Int. Journal of Economics and Management **6(1):** 150 – 166 (2012) ISSN 1823 - 836X

The Dynamics of Regional Disparity in Java Island After Fiscal Decentralization

MUHAMMAD FIRDAUS[a], KRISMANTI[b] AND WIWIEK RINDAYATI[c]

[a,c]*Lecturer at Faculty of Economics and Management IPB*
[b]*Student at Faculty of Economics and Management IPB*

ABSTRACT

Income disparity does not only exist beween Java Island and out of Java. Some figures indicate that the disparity among regions in Java Island is significant. This study aimed to analyze the dynamics of disparity in economic development among regions in Java Island after the decentralization policy. The study employs the data of 105 districts/cities from 2001 up to 2009. Both dynamic and static panel data are employed to satisfy the objectives of the study. The results show that the disparity of regional income among districts/cities is still high in Java Island, while the disparity is dominated by the income inequality among the cities. The model shows that regional GDP convergence does not matter in Java Island, however household income convergence is very high. The significant determinants of disparity among regions in Java Island are share of manufacture, level of labor education, health infrastructure, power and water supply.

Keywords: Income disparity, dynamic panel data, Williamson coefficient, Java Island

INTRODUCTION

Even though Java represents only a fraction of Indonesia's land, it still dominates Indonesia's economy. Until 2009, Java Island's contribution towards Indonesia's Gross Domestic Product (GDP) based upon the current price was 62.04 percent (fossil fuels) or 65.44 percent (non fossil fuels). From the GDP trend according to a constant price, Java Island's contribution towards the national GDP is also very large, always exceeding 50 percent between the years 2000-2009 (Statistical Central Agency, 2010). The economic development in Java is closely related to the rapid influx of both domestic and foreign investments. The proportion of investment to

* Corresponding Author: E-mail: firdausfemipb@yahoo.com
Any remaining errors or omissions rest solely with the author(s) of this paper.

Java always exceeds 60 percent of Indonesia's total investment value during 2000-2009 (Statistical Central Agency, 2010).

The disparity existing between Java Island and the other areas in Indonesia has frequently caused issues of disparity in development. The government has tried to remedy this condition by implementing development acceleration programs in the areas out of Java, fiscal decentralization or regional autonomy in the district/city level and by facilitating economic players in doing their activities in areas out of java, especially in Eastern Indonesia. But the disparity in economic development has existed between regions within Java Island itself, both between provinces and between districts/cities.

As an illustration, the comparison between the economic developments between regions within Java Island if analyzed using the Theil index during the post-decentralization period (after 2000) indicates a significant level of inequality. In 2008, the Theil index between districts/cities within Java Island reached 0.48. The regional inequality prevailing on Java Island is caused more by inequality between proviced rather than inequality within the provinces.

This study aims to observe the dynamics of disparity in economic development between regions within Java Island post decentralization policy by using both data of regional gross domestic bruto and data of household income (proxied by expenditure). There will specifically be testing to discover whether there exists a catching up process or regional income convergence between districts/cities within Java Island. Furthermore, the factors affecting economic development disparity between regions within Java Island are identified.

LITERATURE REVIEW

From many literatures, there is a debate of predicting of convergence process in regional income. Some competing theories can be summarized as follows. The behavior of economies over time has been modeled strongly by the neoclassical wing. A key of implication of the Solow model is that, if all countries (regions) have the same potential (or steady state) level of income, poor will grow faster than rich and eventually catch up at the steady state. It is also known as idea of *club convergence*, that is hypothesis that only countries with similar structural characteristics and initial conditions will converge to one another. There are two important kinds of catch-up. First, given the right economic structure and environment, poor countries tend to have high rates of return to capital. The accumulation of physical and human capital, whether financed by domestic saving or capital inflows, leads to rapid growth. Second, they tend to have rapid rates of growth of total factor productivity. They can emulate the technologies and "best practice" management innovations of the more advanced economies that have gone before them. Growth can therefore be facilitated as much through the accumulation of factors as through increases in the efficiency of the use of these factors.

Theory	Founder (year)	Predicting of convergence/divergence
Neoclassical	Solow (1950)	Convergence
Cumulative causation	Myrdal (1957) Kaldor (1970)	Divergence
Endogenous growth	Romer (1986) Lucas (1988)	Convergence or divergence depends on increase in human or physical capital
New economic geography	Krugman (1991)	Convergence or divergence depends on both history and future expectations

However, the new growth theorists have pointed out to the failure of the poorer economies to catch up to the richer ones (cumulative causation and the later theories). Some authors argued that a fundamental factor in growth is the presence of non-convexities in production, which can create a non-diminishing relationship between an economy's initial conditions and its output level over arbitrarily long horizons. The striking differences in the empirical implications of the neoclassical and new growth perspectives have led to a literature, which has formally tested the convergence hypothesis. For example, by introducing control variables such as human capital; distribution of income and openness, the neoclassical growth model tends to lead to the conditional convergence hypothesis rather than to the absolute convergence hypothesis. Any rejection of absolute convergence does not necessarily imply a rejection of the neoclassical growth model (Lee, 2002). Thus, the convergence hypothesis is important to reexamine.

Some studies related to the testing of convergence theories have been done. Firdaus and Yusop (2009) pointed out that the regions in Indonesia experienced the convergence process, but with a very low rate of convergence (0.29 percent). In this study, the disparity of regional income was tested among the provinces based on the regional gross domestic data. The results are different with some studies conducted in more developed countries. Ralhan and Dayanandan (2005) found that regional income among the provinces in Canada experienced the convergence process with the rate of 6.5 percent. The authors also tested that there was convergence of disposable income data among the provinces, with the lower rate of 2.9 percent. The study conducted by Badinger (2002) in European countries also found the similar rate of convergence process among 196 regions. This study was renewed by Bussoletti and Esposti (2004), and the authors found the convergence rate was about 7.5 percent among 206 regions in Europe. All those studies employed the generalized method of moment (GMM) to estimate the regional income convergence. This study tests the convergence process among regions in Java island, based on data of regional gross domestic product and data of

regional income. The regional income was accounted using household expenditure, based on the survey conducted by Statistical Central Agency.

METHODOLOGY

Data

This study employs some economic data of districts/cities in Java Island, except DKI Jakarta Province, for the period of 2001 up to 2009. Data include 105 regions which did not change at that time. Data are taken form Statistical Central Agency and some provincial government offices. Some data in district/city level are as follows:

- Investment inflows
- Number of labor employed based on their education level
- Regional GDP (at district level) based on constant price 2000
- Share of agriculture and manufacturing sector on regional GDP
- District goverment spending
- Goverment revenue from taxes and retribution
- Total household income, which is proxied by expenditure. Data are taken from SUSENAS (National survey on sosio economic indicators) from 2001-2009.

Some data in provincial level are as follows:

- Number of labor employed based on their education level
- Regional GDP (at province level) based on constant price 2000
- Share of agriculture and manufacturing sector on regional GDP
- Provincial goverment spending
- Number of community health center
- Number of power and water supplied to community
- Length of road (paved, good and bad condition)

Analysis Method

Coefficient of Variation Williamson

In this study, coefficient of variation Williamson is used to measure the difference of economic output among regions. This measurement uses per capita Regional GDP to describe the disparity among regions, with the formula as follows:

$$CV_w = \frac{\sqrt{\frac{f_i}{n}\sum_{i=1}^{n}(y_i - \bar{y})^2}}{\bar{y}}, \quad 0 < CV_w < 1 \qquad (1)$$

where:

$\underline{y_i}$: per capita Regional GDP region i
$\overline{y}$: average per capita regional GDP of all regions
f_i : population size of region i
n : population size of all regions

Analysis of Regional Convergence

Following Mankiw (2007), this study assumes that economic growth follows a constant return to scale Cobb-Douglas production function. Such function consists of output (Y) three inputs: capital (K), labor (L) and labor augmenting technological progress (A), where:

$$Y(t) = K(t)^{\alpha}(A(t)L(t))^{1-\alpha}, \quad 0 < \alpha < 1 \tag{2}$$

Labor and techcnological progress grow at the constant rate:

$$L(t) = L(0)e^{nt} \tag{3}$$

$$A(t) = L(0)e^{gt} \tag{4}$$

where n is the growth rate of labor tingkat and g is the rate of technological progress. *L(0)* and *A(0)* are the initial levels of labor and technological progress. If:

$$\hat{y}_t = \frac{Y(t)}{A(t)L(t)} \text{ is effective output per labor}$$

$$\hat{K}_t = \frac{K(t)}{A(t)L(t)} \text{ is effective capital per labor}$$

$$\text{so } \hat{y}(t) = f(\hat{k}(t)) = \hat{k}(t)^{\alpha} \tag{5}$$

evolution of capital is:

$$\hat{k}(t)s\hat{k}^{\alpha}(t) - \hat{k}(t)(n + g + \delta) \tag{6}$$

where s is the rate of saving and δ is the rate of capital depreciation.

Then the steady state of capital stock ($\hat{K}^*$) is determined by equalizing (6) to zero, then:

$$\hat{K}^*(t) = \left(\frac{s}{n + g + \delta}\right)^{\frac{1}{1-\alpha}} \tag{7}$$

The steady state effective output per labor can be determined by substituting equation (7) into production function, in natural natural logarithmic:

$$\ln \hat{y}^* = \left(\frac{\alpha}{1-\alpha}\right)\left[\ln s - \ln(n+g+\delta)\right] \tag{8}$$

The rate of convergence (λ) is a condition where effective output per labor is close to the steady state, where:

$$\frac{d\ln \hat{y}(t)}{dt} = \lambda\left[\ln(\hat{y}^*) - \ln \hat{y}(t)\right] \tag{9}$$

$$\ln \hat{y}(t_2) = (1-\varsigma)\ln \hat{y}^* - (1-\varsigma)\ln \hat{y}(t_1) \tag{10}$$

and $\lambda = (1-\alpha)(n+t+\delta)$, $\varsigma = e^{\lambda t}$ dan $\tau = (t_2 - t_1)$.

Equation (10) represents a partial adjustment process. Output per labor is accounted by using this below equation:

$$\ln \hat{y}(t) = \ln\left(\frac{Y(t)}{A(t)L(t)}\right) = \ln\left(\frac{Y(t)}{A(t)e^{gt}L(t)}\right) \text{ or}$$

$$\ln y(t) = \ln\left[\frac{Y(t)}{L(t)}\right] - \ln A(0) - gt \tag{11}$$

If *ln y(t)* is substituted into equation (10), then both sides are substracted with $\ln \hat{y}(t_1)$:

$$\begin{aligned}\ln y(t_2) - \ln y(t_1) = &-(1-\varsigma)\ln y(t_1) + (1-\varsigma)\ln A(0) + g(t_2 - \varsigma t_1) \\ &+ \underbrace{(1-\varsigma)\frac{\alpha}{1-\alpha}\ln(s) - (1-\varsigma)\ln\frac{\alpha}{1-\alpha}(n+g+\delta)}_{z}\end{aligned} \tag{12}$$

where is output per capita and z is log output per capita in the steady state.

Say $\beta = -(1-\varsigma)$ as income parameter at time t_1, then the rate of convergence can be written as:

$$\lambda = \frac{\ln(\beta - 1)}{\tau} \tag{13}$$

Equation (12) can be written as an autoregressive of the growth model:

$$\begin{aligned}\ln y(t_2) = &\varsigma \ln y(t_1) + (1-\varsigma)\ln A(0) + g(t_2 - \varsigma t_1) \\ &+ (1-\varsigma)\frac{\alpha}{1-\alpha}\ln(s) - (1-\varsigma)\ln\frac{\alpha}{1-\alpha}(n+g+\delta)\end{aligned} \tag{14}$$

or in the form of panel data model:

$$\ln y_{it} = \gamma \ln y_{i,t-1} + \beta_1 \ln s_{i,t-1} + \beta_2 \ln(n + g + \delta)_{i,t} + \eta_i + \upsilon_{i,t} \quad (15)$$

where

$x_{it} = \ln(s_{it}), \ln(n_{it} + g + \delta), \theta = (1 - \varsigma)\frac{\alpha}{1-\alpha}, -(1 - \varsigma)\frac{\alpha}{1-\alpha}$ and $\gamma = 1 + \beta = \varsigma$.

The final equation (15) is the model of income convergence used by Firdaus (2006). Such equation can be noted as:

$$\Delta y_{it} = (1 - \alpha)\Delta y_{i,t-1} + \beta' \Delta x_{it} + D_i + u_{it} \quad (16)$$

where $i = 1, 2,\ldots, N$ dan $t = 1, 2,\ldots,T$.

where x_{it} are some instrument variables are government revenue, investment, education level of labor employed and share of agriculture on GRDP.

The equation (16) was estimated by using GMM approach, suggested by Arrelano dan Bond (1991). Both *first-difference* GMM and *system*-GMM are employed. The results are compared based on some criteria such as unbiasedness, validity and consistency.

Determinants of Regional Disparity

In order to analyze the determinants of regional disparity, the data panel model is employed. The cross-section unit is a province in Java Island. The formulation of model is as follows:

$$\begin{aligned} \ln y_{it} = {} & \gamma + \theta_1 \ln govexp_{it} + \theta_2 \ln agri_{it} + \theta_3 \ln manu_{it} + \theta_4 \ln edu_{it} \\ & + \theta_5 \ln puskes_{it} + \theta_6 \ln electric_{it} + \theta_7 \ln water_{it} + \theta_8 \ln road_{it} + v_{it} \end{aligned} \quad (18)$$

where:

y	:	coefficient of variation Williamson of GRPD of a province for the second model, *y* is coefficient of variation Williamson of household income of a province
govexp	:	pengeluaran rutin pemerintah
agri	:	share of agriculture on GRDP
manu	:	share of manufacturing on GRDP
edu	:	share of labor employed which has education level is higher than senior high school
puskes	:	number community health center
electric	:	number of power supplied to community
water	:	number of water supplied to community
road	:	length of road (paved, good and bad condition)
i	:	province i in Java island
t	:	form 2001 up to 2009

RESULTS AND DISCUSSION

Williamson's Variation Coefficient

The analysis shows that the disparity in development on Java Island is still very high. Generally, Java Island's Williamson's variation coefficient is between 0.94 until 0.98, meaning that the income difference between districts/cities on Java Island is very steep. However, during the the study, there seems to show a tendency to decline in the numbers (Table 1). The disparity in development between areas is expected in the early satges of the development process in a developing county. The disparity in economic growth also happens due to the difference in resources.

The disparity between districts/cities within a province is relatively lower than the disparity between districts/cities on Java Island. The highest disparity is found in Banten Province, which is in the widest range compared to other provinces, which is between 0.77 until 0.92. These numbers are very striking because they increase quickly from year to year. Banten Province was a part of West Java Province until the year 200 when it detached itself to make a new province. Therefore, it is still in its early stages of development. The number of districts/cities are very few, only 4 districts and 4 cities in 2009 and each of them have different resources. Tangerang is a part of the Jabodetabek (Jakarta, Bogor, Depok, Tangerang, and Bekasi) Metropole area which has a huge economic potential in the industrial and trade sectors. The development of this area is also due to the presence of the gateways of air transportation (Soekarno-Hatta International Airport) and water transportation 9 Merak Seaport).

The least disparity is found in Daerah Istimewa Yogyakarta, being between 0.38 and 0.42 and has a declining trend. These numbers show the difference in the rate of development between Daerah Tingkat II is lessening. This is the opposite of what is happening in the bordering province, Central Java. Williamson's variation coefficient for Central java is between 0.71 and 0.76 and has an inclining trend (Table 1).

The disparity between districts/cities in West Java is between 0.64 and 0.69 and has a declining trend. These numbers are quite high because the rapid industrial area

Table 1 Williamson's variation coefficient of the regional GDP of areas on Java Island, 2001-2009

Area	2001	2002	2003	2004	2005	2006	2007	2008	2009
Java	0,97	0,98	0,95	0,95	0,95	0,94	0,95	0,95	0,95
West Java	0,68	0,67	0,67	0,66	0,65	0,65	0,65	0,65	0,65
Central Java	0,72	0,73	0,73	0,74	0,75	0,76	0,76	0,75	0,75
DIY	0,41	0,42	0,43	0,43	0,40	0,40	0,40	0,40	0,40
East Java	NA	NA	NA	NA	NA	NA	NA	NA	NA
Banten	0,78	0,79	0,81	0,82	0,84	0,85	0,85	0,91	0,91

development is in West Java. West Java Province is important in supporting DKI Jakarta's economy. As a result, the development of this area is rapidly progressing, shown by the city and metropole area expansions. The emergence of new provinces happened in 2000 with the formation of Banten Province, and new districts/ cities which have emerged since 2001 are Cimahi City from Bandung District, Tasikmalaya City from Tasikmalaya District, and Banjar City from Ciamis District.

West Java has three metropole areas, which are urban areas whose main activities are not agriculture and have area function divisions as urban settlements, centralization and distribution of government services, social services, and economic activities (Pontoh and Kustiawan, 2008). The activities in cities in West Java are dominated by industries, housing, trade, and services. The Bandung Raya Metropole area consists of Bandung District, Bandung City, and Cimahi City. Bogor Dsitrict, Bogor City, Depok City, Bekasi District, and Bekasi City (Bodebek) are part of the Jabodetabek metropole area. The Cirebon metropole is projected as the center of development in eastern West Java. The growth of urban areas is hoped to create agglomeration which has a positive impact for the adjacent areas.

The wide disparity on Java Island is dominated by the disparity between cities, triggered by the development of cities as certers of growth. Moreover, the presence of fiscal decentralization gives the regions a higher authority in determining the development in their own regions and competing in building their centers of growth. The Williamson's variation among cities on Java Island is between 0.84 and 0.88, slightly lower than the disparity among districts/cities. The disparity among districts is even lower, between 0.65 and 0.68. Nevertheless, these numbers are relatively high in within the Williamson's variation coefficient calculation range (Figure 1).

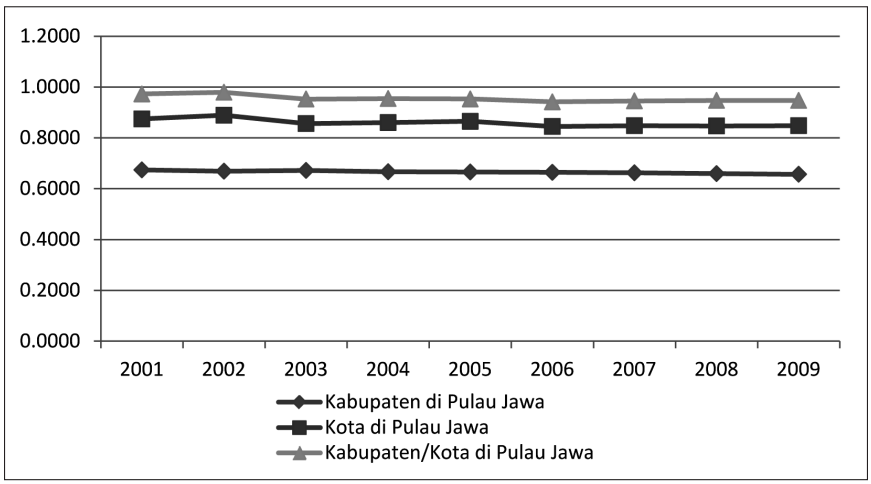

Figure 1 The trend of Williamson's Variation coefficient between districts/cities on Java Island, 2001-2009

The value of disparity among cities and among districts is smaller than the disparity of districts/cities on the whole Island of Java, meaning that the differences between districts and cities increase the regional disparity on Java Island. The high per capita income in cities is caused by the increase in large industrial companies and trade, accommodation, and service activities. However, these calculations are still within the macro scale because they were calculated in aggregate from the regional income (including the foreign companies operating within these regions). The income received by the people in these regions is biased, meaning that it is not as large as the average income when calculated in the macro scope. This is proven by the variation coefficient which was calculated from the household income data.

Table 2 Williamson's variation coefficient of household income in regions on Java Island, 2001 – 2009

Region	2001	2002	2003	2004	2005	2006	2007	2008	2009
Java	0.39	0.35	0.29	0.30	0.39	0.33	0.33	0.44	0.37
West Java	0.34	0.32	0.30	0.29	0.27	0.31	0.32	0.40	0.31
Central Java	0.22	0.25	0.17	0.23	0.26	0.25	0.28	0.32	0.29
DIY	0.29	0.37	0.30	0.31	0.35	0.34	0.31	0.30	0.27
East Java	0.29	0.30	0.25	0.26	0.37	0.29	0.24	0.40	0.26
Banten	0.39	0.32	0.28	0.22	0.37	0.28	0.29	0.36	0.37

The disparity among regions calculated from household income per capita shows a number which is quite similar, unlike the calculation of disparity using the per capita Regional GDP. The highest and lowest disparity each year is found in a different region. This means that the difference between the people's buying power in fulfilling their daily needs between regions and within regions on Java Island are not significantly different, being between 0.16 and 0.44. The disparity within regions during the study was relatively more fluctuative compared to the disparity in the calculation using the per capita Regional GDP.

The Regional GDP Convergence Estimation among Regions

The estimation of income convergence among regions on Java Island is done by using the per capita Regional GDP dependent variable. The income convergence process may be seen through the autoregressive parameter coefficient from the Regional GDP variable. From the Sargan test, the Arellano Bond (AB m) statistical value, it can be said that the model estimation is already valid and consistent (Table 3). The y_{t-1} coefficient value which is less than 1 shows that the income of districts/cities is persistent. The estimation result from the FD-GMM dynamic data panel model shows that the y_{t-1} coefficient is 1.2722 and is significant on the 5 percent level, meaning that the convergence process is not happening on Java Island. In other

words, the income on Java Island is divergent. Based on Sargan's statistical test, the zero hypothesis that the the valid instrument variable is not rejected with a p-value of 0.9870 means that the instrument variable used is valid. The model consistency test is done by observing the AB m_1 significance level which is significant in the 5 percent level and AB m_2 which is not significant in the 5 percent level, meaning that there is no serial correlation or that the model is consistent.

Table 3 The convergence estimation of the disticts/cities using the regional GDP Data on Java Island with the FD-GMM dynamic panel data method

Parameters	Estimated coefficients	Standard error	P-value
ln $pdrb_{t-1}$	1.2722	0.0645	0.0000
ln inv	0.0039	0.0007	0.0000
ln labour	-0.0419	0.0132	0.0020
Implied λ	NA		
Wald-Test	596.6900		0.0000
AB m_1	-4.0375		0.0001
AB m_2	0.8011		0.4231
Sargan Test	14.0256		0.9870

Note: the tax instrument is used as an instrument

The calculation of regional GDP per capita convergence of districts/cities on Java Island differs from the results of Busculetti and Esposti's (2004) study which calculated the per capita income convergence in regions in Europe (the values being between 5 and 7.5 percent). A study between provinces in Canada also shows values between 6 and 6.5 percent (Ralhan and Dayanandan (2005)). While the convergence between provinces with large incomes which are located close to each other in Russia is between 2.8 and 3.8 percent (Kholodilin *et al*., 2009). The results of the studies in Indonesia show that the disparity is on a relatively high level and the convergence rate is low. As seen in the study by Firdaus (2006), the convergence among provinces in Indonesia has happened, but it reached a mere 1.01 percent with the FD-GMM method, whereas in the district/city level on Java Island income convergence among regions could be said to be non-existent. This phenomena is caused by the presence of industrial centers in only one or two cities, causing an ever widening gap in the development rate. Besides that, the nature of the study did not calculate the spatial interdependency among regions potentially misled the study results in the dynamic panel data model (Badinger *et al.*, 2002).

Convergence estimation using the household income approach is observed from the autoregressive parameter coefficient of the per capita household income variable (Table 4). The value of the y_{t-1} coefficient is 0.3421; indicating a household income convergence of 107.28 percent. Based on Sargan's statistical test, the zero hypothesis that the instrument variable is valid is rejected with a p-value of 0.0003.

This shows that the instrument variable used was not valid. The model consistency test was done by observing the AB m_1 significance level which was significant in the 5 percent level and AB m_2 which was not significant in the 5 percent level. This means that there is no serial correlation or that the model is consistent.

Furthermore, for the household income dependent variable, the model estimation result shows a higher level of household income convergence among districts/cities on Java Island compared to the regional GDP convergence rate. This can be seen from the high implied λ value (Table 3). This differs from the results of Ralhan and Dayanandan's study (2005) which calculated the convergence among provinces in Canada. The disposable income convergence was smaller (2.89 percent) than the per capita income convergence (6 to 6.5 percent). The high convergence in the household level on Java Island was because this approach only observed convergence from the household economic actor's point of view, whereas the Regional GDP convergence involves all economic actors, not only households, but also the private sector and the government. Economic activities involved were also different, not only consumption as with the household approach, but also investments by both the private sector and the government. This comparison of the convergence levels shows that similar regional development rates will be achieved in a longer time than the a similar people's buying power.

Table 4 The estimation of district/city convergence through the household income approach on Java Island using the FD-GMM dynamic panel data method

Parameters	Estimated coefficients	Standard error	P-value
ln $cons_{t-1}$	0.3421	0.0098	0.0000
ln inv			
ln labour	0.2967	0.0351	0.0000
Implied λ	107.2755		
Wald-Test	1538.8200		0.0000
AB m_1	-5.7980		0.0000
AB m_2	-1.4747		0.1403
Sargan Test	61.6225		0.0003

Note: the tax instrument is used as an instrument

The Factors Affecting Regional Disparity

Regional disparity often occurs in developing countries because of the difference in regional economic development. Development chances and opportunities are generally utilized by areas which are in better condition, while under-developed areas are unable to utilize these opportunities due to the constraints in facilities and infrastructure and the low human-resource quality (Sjafrizal, 2008).

Estimation of the factors which affect the regional disparity on Java Island is done using the per capita regional GDP Williamson's variation coefficient dependent variable (Table 5). The static panel data model chosen for this disparity analysis is the random effect based upon Hausman's test with the p-value of 0.4780.

Disparity in development among regions on Java Island is affected by the manufacture sector negatively, the labor force with senior high school education and above sector negatively, the number of community health centers negatively, the amount of electric energy sold positively, and the volume of clean water distributed positively. Increases in economic activities in the manufacture sector and improvements in labor education could decrease income disparity. This is also true for improvements in helath facilities i.e. the community health centers; they could reduce regional disparity on Java Island. But on the other hand, the increase in the amount of electricity sold and clean water distributed to consumers will increase regional disparity.

Table 5 The estimation results of the factors affecting the regional disparity among districts/cities between provinces on Java Island using the regional GDP approasch with the static panel data model

Variable	Coefficient	Std. Error	Prob.
C	8.7488	2.8058	0.0036
LOG(GOVEXP)	0.1269	0.0645	0.0569
LOG(AGRI)	-0.4061	0.3800	0.2923
LOG(MANU)	-0.7784	0.3277	0.0230
LOG(EDU)	-1.9334	0.2660	0.0000
LOG(PUSKES)	-1.6334	0.2713	0.0000
LOG(ELECTRIC)	0.9488	0.2443	0.0004
LOG(WATER)	0.2696	0.1055	0.0150
LOG(ROAD)	0.1382	0.1281	0.2880
R-squared	0.8924		
Adjusted R-squared	0.8685		
F-statistic	37.3326		
Prob(F-statistic)	0.0000		
Durbin-Watson stat	1.7757		

The level of economic development that is proxied with the economic sector affects the regional GDP disparity with an elasticity of 0.78. If the manufacture contribution increases 1 percent, the disparity decreases by 0.78 percent. The same direction happens to the education variable as the disparity on Java Island is affected by the quality of its human resources. If the contribution of the labor force having senior high school education increases by 1 percent, the disparity of income will decrease by 1.93 percent.

Furthermore, the infrastructure on Java Island determines the disparity of regional development, including health facilities in the form of community health centers, electricity, and clean water. Besides education, health facilities have high elasticity in the effort to reduce disparity of regions on Java Island. If the number of community health centers in a certain province increases by 1 percent, the disparity of Java Island will be reduced by 1.63 percent. The data used to measure the health variable is the number of community health centers because this health facility is the one that can reach people in remote areas (unlike hospitals are relatively found only in cities or district capitals only) so that the use of the data of the number of community health centers in this variable could truly represent the number of health facilities. This is the opposite of the electricity and clean water infra structures. The increase in these variables will in fact increase regional disparity with an elasticity of 0.95 and 0.27, respectively. The largest consumers of electric power are industries and businesses eventhough the largest number of subscribers are households. The inequal distribution of industries on Java Island is the reason why the electricity variable in fact increases regional development disparity. This is also true for clean water distributed by the Regional Drinking Water Company. It is mostly used by households, especially in large cities. Besides the difficulty in obtaining clean water from natural sources, urban areas are usually crowded with residential areas so that the usage is not equally distributed on Java Island.

The estimation of factors that affect regional disparity on Java Island is also done using Williamson's variation coefficient dependent variable for per capita household income (Table 6). The static panel data model chosen for this disparity analysis is the fixed effect based on Hausman's test with a p-value of 0.0098.

Regional disparity with the household income approach in this study is only affected by the education of its labor force in an opposite direction with the Regional GDP approach. The increase in the number of labor force with senior high school or higher education will actually increase disparity in households with an elasticity of 0.70 percent, meaning that every increase in the share of the labor force having senior high school education and above by 1 percent will increase household income disparity by 0.70 percent. A labor force with higher education will increase household productivity and income, and in turn, household income. In the household level, improvements in education will widen the consumption disparity.

CONCLUSIONS AND SUGGESTIONS

Some conclusions of this study are as follows:

- The disparity among districts/cities on Java Island is quite high compared to the disparity among districts/cities within provinces and is dominated by disparity among cities.
- The regional GDP income convergence between regions on Java Island does not matter (divergence process occurs). On the other hand, household income

Table 6 The estimation results for the factors affecting regional disparity among dsitricts/cities between provinces on Java Island using the household income approach with the static panel data model

Variable	Coefficient	Std. error	Prob.
C	-10.5350	10.1538	0.3084
LOG(GOVEXP)	0.6262	0.6349	0.3324
LOG(AGRI)	-0.0532	0.4206	0.9003
LOG(MANU)	0.0976	0.3464	0.7801
LOG(EDU)	0.6953	0.3049	0.0304
LOG(PUSKES)	-0.6160	0.4641	0.1951
LOG(ELECTRIC)	0.1906	0.2612	0.4715
LOG(WATER)	-0.2351	0.1580	0.1478
LOG(ROAD)	0.2220	0.1417	0.1284
R-squared	0.6809		
Adjusted R-squared	0.4985		
F-statistic	3.7341		
Prob(F-statistic)	0.0011		

convergence is very high. This shows that there is a large outflow of income generated by industries within the districts/cities.

- The factors which affect the disparity in regional income are the manufacture sector, the labor force education, health infra structure, electrical power, and clean water. The disparity of household income is only affected by the labor force's educational level.

Based upon this study's conclusion, it is recommended that there be wiser industrial policy so there will be no depletion of the adjacent resources and it does not increase regional disparity among districts/cities. However, the manufacture sector needs to be enhanced in general and it must be more equally distributed throughout Java Island as it can reduce income disparity among provinces. The convergence process may be sped up through economic activities other than consumption, i.e. by equal distribution of investments and government policies. The labor input in economy does not only have a role in quantity but also quality. Therefore, the quality of human resources, especially the labor force, could be a strategic policy in reducing regional disparity. Improvements in education needs to be prioritized for low-income households as an effort to disrupt the poverty cycle which in turn will increase regional income convergence.

Infrastructure development as a part of investment holds an important role in the effort to decrease disparity on Java Island. Health infrastructure which is closely related to labor force productivity becomes an important solution, especially helath services that can reach all regions. Furthermore, infrastructural policies related to

industry, especially energy, need attention so that the development in this sector does not increase development disparity. Hence, policies to advise the shifting of industrial locations from urban areas to rural areas close to the location of the raw materials are needed in order to increase competitiveness.

REFERENCES

Badinger, H., Muller, W. and Tondl, G. (2002) Regional Convergence in the European Union (1985 – 1999). IEF Working Papers 47, pp. 7 – 17.

Baltagi, B. H. (2005) *Econometric Analysis of Panel Data*. Ed ke-3. John Wiley & Sons. Ltd.: Chichester, England.

Barro, R. and Martin, X. S. (1995) *Economic Growth*. McGraw-Hill: New York.

Blanchard, O. (2006) *Macroeconomics*. Prentice Hall Business Publishing: New York.

Bussoletti, S. and Esposti, R. (2004) Regional Convergence. Struktural Funds and the Role of Agriculture in the EU. *Dipartimento Economia,* **220**, 2 – 23.

Capello, R. (2007) *Regional Economics*. Routledge: New York.

Ding, S. and Knight, J. (2008) Can The Augmented Solow Model Explain China's Economic Growth? A Cross-Country Panel Data Analysis. Department of Economics Discussion Paper Series 380, pp. 18 – 32.

Firdaus, M. (2006) Impact of Investment Inflows on Regional Disparity in Indonesia [Dissertation]. Universiti Putra Malaysia: Malaysia.

Firdaus, M. and Yusop, Z. (2009) Dynamic Analysis of Regional Convergence in Indonesia, *International Journal of Economics & Management,* **3**, 73 – 86.

Jhingan. (2008) *Ekonomi Pembangunan dan Perencanaan*. PT. RajaGrafindo Persada: Jakarta.

Kaldor, N. (1970) The Case for Regional Policies, *Scottish Journal of Political Economy,* **18**, 337 – 348.

Kholodilin, K., Oshchepkov, A. and Siliverstovs, B. (2009) The Russian Regional Convergence Process: Where Does It Go?. Discussion Papers 861, pp. 12-18.

Krugman, P. (1991) Increasing Returns and Economic Geography, *Journal of Political Economy,* **99(3)**, 483 – 499.

Kuncoro, M. (2002) *Analisis Spasial dan Regional: Studi Aglomerasi dan Kluster Industri Indonesia*. UPP AMP YKPN: Yogyakarta.

Lee, H. A. and Azali, M. (2002) Evidence of Income Equality in Asian Countries, *Proceeding of Asia Pacific Economics and Business Conference*, pp. 22-28.

Lucas, R. (1988) On the Mechanics of Development Planning, *Journal of Monetary Economics,* **22**, 3 – 42.

Myrdal. G. (1957) *Economic Theory and Under-Developed Regions*. Duckworth: London.

Ralhan, M. and Dayanandan, A. (2005) Convergence of Income Among Provinces in Canada – An Application of GMM Estimation. Econometrics Working Paper EWP 0502:13-21.

Romer, P. (1986) Increasing Returns and Long-run Growth, *Journal of Political Economy,* **94**, 1002 – 37.

Rumayya, W. W. and Landiyanto, E. A. (2005) Growth in East Java: Convergence or Divergence?. EconWPA 0508:15-16.

Martin, X. S. (1994) Regional Cohesion: Evidence and Theories of Regional Growth and Convergence. Economic Working Paper 104:31-33.

Sjafrizal. (2008) *Ekonomi Regional: Teori dan Aplikasi*. Pranita Offset: Sumatera Barat.

Todaro, M. and Smith, S. (2006) *Pembangunan Ekonomi*. Ed ke-9. Erlangga: Jakarta.