The Role of Special Economic Zones (SEZ) in the Formation of Club Convergence in Indonesia

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Abstract

This study attempts to identify club convergence at the district level in Indonesia using the nonlinear time-varying factor model proposed by Phillips & Sul (2007). In addition, this study also aims to provide insight into the role of SEZ and the factors that responsible for the formation of club convergence by using an ordered logit model. The results of the study using real GDP per capita show that there are five convergent clubs and one divergent group in districts in Indonesia. Furthermore, this study also finds that the initial conditions of the average years of schooling, the ratio of investment to GDP, infrastructure index, district dummy, and SEZ dummy have an important role as a factor in forming a club convergence in Indonesia.

Keywords: Club convergence · Regional development · Log t regression test . Ordered logit

Background

Regional inequality is still a development problem that is quite important to discuss. Because one of the goals from Indonesian Government is equitable development in Indonesia. Based on the World Bank classification regarding income, it appears that Nusa Tenggara Timur Province is in the lower income category with real GDP per capita reaching only IDR 13.09 million, while DKI Jakarta Province is in the upper middle income category with real GDP per capita reaching IDR 174.96 million. The difference, which is quite significant, shows the regional inequality that still occurs in society. Furthermore, from BPS (Statistics Indonesia) data, it appears that the ratio between the region with the highest real GDP per capita, DKI Jakarta, and the region with the lowest real GDP per capita, Nusa Tenggara Timur, continues to increase until it reaches its peak in 2019. Increasing inequality is a major source of instability in society and also a major obstacle for the government to achieve its goals.

If we look back, one of the policies taken by the government to increase equitable development in Indonesia was to build Special Economic Zones (SEZ) that are spread throughout Indonesia. The existence of SEZ is expected to have a positive impact on the area and its surroundings because the development of SEZ also accompanied by the construction of facilities that can maximize industrial activities, exports, imports and various other economic activities, as well as creating international competitiveness.

SEZ is a manifestation from the 4 (four) priority agenda of Nawacita, which is to develop Indonesia from the outskirts by strengthening regional and village areas within the framework of a unitary state, improving the life quality of Indonesian people, increasing people's productivity and competitiveness in international markets and externalize economic independence by develop strategic sector of the domestic economy. Based on the 2015-2019 RPJMN, SEZ is directed as a center for natural resource-based growth and leading sector activities as the main driver of regional development. SEZ development is carried out from preparing areas that have regional geoeconomic and geostrategic advantages, providing special facilities and incentives to attract investment. SEZ not only emphasizes accelerating regional economic growth and equitable development, but also encourages the increased of value added based on authorization of technology and human resources.

Based on the "2019 Annual Report of the National Council for Special Economic Zones", each district or city with SEZ experienced an increase about 14.68% in GRDP (Gross Regional Domestic Product) between 2016-2018. The same thing also happened to the increase in PAD (Regional Income) of districts or cities in which SEZ located around 68.85% in the same year. This is in line with the results of Jones et al. (2003) who found that cities in special economic zones (SEZ) and around the coast enjoyed higher levels of economic growth than other cities. Seeing the phenomenon related to the success of SEZ in increasing regional income, it is necessary to carry out research to see whether SEZ has an influence on improving people's welfare and also achieving equitable development in Indonesia.

One method that can be used to see whether there is equal distribution of development or vice versa, regional inequality, using the convergence test. The convergence test has several approaches, including new classical convergence and club convergence. To overcome some of the weaknesses of the new classical convergence, Phillips & Sul (2007) developed a convergence test with the log t-test (club convergence). Seeing the advantages of using the club convergence test, it would be interesting to apply in this research, related to conditions of equitable development in Indonesia, and also to seek more detailed information regarding factors that can form club convergence in Indonesia. Based on the results of a study literature, this research will focus on identifying the factors that form club convergence at the district/city level in Indonesia and looking at the role of SEZ in the formation of club convergence in Indonesia.

Reference Overview

Since the end of World War II, discussions related to economic growth have focused on the Solow-Neoclassical model. In this model, labor and fixed capital combined with a certain framework of technological progress will produce a certain amount of output. Considering that

input factors have diminishing marginal returns, every economy will converge to a steady state condition characterized by a stable balanced growth path in the long term.

Convergent theory in economics is the hypothesis that countries that have a smaller per capita income will grow faster than countries that have a larger per capita income. There are two concepts of convergence that are generally known, absolute convergence and conditional convergence. Absolute convergence assumes that economies in the long run will converge towards the same steady state value regardless of the initial conditions of each economy. Meanwhile, conditional convergence says that economies in the long term will converge towards their respective steady state values where the steady state value depends on saving, labor growth, and also technology

In contrast to conditional convergence, club convergence says that economies will converge towards the same steady state value in similar clubs but the steady state between convergent clubs is different. In other words, members from a lower convergent club cannot move or converge to a higher convergent club, and can only converge with members of the same club. The reasons why the steady state differences between these clubs are structural barriers in the form of education, infrastructure, investment, and others. These structural barriers are the one which make low convergent clubs unable to converge to higher convergent clubs.

Development of Club Convergence Testing in Indonesia

Studies related to convergence using the club convergence method have generally been carried out in various countries, including Indonesia. Research conducted by Aginta et al. (2020) shows that in the dynamics of district/city income there are five significant convergence clubs. This implies that there is still the problem of income disparities between districts even after the implementation of decentralization policies.

At the provincial level, Mendez & Kataoka (2021) analyze regional inequality more comprehensively using labor productivity, capital accumulation and efficiency during the 1990-2010 period. The study results show that based on the provincial composition of each convergence club and the low level of efficiency throughout Indonesia, substantial improvements in both capital accumulation and efficiency are still needed to reduce regional disparities and accelerate productivity growth.

Factors Forming Club Convergence

From empirical studies in various literature, it was found that there are several factors or barriers that have an effect on the formation of club convergence. To test the influence of initial conditions, Quah (1996) said that initial levels in per capita income, physical capital accumulation,

human capital accumulation are important factors that determine the formation of club convergence. Physical capital can be in the form of investment in infrastructure development which has a positive impact on the economy. An increase in accumulation of physical capital will increase labor productivity which will spur increased economic growth and ultimately improve social welfare. The higher the welfare of the people of an area, the greater the possibility of that area being in a convergent club with higher per capita income.

Advances in science (knowledge) make education an important factor in the formation of human capital. The human capital accumulation variable can be reflected by the average years of schooling and school participation rates at a certain educational level. Tilak (1989) stated that the essence of human capital is education which is able to stimulate labor productivity so that it has an effect on economic growth. Therefore, investment in human capital can increase quality human resources so that they become potential assets in development (Galor and Moav 2004).

Apart from the accumulation of physical capital and human capital, Frenken & Hoekman (2006) argue that networks, such as states or provincial capitals, have a role in global trade and tend to converge more quickly than other regions. Therefore, the district/city dummy is used as a proxy to see the impact of district/city type in the formation of convergent clubs.

Borsi & Metiu (2015) and Dapena et al. (2016) found that spatial interaction effects can be an important factor in spatial dependence between regions, implying that regions or regions tend to cluster geographically and form convergence clubs. Reflecting on these findings, this research uses SEZ to see its role in the formation of convergence clubs. The development of Special Economic Zones (SEZ) in Indonesia focuses on accelerating regional economic growth and encouraging the realization of SEZ which are able to build value added for human resources and authorization of technology.

Empirical Method

Data Sources

The variables that will be used in this research based on previous literature studies are real GDP per capita, initial condition from average years of schooling, and ratio of investment to GDP, infrastructure index, SEZ dummy and district/city (region) dummy. The data that will be used as a proxy for the initial condition variable is the ratio of investment to GDP, and the average number of years schooling. Other data that will be used are infrastructure index data that are compiled from 2011 PODES data. All the data above comes from BPS (Statistics Indonesia) publications. To see the influence of SEZs on the formation of club convergence, a dummy variable will be used which will have a value of 1 if there is a SEZ in the region and a value of 0 if there is not. Likewise with the dummy variable for districts/cities: it will have a value of 1 if it is a city and 0 if it is a district.

Data

Based on observations of real GDP data, population, investment ratio, and average years of schooling, there was a lot of empty or unfilled data in the first few years of the research. The reasons for the empty data, such as the expansion of districts/cities that occurred at the beginning of the research year, 2012, 2013, and 2014. To overcome this, the researcher restored the condition of the research data to the condition of the districts/cities at the beginning of the research year, 2010. From the research time period, 2010-2019, there were seventeen districts/cities that experienced expansion. Among of the seventeen districts/cities, four districts/cities experienced expansion in 2012, ten districts/cities experienced expansion in 2013, and three districts/cities experienced expansion in 2014.

To obtain real GDP per capita data, the real GDP and population data need to be changed to the number of districts/cities to match the number of districts/cities in 2010 (497 districts/cities) using the previously established frame. After obtaining data that has been converted to 2010 conditions, the real GDP data is divided by data population of each district/city so that real GDP per capita can be obtained. This real GDP per capita data is used to test the existence of convergence clubs and also the number of convergence clubs that have been successfully formed. The real GDP per capita data used is in the form of panel data with the time period used being 2010-2019 in 497 districts/cities.

The variable average years of schooling is used as a proxy for education, which is one of the core elements of human capital. The data used is cross-section data from 497 districts/cities in 2010. Similar to real GDP per capita, the average length of schooling data obtained from 514 districts/cities so it must be changed to adjust the conditions of the existence of the districts/cities in in 2010 (497 districts/cities). To change the average length of school to match conditions in 2010, the average for the districts/cities that experienced expansion was used.

The ratio of investment to GDP is used as a proxy for physical capital. In line with the average years of schooling, the data used is cross-section data from 497 districts/cities in 2010. Similar to real GDP per capita, the ratio of investment which has been converted to adjust the conditions of existence of districts/cities in 2010 can be obtained by dividing investment data (using PMTB data) with GDP data.

The infrastructure index was compiled from PODES 2011 data using eleven indicators, including: availability and access to high school and equivalent (I1), availability and access to hospitals (I2), availability and access to community health centers (I3), availability of shops, minimarkets , or grocery store (I4), availability and access to restaurants, restaurants, or food stalls (I5), access to hotel or lodging accommodation (I6), availability and access to banks (I7), access to electrical energy (I8), availability and quality of cellular communication facilities (I9), traffic and

road quality for inter-village transportation (I10), and road accessibility (I11). Each indicator must have a contribution to the infrastructure index. The magnitude of the contribution of each indicator illustrates the magnitude of the indicator's influence on the formation of the infrastructure index. To obtain the contribution of each variable, the principal component analysis (PCA) method is used. Next, the contribution value of each indicator is used as a weight for each indicator to produce an infrastructure index value. The infrastructure index value is obtained from the weighted addition of each indicator that makes up the infrastructure index.

Empirical Strategy

The log-t test method developed by Phillips & Sul (2007) is very easy to apply in practice, because it only involves a simple linear regression test and a one-sided regression coefficient test with normal and standard critical values. This method has many purposes, including testing unconditional convergence as a whole, forming convergence clubs, and also testing convergence in each of these clubs. The advantage of this log-t test method is that the test does not depend on certain assumptions regarding trend stationarity or stochastic nonstationarity in X_{it} or μ_t. Moreover, equation (3.3) is flexible enough to include various possibilities in terms of time paths for δ_{it} and its heterogeneity along i.

The stages of club convergence testing that will be carried out are:

Log-t convergence test

To test the convergence hypothesis and identify the existence of clubs, the method developed by Phillips & Sul (2007) will be used.

The null and alternative hypotheses that will be used are:

$$H_0: \delta_i = \delta, \text{ dan } \alpha \geq 0 \quad (3.1)$$

$$H_a: \delta_i \neq \delta, \text{ dan } \alpha < 0 \quad (3.2)$$

The null hypothesis is tested using log-t regression in the following equation (3.3):

$$log\left(\frac{H_1}{H_t}\right) - 2log[log(t)] = \hat{\Upsilon} + \hat{\beta}\log(t) + \varepsilon_t \quad (3.3)$$

$$H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \rightarrow 0 \text{ ketika } t \rightarrow \infty \qquad h_{it} = \frac{X_{it}}{N^{-1}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{N^{-1}\sum_{i=1}^{N} \delta_{it}}$$

for $t = [rT], [rT] + 1, \ldots, T$, for all $r > 0$, where $r \in (0{,}2; 0{,}3)$, $r = 0{,}2$ when $T \leq 50$; and $r = 0{,}3$ when $T \geq 100$. Based on recommendations from Phillips & Sul (2007), in this research we will use $r = 0{,}3$. The $\hat{\beta}$ is coefficient of $log(t)$ and $\hat{\beta} = 2\hat{\alpha}$, which $\hat{\alpha}$ is *speed of convergence*. $\hat{\alpha}$ parameter is speed (*rate*) in which *cross section* varians during the transition decays or converge to zero from time to time. Using $\hat{\beta}$ value, null hypothesis $\alpha \geq 0$ will be rejected when value from $t_{\hat{\beta}}$ less than -1,65 at the 5 (five) percent significance level.

Convergence club clustering algorithm

The club clustering algorithm was introduced by Phillips & Sul (2007) to detect the existence of clubs, as follows:

Stage 1 *Ordering*

Panel data is arranged in descending order from the last observation.

Stage 2 *Core Group Inforation*

First, G_n *core group* formed between two regions by conducting a log-t test for n=2 first region. If $t_{\hat{\beta}}(n = 2) > -1{,}65$, then the regions will forms G_n *core group*. Second, log-t test run for the next region and this core group and if $t_{\hat{\beta}}(n = 3) > t_{\hat{\beta}}(n = 2)$, then the region is added to G_n *core group*. This stage will continues to repeat until $t_{\hat{\beta}}(n) > t_{\hat{\beta}}(n - 1)$. *Core group* with n^* size selected by maximizing $t_{\hat{\beta}}(n)$ greater than k until min $\left[t_{\hat{\beta}}(n)\right] > -1{,}65$, which $2 < n^* < N$.

Stage 3 *Club Membership*

After the formation of the core group, regions that not included in the core group were identified and added to the core group and the log-t test was run again. If $t_{\hat{b}}(n) > 0$, then the new region is included in the club.

Stage 4 *Stopping Rule*

For regions that are not selected in stage 3, the log-t test is applied, and if the statistic test is greater than -1.65, these regions will form another convergence club. If not, then stages 1 to 3 are repeated again for this group.

Stage 5 *Club Merging*

To combine two or more clubs into a new club, Phillips & Sul (2007) propose using the log-t test for nearest clubs after the club clustering process or stage 4. The log-t test is carried out on all pairs of clubs (at least 2 clubs tested), and if the convergence hypothesis is met, then the clubs can merge to form a new club. For example, if $t_{\hat{\beta}}(n) > -1{,}65$ for two clubs; club 1 and club 2, then these two clubs can form one new club.

Ordered Logit Model

The club clustering method used by Phillips & Sul (2007) can identify club convergence for heterogeneous individuals, but cannot be used to determine the factors that lead to the formation of these clubs. Bartkowska & Riedl (2011) used an ordered logit model to identify factors that determine club formation. This is because the convergence clubs can be sorted according to the steady state conditions of real GDP per capita from each convergence club.

This research also uses the Ordered Logit Model method to test and explain the variables that form convergence clubs. The ordered logit model method is used because the dependent

variable in this model is a sequential categorical variable which is divided into six clubs or levels. The independent variables in this study are three continuous variables and two dummy variables. The ordered logit model allocates each district/city to one convergence club, denoted as c=1,2,…,6, which is a categorical variable (convergence club). So the model equation that will be used in this research are:

$$y_i^* = x_i'\beta + \varepsilon_i \quad (3.4)$$

which y_i^* is unobserved dependent variable (ordinal) and ε_i has logistic distribution. Joint estimation from β are maximum likelihood (ML). x_i vector consists of independent variables that determine a particular convergence club for the each district/city, which are average years of schooling, the ratio of investment, infrastructure index, district/city dummy, and SEZ dummy. In this case, the β coefficient does not have a sufficiently precise economic interpretation, so to assess the importance of the variable in determining club membership, the marginal effect of predicted probablities is estimated.

Marginal effects provide an estimation of how the probability being part of a club changes for each unit change in one of the independent variables, assuming all other variables remain at their sample means. Then, for the goodness of fit test, we will use McFadden's R^2, which is often used as a likelihood ratio index.

Result and Discussion

Development of Special Economic Zones (SEZ) in Indonesia

Out of nineteen SEZs in Indonesia, seven of them are still in the development stage and the other twelve have been operated. The operational years from the twelve SEZ are different for each other, with the earliest SEZ operating are the Sei Mangkei SEZ which is located in Simalungun Regency, Sumatera Utara Province. Several region in which SEZ located have experienced accelerated economic growth. This shows that SEZ able to provide additional income for the regions and also increase the income of local community. However, there are also several regions, SEZ located, did not experience an increase in growth and instead slowed down. Some of the causes of the slowdown in the SEZ location are the lack of investment.

However, if we look at the gini ratio before and after the operation of the SEZ, it shows that only around four regions experienced an improvement in inequality or their gini ratio decreased. Meanwhile, the remaining seven regions experienced an increase in inequality and one regions experienced no change. In terms of poverty, it appears that there are seven regions where the number of poor people has decreased, while five other regions have experienced an increase in poverty. This is quite an interesting phenomenon considering that the aim of SEZ is to equalize development in Indonesia. The statistics show that after the operation of the SEZ, economic growth

in the region has increased, most regions have experienced a decrease in the percentage of poverty, but this does not necessarily reduce the inequality that occurs among the population in the region.

Identify Club Convergence

To overcome long run behavior in growth, we used the Hodrick–Prescott (HP) filter on real GDP per capita data. This filter able to separate time series into trend and cyclical components. According to Phillips & Sul (2007), an HP filter is needed before identifying clubs. To categorize countries into several clubs, log t regression was used using equation (6) and the results are presented in Table 1 below.

Table 1 Phillips & Sul Log-t Regression Results

	$\widehat{\boldsymbol{\beta}}$	SE	T-stat
log(t)	**-0.86**	**0.06**	**-14,29**

From Table 1, it appears that the estimated $\hat{\beta}$ is -0.86 and the t-statistic value is -14.29, which indicates it is statistically significant at the 5 percent significance level. Thus, the log-t regression results show evidence that there is rejection of the null hypothesis (H_0), there is unconditional convergence in the regions as a whole. These results provide evidence that there is divergence in real GDP per capita among 497 districts/cities in Indonesia. The existence of evidence of rejection of unconditional convergence in the entire sample does not necessarily indicate that the regions are not converging at the same level. To prove this, convergence clubs were identified. Club identification can be done using the club clustering algorithm initiated by Phillips & Sul (2007). The formation of clubs at this stage is based on regions that have similar levels of per capita income and economic structures.

The results of the initial test of convergence clubs using the log-t test showed that the real GDP per capita of 493 regions in Indonesia initially converged to the six clubs and two nonconverged groups. Apart from that, from the results of club convergence testing at this initial stage, it was also found that there were four districts/cities that were not included in the eight convergence clubs. These regions include Kota Jakarta Pusat, Kabupaten Kepulauan Anambas, Kabupaten Kutai Timur, and Kabupaten Sumba Barat Daya. The result of eight convergence clubs from this initial test need to undergo another test, merge clubs, to see whether there are clubs that can merge into 1 club or larger group. The club merger test uses the club merger test which was also initiated by Phillips & Sul (2007) and the results are shown in Table 2.

From table 2, it can be seen that after carrying out the merge clubs test, five convergence clubs and one non-convergence group were obtained. There are differences in terms between clubs

and groups used in this research. Clubs are used for clusters which members are convergence. This can be seen from the results of the t-test, if it turns out that the test results with the log t-test show significance and the value of $\hat{\beta} > 0$ then the club has strong convergence. If the t-test is not significant, for $\hat{\beta} > 0$ and $\hat{\beta} < 0$ then the club has weaker convergence compared to other clubs. In contrast to clubs, the term group is used for clusters that have $\hat{\beta} < 0$ and are significant. From the results of the club merging test, it was found that club 2 and club 3 were able to merge into one larger club, as well as group 4 and group 5 which merged into one nonconvergence group. The merger of group 4 and group 5 was carried out because the two groups are divergent groups, where the regions within them are not moving towards the same steady state. Because the members in the group do not go to the same steady state, the two groups can be combined into one larger divergent group.

From Table 2, it appears that club 1, club 2, club 3, and club 6 are included in weak convergence because they have insignificant t-statistics ($t_{hit} > -1{,}65$). Club 5 has $\hat{\beta} > 0$ and is statistically significant, meaning that this club has quite strong convergence compared to the other clubs. Group 4 has $\hat{\beta} < 0$ and is statistically significant, which shows evidence of no convergence (non-convergence) between regions in that group. Speed of convergence ($\hat{\alpha}$) differs between clubs. Interpretations related to speed of convergence can only be made for clubs that have a value of $\hat{\beta} > 0$ and significant, in this case it only occurs in club 5. Regions in club 5 converged at a rate of 0.60 percent.

Apart from that, measuring the gap between convergence clubs also useful for understanding the disparity in per capita income between convergence clubs. This can be seen from the average per capita income of each convergence club. It appears that there is a fairly large gap in per capita income between clubs, especially between club 2 and club 3, where the average per capita income for regions in club 2 is IDR 198.06 million, around 2.79 times greater than the average per capita income of regions in club 3. The average of real GDP per capita can also reflect the quite severe income inequality between regions in Indonesia, where the average per capita income in the last club, club 6, only around 2.76 percent of the average per capita income in club 1.

Another interesting phenomenon is regions that are in the same province are not always in the same convergence club. For example, DKI Jakarta Province is the province with the highest real GDP per capita in Indonesia. Out of the 6 regions in DKI Jakarta Province, there are 4 regions that are included in club 2, 1 region in club 3 and there is also 1 divergent region, Kota Jakarta Pusat. From this phenomenon, it can be seen that research related to club convergence using the provincial level as the unit of analysis tends to be less effective because it does not take into account the

existence of quite large economic levels between regions in the same province, thus affecting the correct assessment of the existence of club convergence.

Table 2. Results of Club Convergence in Indonesia

Club	$\widehat{\beta}$	*std.err*	*t-stat*	*Speed of convergence (â)*
(1)	**(2)**	**(3)**	**(4)**	**(5)**
Club 1	0.226	0.344	0.656	-
Club 2	-0.596	0.451	-1.321	-
Club 3	0,021	0.457	0.046	-
Group 4	-1.070	0.030	-31.160	-
Club 5	0.121	0.063	1.899	0.060
Club 6	-0.059	0.087	-0.672	-

Factors that forming Club Convergence in Indonesia

After identifying the existence of club convergence and its members, which was formed due to similarities or being at a similar level in terms of per capita income or economic structure, the next stage is to identify the factors that form convergence clubs or structural barriers that differentiate one club from another using an ordered logit model. In this model, the dependent variables used are clubs and groups from each regions which are represented by categorical variables with values from 1 to 6 and the regression results are presented in table 3. Table 3 reports the average marginal effects to the probability of being part of each club.

Table 3. A*verage Marginal Effect* on the Probability of Each Club: *Full Model*

Club	Control Variable				
	YOS	**I**	**Infrastructure Index**	**Dummy Regions**	**Dummy SEZ**
Club 1	**0.0009**	**0.0005*** **	**0.0001** **	**-0.0056** **	**-0.0024** **
	(0.0006)	**(0.0001)**	**(0.0000)**	**(0.0024)**	**(0.0012)**
Club 2	**0.0040***	**0.0024*** **	**0.0006*** **	**-0.0243** **	**-0.0106***
	(0.0022)	**(0.0007)**	**(0.0002)**	**(0.0096)**	**(0.0057)**
Club 3	**0.0157*** **	**0.0093*** **	**0.0022*** **	**-0. 0951*** **	**-0.0416** **
	(0.0061)	**(0.0017)**	**(0.0006)**	**(0.0214)**	**(0.0170)**
Group 4	**-0.0097***	**-0.0057*** **	**-0.0013*** **	**0. 0586** **	**0.0256***
	(0.0055)	**(0.0016)**	**(0.0005)**	**(0.0232)**	**(0.0140)**
Club 5	**-0.0049** **	**-0.0029*** **	**-0.0007** **	**0.0299*** **	**0.0130** **

Club	Control Variable				
	YOS	I	Infrastructure Index	Dummy Regions	Dummy SEZ
Club 6	**(0.0021)**	**(0.0011)**	**(0.0003)**	**(0.0101)**	**(0.0058)**
	-0.0060**	**-0.0036*****	**-0.0008*****	**0.0365*****	**0.0160****
	(0.0024)	**(0.0010)**	**(0.0003)**	**(0.0107)**	**(0.0069)**

Notes: Pseudo R^2=0.3134; Log pseudolikelihood=-362.9038; standard errors written in brackets. ***p<0.01, **p<0.05, *p<0.1

From Table 3, it can be observed that average years of schooling, the ratio of investment , infrastructure index, districts/cities dummy, and SEZ dummy play an important role in club formation. This can be seen through the t-statistical values for all clubs which show significance with different levels of significance except for club 1 in the average years of schooling variable. This shows that all the variables used have an influence on the formation of convergence clubs in Indonesia.

The regression results with the ordered logit model in table 3 show that the average years of schooling variable in this study has an influence on the formation of most clubs and groups. An increase in the average years of schooling by one year in a region will increase the probability of that region entering club 2 and club 3 by 0.40 percent and 1.57 percent, respectively. Apart from that, an increase in the average years of schooling by one year will also reduce the probability of a region being part of group 4, club 5, and club 6, each, by 0.97 percent, 0.49 percent, and 0.60 percent. This shows that the higher the average years of schooling in a region, the probability of that region become part of a club that has a high average per capita income will increase.

The ratio of investment to GDP of each regions has a positive impact on the formation of club 1, club 2, and club 3. An increase in the investment ratio to GDP will increase the probability of the regions become part of club 1, club 2, and club 3 by 0.05 percent, 0.24 percent, and 0.93 percent, respectively. In addition, an increase in the ratio of investment to GDP will reduce probability the region will be in group 4, club 5, and club 6 respectively by 0.57 percent, 0.29 percent, and 0.36 percent. This indicates that investment is generally still concentrated in areas with high per capita income or fairly advanced regions.

The regression results in table 3 show that an increase of one unit in the infrastructure index will increase the probability of a regions become part of club 1 by 0.01 percent, club 2 by 0.06 percent, and club 3 by 0.22 percent and will also reduce the probability of being part of group 4, club 5, and club 6 by 0.13 percent, 0.07 percent, and 0.08 percent, respectively. Looking at these results, it can be seen that the higher the increase in the infrastructure index of a regions, the greater the probability of that regions being part of a club that has a higher average real GDP per capita.

The Role of Special Economic Zones (SEZ)

If we look at the existence of SEZs in the convergence clubs that have been formed, it is found that SEZs are only in club 3 (one unit) and group 4 (nine units). From these findings it appears that SEZs are generally located in regions with lower-middle income conditions, which had average GDP per capita in the range of IDR 16.15 million to IDR 19.70 million. This is in line with the focus strategy of the SEZ that had been carried out in Indonesia, which is more on specialized zones, where the selection of SEZ locations in Indonesia is still based on the availability of resources and lower middle class regions. It can also be seen that the sign of the marginal effect on the SEZ dummy variable shows that the existence of a SEZ in a regions will reduce the probability of that regions become part of club 1, club 2, and club 3, as well as increasing the probability that the regions will be part of group 4, club 5, and club 6 which can be said to be clubs with low to middle and low per capita income.

Conclusion and Policy Implications

Conclusion

From the research that using the nonlinear time-varying factor model initiated by Phillips & Sul (2007), it can be concluded that regions in Indonesia as a whole do not have unconditional convergence. This is also supported by the findings from the convergence club test, where around 84.41 percent of districts/cities were in the divergent group. Meanwhile, 15.59 percent or 76 other districts/cities showed convergence in their respective clubs.

After identifying the convergence clubs, in order to obtain further information regarding the factors that forming convergence clubs, the ordered logit model was used. This model can identify the control variables that significantly form the convergence club and see the magnitude of these control variables on each convergence club. The control variables used in this study are average years of schooling, the ratio of investment, infrastructure index, districts/cities dummy, and SEZ dummy. From the results of testing with the ordered logit model, it was found that all control variables used significantly influenced the formation of the convergence club.

Policy Implications

The number of convergence clubs obtained from the results of this research is six convergence clubs, providing insight to policy makers that the income gap in Indonesia is still quite worrying. All of the regions did not converge towards the same steady state, but rather towards six different steady state values. Seeing evidence of regional inequality that still occurs in this society, policy makers can implement policies related to regional development that differ between clubs. For

example, regional development policies for regions in club 1 could be directed at finding new sources of growth to avoid income stagnation. Then the regional development policy for clubs 5 and 6 is more focused on developing basic infrastructure and providing public services that can encourage accelerated development.

In this research, SEZ become the main focus in which the government hopes SEZs can help them to achieve equitable development between regions. From the test results, it was found that the SEZ development had no significant effect on equitable development or reducing regional inequality. This could be due to the small number of SEZs operating in Indonesia. This needs to be a concern for policy makers to increase the number of SEZs in Indonesia, especially to improve the quality of existing SEZ infrastructure, simplicity in customs procedures, and reform of labor regulations. The quantity and quality of production and distribution supporting facilities must be increased according to the criteria of each club so as to strengthen industrial integration. In this way, industry can more easily obtain resources such as labor, raw materials, energy, capital, etc., and maximizing the distribution network so as to increase industrial competitiveness.

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