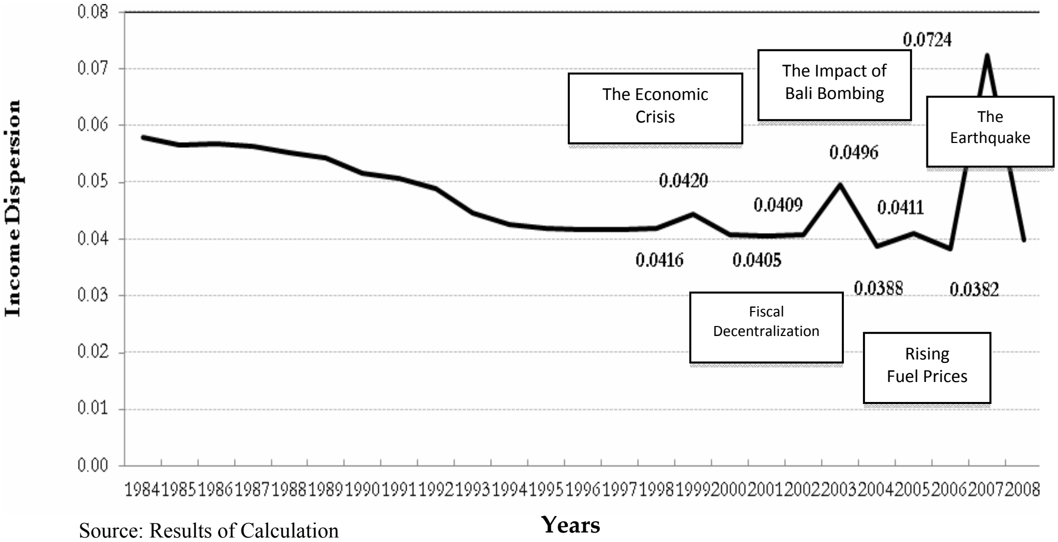
Factors that also affect the dispersion of income is fiscal decentralization in Indonesia, where the regional autonomy law No.22/1999 and 25/1999 became effective in January 2001 at the end of the era of President Abdurrahman Wahid, This reflected that at the beginning of fiscal decentralization in Indonesia in 2001, in which income disparity increased from 0.0405 to 0.0409 in 2002. Actually result in increased economic growth is relatively higher in the central business and the region is rich in natural resources than the poor natural resources and non business district. Contribution of economic activity on the island of Java and Sumatra reached about 80 percent of Indonesia's GDP. There is even a trend of inequality between provinces and regencies or cities which is likely to increase after regional autonomy 2001. GDP per capita is highly centered on the province rich in natural resources as well as densely populated areas (Kuncoro, 2012).

According to Waluyo (2007), the revenue sharing policy (PBB, BPHTB, PPh and BHSDA) exacerbate regional disparities in Indonesia. This is demonstrated by the increasing coefficient of variation increased from 59.79 percent to 60.03 percent for BHSDA, 59.9 percent and 59.9 percent for income tax for the PBB and BPHTB. BHSDA has the most impact on regional disparities compared with of the PPh, PBB and BPHTB. This is due to the uneven distribution of natural resources. Three provinces of Aceh, Riau and East Kalimantan BHSDA obtained for 3.07 percent, 5.56 percent, and 5.19 percent of the total GDP respectively. While areas such as South Sumatra gained 1.33 percent, 1.26 percent Kalimantan and North Maluku gained 1.21 percent. Other areas generally earn a share of less than 1 percent of its total regional GDP. Region that received the smallest BHSDA is Banten with 0.008 percent. PPh revenue sharing ranks second as a cause of regional disparities. PPh distribution is uneven across Indonesia as only large areas of industry and activity level services may obtain a larger part, such as Jakarta. Jakarta obtained funding from revenue share the results of more than 1 trillion rupiah, or about 0.69 percent of the total GDP. Other areas got funding that was less than 0.5 percent of total regional GDP. Areas of high levels of industry and services are likely to have large income tax revenue. Regions such as Riau, Jakarta, East Kalimantan, and Papua obtain income tax revenue which was relatively higher than other areas. Revenue sharing PBB and BPHTB ranks last as cause of income inequality between regions, because the value of the results of each region is relatively evenly distributed. Based on the spatial dimension, the island of Java and Sumatra remains the largest contributor to Indonesia's GDP.

In the era of President Megawati Soekarno Putri leadership in 2002 to 2003, the income dispersion among the provinces in Indonesia increased significantly, from 0.0409 in 2002 to 0.0496 in 2003. That is, during 2002 to 2003 σ convergence did not happen. This is a result of the impact of Bali bombing that occurred in October 12, 2002, in which it reduces the number of tourist visits and impact on employment transition and declining revenue, particularly for regions that relied on the tourism sector in all regions in Indonesia. According to the Bappenas (2004), the socio-economic impact of the Bali bombing in 2002 had a lasting effect throughout 2003 that included Balinese local revenue decline an average of 43 percent and terminate the employment of 29 percent of the workforce and lead to further national decline in foreign tourist arrivals up 30 percent during early 2003.

In the early era of President Susilo Bambang Yudhoyono, the income dispersion among provinces in Indonesia in 2004 and 2005 increased from 0.0388 in 2004 to 0.0411 in 2005. The existence of income inequality is partly due to the impact of rising fuel prices in October 2005 that triggered the onset of inflation in some areas which exacerbate income disparities between regions; specifically inhibited the growth of the local economy is poor, so the gap between the poor and the rich become wider.

In 2006 to 2007, the income dispersion among provinces in Indonesia increased significantly, from 0.0382 in 2006 to 0.0724 in 2007. This is caused as a result of the impact of the earthquake in Yogyakarta and Central Java. The earthquake that occurred on May 27, 2006 destroyed much of the economic activity in the province of Yogyakarta and Central Java. Moreover, the earthquake occurred in densely populated areas. The six districts most severely affected by the earthquake had an estimated population of about 4.5 million inhabitants. Bantul and Klaten suffered the most severe damage; each has a population density average over 1,600 inhabitants. These areas include two of the ten districts with the highest population density in Indonesia. According to Bappenas (2006), losses reach 29.1 trillion rupiah, greater than the loss caused by the 2004 tsunami in Sri Lanka, India, and Thailand. Damage to buildings and productive assets in the business sector are expected to result in a revenue loss. Approximately 650,000 workers were employed in different sectors devastated by the disaster, 90% of which was concentrated in the SME sector. Meanwhile, about 30,000 companies were affected either directly or indirectly. Indirect impacts include the disruption of pathways for material supply and trade routes. Based on these facts, the unemployment rate was expected to rise dramatically. The disaster has negative implications for poverty rates, Gross Domestic Income as well as regional economic growth. Before the disaster, there were approximately 880,000 poor people living in the affected areas (ADB, 2006). ADB (2006) estimates that this disaster will increase the number of poor people and as many as 66,000 people and there had been 130,000 people lost their job and regional GDP in earthquake the areas had fallen by about 5%, while the most affected districts were expected to experience severe contraction of economic decline by 18%.



Source: Results of Calculation

Figure 2. Dispersion of Income across Provinces in Indonesia, 1984-2008

2. Beta ConvergenceAnalysis (*β-convergence*)

2.1.Absolute Convergence

Table 2 shows the results of panel data estimation of the absolute convergence across provinces in Indonesia during the period 1984-2008. Based on the estimation results provide a strong indication of absolute convergence in Indonesia during the study period. This is reflected by the positive coefficient is less than 1 on the log of initial per capita regional GDP and statistically significant at the 1 percent level. Based on the results of OLS estimation, column (1) shows that the absolute convergence of 0.9635 and statistically significant at the 1percent level. In addition, the R-square value reached 0.9387 or 93.87 percent. That is, the variation of the independent variable can explain the dependent variable is equal to 93.87 percent, while the remaining 6.13 percent is explained by other factors outside the model. Based on the estimated coefficient of log of initial per capita regional GDP the discovered speed of convergence is 3.72 percent per year.

Furthermore, the choice between the estimated fixed effect and random effect as the right model can be calculated based on the Hausman test. In columns (2) and (3) were found Hausman test results (χ^2) of 0.5990. That is, the null hypothesis of the random effect models acceptable or right model is the random effect models when compared to fixed effect models, where the p-value=0.5990>5 percent. Column (3) shows that the absolute convergence is based on the estimation of random effects are worth 0.9635 at 1percent level. Furthermore, speed of convergence is 3.72 percent per year.

One issue that is relevant and crucial in the estimation results concerning the estimator of the OLS tends to bias or inconsistency as regressors tend to be correlated with the error or also known as endogeneity problem (Baltagi, 2005). Furthermore, as expressed by Hsiao (2004), the OLS estimates have some drawbacks, among others is to ignore the influence of time invariant province or country unobserved (time invariant unobserved country effects) in a dynamic panel data model level, causing OLS estimates to be biased upward. In addition, OLS estimation cannot be applied if the production function is heterogeneous (Ralhan, 2005).

Meanwhile, consistent estimator of the fixed effect is very dependent on T increases. In addition, for dynamic models with fixed effects generate estimates which are inconsistent as the number of "individual" tends to

Table 2. Regression For Absolute Convergence Among Provinces in Indonesia, 1984-2008

Variable	Dependent Variablel n(y_{it})				
	Pooled OLS (1)	Fixed Effect (2)	Random Effect (3)	GMM-DIFF (4)	GMM-SYS (5)
Ln(y_{t-1})	0.9635***	0.9713***	0.9635***	0.6367***	0.9766***
	(0.0198)	(0.0210)	(0.0180)	(0.1401)	(0.1435)
Implied λ	3.72%	2.91%	3.72%	45.15%	2.37%
Half-life					29
Hausman Test			0.5990		
R-Square	0.9387	0.9297	0.9387		

Description:

* significant at the 10%, ** significant at the 5% and *** significant at the 1%. Values in parentheses are robust standard errors. The half-life of convergence values calculated from $H = -\ln(2)/\ln(1+\beta)$ and λ is the speed of convergence calculated from $\lambda=-\ln(1+\beta)/\tau$. Instruments used for DIF-GMM(column (4)) is $\ln(Y_{i,t-2})$. Instruments used for SYS-GMM (column (5)) is $\Delta\ln(Y_{i,t-2})$

infinity if the number of time periods is kept fixed (Nickell, 1981). As noted recently by Barro (2012), there are reasons to think growth regressions with country fixed effects yield upwardly biased estimates of the convergence rate when the time horizon is short. In the meantime, to random effect the regressors are changed or transformed regressors will be correlated with the error changed or transformed. To overcome this, Arellano & Bond (1991) showed that the presence of the instruments could be found a consistent estimator when N tends to infinite with T fixed.

Column (4) shows the estimation results using the first-differenced GMM, which assumes that the log of initial per capita GRDP as endogenous. The coefficient on the log of initial per capita GRDP is positive at 0.6367 and statistically significant at the 1 percent level. The coefficient of initial per capita GRDP is less than the value of 1, which implies that the absolute convergence occurred in Indonesia during the study period. The estimated coefficient is lower than the estimation made by the OLS, fixed effect and random effect. As shown in column (4) that the value of speed of convergence is 45.15 percent per year.

The estimation based on the technique of system GMM in column (5) shows that the coefficient on the log of initial per capita GRDP is positive at 0.9766 and statistically significant at the 1 percent level. The coefficient estimates based system GMM is higher than estimates by the first-differenced GMM but the speed of convergence is lower than by first-differenced GMM is 2.37percent per year. These conditions indicate that the speed of convergence is estimated using system GMM slower to reach the point of steady state conditions than first differenced GMM estimation. Furthermore, the time it takes to cover half of the per capita income gap was about 29 years.

2.2. Conditional Convergence

Violation of assumptions in econometric model would produce value, which does not describe the pure effect of independent variables on the dependent variable. Based on the test results in Table 3, it can be seen that there is no multicollinearity between the variables in the model. This is shown by test correlation matrix showing no assumption of multicollinearity in the model, since all the values of each variable correlation below 80 percent.

Furthermore, to address other BLUE issues, autocorrelation and heteroscedasticity, standard error used by all estimates in this study using robust standard error, unless the random effect estimates are not using robust standard errors due to address autocorrelation and heteroscedasticity has been corrected using the GLS estimate (Wooldridge, 2009). Thus, it is expected that the resulting values may indicate the value is efficient and unbiased and can describe the pure effect of the independent variable on the dependent variable that deserve to be as basic analysis.

Table 3. Correlation Matrix

Independent Variables	*Ln* (y_{t-1})	*Openness*	*Education*	*Health*	*Ln Investment*	*LnNet Migration*
Ln(y_{t-1})	1.0000					
Openness	-0.3310	1.0000				
Education	0.3591	-0.0692	1.0000			
Health	0.5643	-0.0988	0.7241	1.0000		
Ln(Investment)	0.1763	0.0833	0.5561	0.4711	1.0000	
Ln(Net Migration)	0.2570	-0.1185	0.1670	0.1777	-0.1243	1.0000

Source: Results of Calculation

Table 4 shows the results of the panel data estimation of conditional convergence across provinces in Indonesia during the period 1984-2008. Based on the results of OLS estimation in column (1) shows that the coefficient of the conditional convergence of 0.9407 and statistically significant at 1 percent level. Meanwhile, degree of openness is a proxy of the openness of the regional economy at 0.0017 and statistically significant at the 5 percent level. This indicates that the openness of the regional economy plays an important role in enhancing the economic growth of a region. While the level of education, health, net migration and local investment do not affect to economic growth, which all these variables did not show statistically significant results. Based on the estimated coefficient of log of initial per capita GRDP was discovered the speed of convergence is 6.11 percent per year.

The choice between the estimated fixed effect and random effect as the right model can be calculated based on the Hausman test. Hausmantest result (χ^2) of 0.7204 can be seen in columns (2) and (3). That is, the null hypothesis of the random effect models acceptable or appropriate model in this case is the random effect models than fixed effect, where the p-value=0.7204>5 percent. In column (3) shows that the conditional convergence of the estimation of random effects is 0.9407 at the 1 percent level of confidence.

Control variables in the estimation of random effects that influence economic growth among other variables measured net migration as the difference migration in and out and degree of openness. Net migration had positive effect on economic growth of 0.0170 and statistically significant at the level 10 percent. These results are consistent with research conducted by Barro & Sala-i-Martin (2004) on the effects of internal migration on the growth of income per capita across regions in the United States, Japan and European countries share the show that existing migrations influence can encourage convergence in income. Meanwhile, degree of openness has a positive effect on economic growth of 0.0017 and statistically significant at the 5 percent level. It can be said that the openness of the regional economy plays an important role in enhancing the economic growth of a region. Based on the estimation results indicate that the level of education, heath as well as the level of investment in the area did not show statistically significant results, both at a rate of 5 percent and 10 percent. Meanwhile, speed of convergence is 6.11percent per year.

In column (4) shows the estimation results using the first-differenced GMM by assuming that the log of initial per capita GRDP, degree of openness, investment, level of education together with health and net migration is considered to be endogenous and thus instrumented. The coefficient of the log of initial per capita GRDP is less than 1, which implies that the conditional convergence occurred in Indonesia during the study period. The coefficient on the log of initial per capita GRDP is positive at 0.9009 and statistically significant at the level 1 percent. The coefficients significantly influence economic growth is degree of openness. In this case, degree of openness has a positive influence on economic growth at 0.0032 and statistically significant at the 10 percent level. It can be said that with the openness of the regional economy play a role in enhancing the economic growth of a region. Meanwhile, the other control variables are level of education, health, net migration and investment not showing results which is statistically significant at the 5 and 10 percent. As shown in column (4) that the speed of convergence is 10.44 percent per year.

The application of Sargan Test shows that the instrumental variables used in the first-differenced GMM estimator is not valid. This is reflected from the p-value of 0.10 is statistically significant at the 10 percent level. This indicates that the instruments used in the estimation techniques first-differenced GMM relatively weak. In addition, from the value

Table 4. Regression for Conditional Convergence Among Provinces in Indonesia, 1984-2008

Variables	Dependent Variable ln(y_{it})				
	Pooled OLS (1)	Fixed Effect (2)	Random Effect (3)	GMM-DIFF (4)	GMM- SYS (5)
Ln(y_{t-1})	0.9407***	0.8839***	0.9407***	0.9009***	0.9427***
	(0.0298)	(0.0576)	(0.0373)	(0.1030)	(0.0594)
Openness	0.0017**	0.0021	0.0017**	0.0032*	0.0042***
	(0.0008)	(0.0017)	(0.0015)	(0.0017)	(0.0008)
Education	0.0026	0.0077**	0.0026	0.0131	0.0134**
	(0.0023)	(0.0035)	(0.0027)	(0.0116)	(0.0063)
Health	-0.0006	0.0029	-0.0006	0.0014	-0.0006
	(0.0050)	(0.0092)	(0.0049)	(0.0102)	(0.0072)
Ln(Investment)	-0.0037	0.0134	-0.0037	-0.0510	-0.0730
	(0.0336)	(0.0542)	(0.0330)	(0.0775)	(0.0487)
Ln(Net Migration)	0.0170	0.0200	0.0170*	0.0429	0.0492*
	(0.0108)	(0.0306)	(0.0122)	(0.0316)	(0.0279)
Implied λ	6.11%	12.34%	6.11%	10.44%	5.90%
Half-life					12
Hausman Test			0.7204		
AR(1)				0.1623	0.2050
AR(2)				0.7188	0.7103
Sargan Test				0.10	0.33
R-Square	0.9413	0.9259	0.9413		

Description:

* Significant at the 10 %, ** significant at the 5 % and *** significant at 1 %. Value in parentheses are robust standard errors and two-step estimator. Value reported for the AR (1) and AR (2) are the p-values for the first and second order autocorrelated disturbances in first differences equation. Values shown in the Sargan test p-values are null hypothesis to test the validity of the instruments used. The half-life of convergence values calculated from $H = -\ln(2)/\ln(1+\beta)$ and λ is the speed of convergence calculated from $\lambda = -\ln(1+\beta)/\tau$. Instruments used for DIF-GMM (column (4)) are $\ln(Y_{i,t-2})$, Degree of $\text{Openness}_{i,t-1}$, $\text{Education}_{i,t-1}$, $\text{Health}_{i,t-1}$, Ln $\text{Investment}_{i,t-1}$, Ln Net $\text{migration}_{i,t-1}$.Instruments used for SYS-GMM (column (5)) are $\Delta\ln(Y_{i,t-2})$, ΔDegree of $\text{Openness}_{i,t-1}$, $\Delta\text{Education}_{i,t-1}$, $\Delta\text{Health}_{i,t-1}$, ΔLn $\text{Investment}_{i,t-1}$, ΔLn Net migration $_{i,t-1}$.

indicated by the AR (1) and AR (2) are p-values for the first and second order autocorrelated disturbances in the first-differenced equation that reached 0.1623 for AR (1) and 0.7188 for the AR (2). That is, there is no autocorrelation, both the first and second order autocorrelated as reflected in the AR (1) and AR (2) is not statistically significant at the 1 percent level. One of the weak points in the first-differenced GMM estimator, namely the existence of a weak instrument that can have an impact on initial per capita income will be biased (Bond, *et al.*, 2001). To cope with the weak instruments are then resolved by system GMM estimation.

In column (5) shows the results of system GMM coefficient estimates based on log of initial per capita GRDP is less than 1, which implies that the conditional convergence in Indonesia proved during the study period. The coefficient on the log of initial per capita GRDP is positive at 0.9427 and statistically significant at the 1 percent level. The coefficient estimates based system GMM higher than the estimate made by the OLS, fixed effects, random effects and first-differenced GMM.

Control variables statistically significant effect on economic growth are degree of openness, the level of education and net migration.

In this case, degree of openness has a positive influence on economic growth at 0.0042 and statistically significant at the 1 percent level. It can be said that with the openness of the regional economy play a role in enhancing the economic growth of a region. The estimates in this study is consistent with endogenous growth theory in open economies which states that investment in physical capital in an open economy is an increasing return which factors have returns greater contribution in sustaining economic growth although the effect is relatively small in the amount of 0.0042 percent. This is consistent with research conducted by Harrison (1996) using times series analysis that states that the indicators of openness have a positive relationship with economic growth despite the correlation with each other is very weak. Furthermore, in some studies suggest that higher levels of openness then the tendency will create faster convergence. That is, the more open a country that has low income to grow faster than low-income countries that have closed economy (Sachs & Warner, 1997).

Meanwhile, the level of education has a positive effect on economic growth by 0.0134 percent and statistically significant at the 5percent level. These results are consistent with endogenous growth theory which states that investment in human capital plays a key role in the formation of the ability of a region to absorb modern technology evolve and to develop the capacity to create sustainable growth and development. Furthermore, this condition is consistent with the results of previous studies by Wibisono (2003) who conducted a study on convergence in Indonesia, concluded that the level of education has a positive effect on economic growth. Thus, further confirms that education is a key to economic growth. Garcia & Soelistianingsih (1998) states that investment in human resources, including education is an important and effective way to increase revenue and lower provinces in Indonesia disparities in GDP per capita province. Poor provinces and rural areas can grow is faster because it has the advantage of better educational level.

The coefficient of net migration as measured by the difference in migration in and out has a positive effect on economic growth of 0.0492 and statistically significant at the 10 percent level. These results are consistent with research Ozgen et al. (2009) in developed and developing countries through meta-regression analysis techniques which states that influence the overall effect of migration on income convergence is a positive value. Research conducted by Barro and Sala-i-Martin (2004) on the effects of internal migration on the growth of income per capita across regions in the United States, Japan and European countries show migrations existence influence can encourage convergence in income.

In column (5) shows that the speed of convergence is 5.90percent per year. The results the speed of convergence is relatively fast for an area to reach the point of steady state conditions in comparison with the United States, Japan or regions in Western Europe is less than 2 percent per year (Barro & Sala-i-Martin,1991). Speed of convergence is estimated using system GMM slower to reach the point of steady state conditions than first-differenced GMM estimation that reached 10.44percent per year. Meanwhile, the time it takes to cover half of the per capita income gap between provinces in Indonesia is around 12 years. Thus, it can be said that taking into account the level of degree of openness, level of education, health, regional investment and net migration could accelerate the convergence rate of about 18 years sooner.

Based on the results of the Sargan test showed that the instrumental variables used in the system GMM estimator shows no problems occur with the validity of the instrument. This is reflected from the p-value of 0.33 is greater than the significance level of 5 or 10 percent. This indicates that the instruments used in the system GMM estimation are valid and highly informative. In addition, from the value indicated by the AR (1) and AR (2) are p-values for the first and second order autocorrelated disturbances in the first-differenced equation that reached 0.2050 for AR (1) and 0.7103 for the AR (2). That is, in this case does not happen autocorrelation, both on the first and second order autocorrelated as reflected in the AR (1) and AR (2) is not statistically significant at the 1percent level.

Table 5 shows the results of the system GMM estimation based on conditional convergence that occurred in provinces - provinces in Java (West Java, Jakarta, Yogyakarta, Central Java, East Java, and Banten) and outside Java. Based on the estimates in column (1) it is found that conditional convergence is happening in the provinces - provinces outside Java by 0.9851 and statistically significant at the 1 percent level and speed of convergence that reached 1.50percent per year. The outcome was the time required to cover half of the per capita income gap is 46 years. Meanwhile, in column (2) conditional convergence generated by the provinces-provinces in Java is 0.8726and statistically significant at the 1 percent level with a speed of convergence reached 13.63percent per year and the time required to cover half of the per capita income gap is 5 years. When compared between the provinces in Java and outside Java during the period 1984-2008, it can be

Table 5. Regression for Conditional Convergence in Java and Outside Java Provinces, 1984-2008

Variables	Dependent Variable $\ln(y_{it})$	
	Outside Java Provinces 1984-2008 GMM-SYS (1)	Java Provinces 1984-2008 GMM-SYS (2)
$\mathrm{Ln}(y_{t-1})$	0.9851***	0.8726***
	(0.0324)	(0.0121)
Openness	0.0095*	0.0164*
	(0.0054)	(0.0093)
Education	0.0056	0.0231*
	(0.0123)	(0.0131)
Health	0.0014	0.0044
	(0.0142)	(0.0198)
Ln(Investment)	0.0091	0.0113
	(0.0174)	(0.0169)
Ln(Net Migration)	0.0126	0.0132*
	(0.0176)	(0.0075)
Implied λ	1.50%	13.63%
Half-life	46	5
AR(1)	0.000	0.000
AR(2)	0.466	0.531
Sargan Test	0.11	0.18

Description:

* Significant at the 10 %, ** significant at the 5% and *** significant at 1%. Value in parentheses are robust standard errors and two-step estimator. Value reported for the AR (1) and AR (2) are the p-values for the first and second order autocorrelated disturbances in first differences equation. Values shown in the Sargan test p-values are null hypothesis to test the validity of the instruments used. The half-life of convergence values calculated from $H = -\ln(2)/\ln(1+\beta)$ and λ is the speed of convergence calculated from $\lambda = -\ln(1+\beta)/\tau$. Instruments used for DIF-GMM (column (4)) are $\ln(Y_{i,t-2})$, Degree of Openness$_{i,t-1}$, Education$_{i,t-1}$, Health$_{i,t-1}$, Ln Investment$_{i,t-1}$, Ln Net migration$_{i,t-1}$.Instruments used for SYS-GMM (column (5)) are $\Delta\ln(Y_{i,t-2})$, ΔDegree of Openness$_{i,t-1}$, ΔEducation$_{i,t-1}$, ΔHealth$_{i,t-1}$, ΔLn Investment$_{i,t-1}$, ΔLn Net migration

concluded that the speed of convergence which occurs relatively quickly in Java about 41 years compared to outside Java. This low speed of convergence process that occurs outside of Java may be related to some reasons, such as: (1) a more rapid structural changes are common in provinces - provinces in Java than outside Java, (2) regional imbalances in human capital development between Java and outside Java (3) imbalances in technological processes, education and infrastructure facilities between Java and outside Java (4) many areas outside of Java which is undergoing a process of economic development.

Furthermore, the coefficient of degree of openness between the provinces in Java and outside Java have positive effect on economic growth each - amounting to 0.0164 and 0.0095 at 10 percent level. Degree of openness contribution on economic growth in Java is greater than outside Java. This is due provinces-provinces outside Java (which is mainly reliant on agriculture for its economy rich in natural resources) are widely associated with many different levies towards decentralization. For example, weigh issues in South Sulawesi. After the Law No. 18/1997 enacted, all weighbridge in Indonesia should be abolished. However, some times after the regional autonomy demands bloom early 1999, the practice of weigh bridges in some areas such as the South Sulawesi started running again. The purpose of the weighbridge is to keep the roads from damage caused by trucks overloaded. But in practice, it becomes a means of corruption and collusion of officers, police, and the truck driver or the employer. It is indirectly increasing costs, especially agricultural goods are distributed. Thus, the additional costs can cause "high cost economy" that will eventually lead to a negative effect on economic growth (Simanjuntak, 2001). In addition, the pattern of trade between the islands it can be seen that there was some concentration of the flow of goods and labor from outside the island of Java to Java. This condition is a direct implication of the concentration of industry in Java which is supported by the availability of port infrastructure and the existence of human resources is relatively better than outside Java. In addition, the high flow of goods to Java is also affected by the large number of people in the Java community have an increasing impact on demand.

The coefficient of net migration in Java has a positive effect on economic growth 0.0132 at 10 percent confidence level. According to BPS data, prior to autonomy era in 1990, the largest migration recorded among the provinces was those to Jakarta, and West Java and Lampung. This is understandable because of the Mega city, providing opportunities for individual administration to seek fortune and livelihood. The existence of the industry is still a major attraction migration. West Java and Jakarta with a number of industries have higher stats than those of other provinces in Indonesia. So is Lampung who have access to capital. Meanwhile, the largest out-migration record was held by Central Java, East Java and West Java. Allegedly migration flows from the three provinces most incoming Jakarta and West Java. This is possible due to the growth of industry and services in the provinces more rapidly than the other provinces. It is also stressed by the largest number of workers by the number of West Java province because of the large number of industries directly proportional to the number of workers. The era of regional autonomy, migration flows both outgoing and incoming remained unchanged, during which regional autonomy is running, the largest migration recorded by the same province as before decentralization is applied. Only a few provinces managed to make the essential conditions resulting in increased migration figures, such as Riau. With a wealth of natural resources and the proper management and direction, Riau managed to become a new magnet for migrants. Meanwhile, levels of education contributed most to economic growth, in particular in the provinces in Java. The level of education in Java has a positive influence on economic growth of 0.0231 at 10 percent confidence level. Lack of educational facilities located in most provinces outside Java has caused many students and productive workers to leave the area to get a better education, skills and eventually pursue higher paying jobs, which are mostly located in Java.

CONCLUSIONS

There are several things that can be summed up in this study, firstly, based on the estimation results indicate that the dispersion of income as measured by the coefficient of variation during the period 1984-2008 is generally fluctuated. Factors, which influenced income dispersion rate, were the impact of the economic crisis, the period of fiscal decentralization, the impact of the Bali bombing, the impact of rising fuel prices in October 2005 and the earthquake in Yogyakarta and Central Java. Secondly, based on the estimation results across 26 provinces over the period 1984-2008 provides a strong indication of the existence of absolute and conditional convergence in Indonesia during the study period, both based on estimates of OLS, fixed effects, random effects and first differenced GMM and system GMM. Dynamic panel data estimation with system GMM produces an efficient and consistent estimator to handle issue regarding problems of instrument validity. Thirdly, based on the system GMM estimation, it is found that the provinces in Java have faster speed of convergence comparatively to those outside Java.

This study only used data from the period 1984 to the year 2008. Nonetheless, there are still many limitations in this study, especially with regard to the data set, and there are many other factors considered to affect economic growth, particularly concerning the issue of convergence. Further research would be even better if using a data series for a longer period so that the research results will be closer to actual conditions. Economic growth expected in this study is only affected by the degree of openness, level of education, health, investment and migration rates. However, many other factors are thought to affect the economic growth. For example, the spatial dimension of regional population density, the financial dimension, the geographical dimensions and the infrastructure dimensions.

POLICY RECOMMENDATION

The government should consider the level of equitable development, particularly in areas outside Java, so that the level of economic growth achieved will have a high quality and sustainable. Besides, it is proper for the government to create a favorable investment climate this era that could increase the level of investment and attempted to restructure the forms of levies and cause further harm heavy burden businesses due to increased spending on transaction costs is hurting the trade area could ultimately have a negative impact on regional economic growth. Meanwhile, the government needs to give serious attention to the level of education that contributes greatly to the economic growth and is proven to accelerate the convergence rate. Efforts to do is to increase the accessibility and expanding learning opportunities for all children of primary and secondary education with the main target areas, especially for the poor, remote and isolated normally available outside of Java through scholarships and assistance programs. It aims to address the disparity regarding the issue of access and educational services, particularly for the junior and senior high school.

The inequality between one area to another clearly becomes the main encouragement for citizen to relocate. Therefore, regional development should be directed to further developing and harmonizing the rate of growth between urban and rural areas, and aimed to open up isolated areas and accelerate the development of lagging regions, such as outside Java and Eastern Indonesia (KTI).

Furthermore, a policy that prioritizes the allocation of expenditure on local spending and the productive sector in boosting the region's economy through improved infrastructure, especially outside Java.

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