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DETECTING THE CONVERGENCE CLUBS AND CATCH−UP IN GROWTH

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ABSTRACT

We conduct empirical panel data analysis to detect the catching- up effect in growth and the possibility to form different convergence clubs in selected Europe and Asian economies. In particular, we seek to investigate if the selected countries are able to catch- up to the growth level of developed economy of the United Kingdom (U.K.). The control variables used to test for conditional convergence include inflation, trade, net inflow of foreign direct investment, total population and government consumption expenditure. Our results reveal that all economies except Turkey and India are able to catch- up with U.K. economy. The economies in both regions of Europe and Asia are able to form their convergence clubs.

Keywords: Catch–up effect, Convergence, Panel data analysis

INTRODUCTION

The research on economic growth remains interesting and continuing as it is the core objective of economic policy. Research scope for economic growth is broad. Many growth models are proposed to explain the dynamic of growth. Among these models include Solow Swan model, panel data model and neoclassical growth model. Economists are interested to identify the determinants to different growth levels across economies. The main determinants of growth include income per capita, trade openness, gross domestic product, schooling level, inflation and population. Besides previous studies also concern about the impact of growth on the environmental quality. For instance, Johansson (2001) conducted an empirical analysis on the impact of growth on air quality in the United States (U.S.). The author found that greater economic activity inevitably leads to degradation in air quality in U.S., i.e. economic growth has a negative impact on environmental

quality. Similar results also found in Chen (2007), Lee *et al.* (2005), and Panayotou (2003).

Apart from these, some studies seek to compare the catch–up effect and convergence of growth between developed and developing economies. The examples include Chen (2002), De la Fuente (1997), and Felipe (2000). These studies revealed evidence of developing economies catching up to developed economies. Other studies reported no evidence of catching-up effect such as Li (1999) and Wane (2004). We continue the analysis of previous studies on convergence in growth by comparing the growth convergence in two groups of economies, i.e. Europe and Asia. In particular, we seek to answer the following questions: Does the economic growth in Europe and Asia can catch–up with the growth level in the leading country like the United Kingdom? Are the growth in Europe and Asia enable them to form a convergence club among their region? United Kingdom is selected to be the benchmark country for comparison. The control variables to be tested in the analysis of conditional convergence include inflation, trade, foreign direct investment net inflow, total population and government consumption expenditure.

Using conditional β–convergence concept, the results show that the two groups of regions (Europe and Asia are able to form two different convergence clubs based on their region. Results of stochastic catch–up indicate that only Turkey and India are not able to catch–up with the benchmark country, United Kingdom (U.K.). However, the conditional catching up tests shows that all economies in Europe and Asia are able to have conditional catch–up by conditioning to some control factors.

The rest of the discussion is organized as follows. Section II discusses the literature review and some concepts of the topic. Section III is about methodologies. Section IV discusses the findings. We divide the results into two main parts, i.e. results for catch–up and convergence club. Finally, Section V concludes.

LITERATURE REVIEW AND CONCEPTS

Types of Convergence

Catch–up effect sometimes refers as the theory of convergence. It is easy for a poor country to become a little richer in the sense of increasing per capita Gross Domestic Product (GDP) but it is difficult for a country which is already rich to become richer. Both countries becoming richer but the poorer countries tend to grow at a faster rate compared to the richest countries (Zhang, 2003). Convergence of growth rate is also one of the propositions in Harrod-Domar growth model. Analysis of catch–up effect in this study basically is based on the concept of stochastic convergence and β–convergence (conditional).

There are three types of convergence, σ–convergence, absolute β–convergence, and conditional β–convergence. σ–convergence occurs when the dispersion of income per capita declines over time across countries (Tiruneh, 2003). If each territory converges to its own steady state by conditioning (control variable), we call it as conditional β–convergence (Tiruneh, 2003). A poor country that has conditional β–convergence is said to have conditional catch–up which is controlled by some determinants or control variables.

On the other hand, absolute β–convergence suggests the equalization of per capita income in the long run (Felipe, 2000), poor and rich countries will converge to the same steady state in income per capita somehow poor countries have the fastest growth rate (Ismail, 2008). It implies the poor country able to catch-up by conditions if the country has conditional β–convergence. Mutaqin and Ichihashi (2012) obtained the same result as Ismail (2008) where ASEAN region converged only conditionally. Mutaqin and Ichihashi (2012) have also proven that Eurozone region converged only conditionally. Convergence of growth is a hypothesis that a poorer countries have faster growth rate compare to richer countries. As a result, the idea of convergence is also referred as catch–up effect (Felipe, 2000).

Convergence Club

Convergence clubs represent the levels of international attainment of a country. Groups of countries are classified based on the education levels, income per capita, human capital, and any other measurable factors that can be obtained in the countries. For instance, a convergence club at a low level of per capita wealth is created when a very poor or "Third World" country tends to converge towards one another. For rich or developed countries like the United State (U.S.) and Western European countries, they are grouped into a higher income per capita convergence level (Li, 1999). The level of initial conditions such as per capita income and human capital plays an important role in determining the formation of the convergence club (Bernard and Durlauf, 1995). To prevent a very poor country from jumping from one level to a higher level of convergence club, barriers are introduced. The range of barriers can be educational limitations, lack of resources, poor infrastructure etc. Convergence clubs are useful in inspecting the development of a country's economy with reference to other countries. With all these groups, we can identify the similarities or differences between countries and easy for researchers in making generalized hypotheses (Bernard and Durlauf, 1995).

Previous studies on the ability of forming convergence club and catching up effects show that exports play an important role in economic growth in East Asian countries (Fukuda and Toya, 1995). According to (De la Fuente, 1997), investment in human and technological capital is important in the growth process. However, there exist some conditions that are not sufficient or unnecessary for country growth like saving rate, external or foreign financial aid. Li (1997) stated, an increase in initial physical capital or having external financial aid per capita may help to

increase growth rate in the short–term, but these are not necessary or sufficient conditions for catching up. Factors like preferences and perception or languages are not the key determinant of development for a various ethnic and religious group countries (Li, 1997). However, the factors of key determinant for a follower country to catch–up are adequate location, initial human capital and institutional arrangement. Same result obtained by Wane (2004). Natural resources, extra initial physical capital or external financial aid per capita are unnecessary and not sufficient conditions for catching up (Li, 1997).

According to (Li, 1999), convergence club exists between the richest countries; where else the poorest countries exhibit a diverging trend. However, convergence club also exists among some middle–income groups although the majority of the moderate–income groups diverge. Siano and D uva (2006) have slightly different results, poorest regions have the highest growth rate while richest regions have second highest growth rate. However, there are same results obtained among the researches where medium groups have the lowest growth rate. The conclusion made by (Park, 2000) is consistent with the stylized facts, where the economic growth in poorer regions has a faster growth rate although convergence does not hold during a period of time.

Determinants of Growth and Speed of Convergence

According to Permani (2008), there is a significant influence of human capital measured by the schooling level on East Asian countries. In order to achieve sustainable growths, education can be taken as a long–run policy tool (Permani, 2008). As concluded by Felipe (2000), advanced Asian countries have the ability to reduce the income gap with US faster. Higher educated countries tend to learn and adapt new technology faster and easier compared to those lower educated countries (Wolff, 2000). However, Wolff (2000) stated that the interaction effects between schooling and research and development (R&D) were not significant determinants of country labor productivity growth. According to Morgese *et al.* (2008), labor and capital play an important role as the determinant of economic growth. Same result attained by Morgese *et al.* (2008) and other researchers such as Chien *et al.* (2006), growth in Total Factor Productivity (TFP) is an important determinant of growth. As mentioned by Chen (2002), the importance of technological change in economic growth depends on how TFP is defined and measured. This is also consistent with the Solow growth model.

There exists a common view from researchers that poorer countries tend to grow faster than developed or richer countries with conditional convergence De la Fuente (1997). If the labor productivity of follower countries converges to the leader countries, the follower countries are said to be catching up (Li, 1997). The speed of convergence for each country is different. Some countries have faster speed of convergence but some might be slower. The speed of convergence mainly correlated with proxies of economies' openness and indicators of flexibility (Wane, 2004). According to Morgese *et al.* (2008), with the evidence of conditional convergence, countries with a

lower initial level of GDP tend to grow faster. Based on Sala-i-Martin (1996), developed countries such as US, Canada and Japan tend to converge at a similar speed which is quite slow, about two percent per year. On the other hand, Ismail (2008) showed evidence that poor countries in ASEAN do catch–up with the rich one with the speed of convergence about 1.6% to 16.6% in his research. Mutaqin and Ichihashi (2012) in their study show that ASEAN has better performance than the Eurozone in terms of growth and convergence in income, productivity and unemployment.

Many studies reported the evidences of convergence on growth. Despite different methods applied, most researchers have same results in proving that poor countries tend to converge to a steady state growth rate with a faster speed of convergence (up to sixteen percent per year) compared to the rich countries. As a result, poor countries will catch–up with the rich countries and converge to the same per capita GDP as that of rich or developed countries in the long-run.

DATA AND METHODOLOGY

This paper divides the analysis into two main parts, i.e. catch–up and convergence club. The testing of these two conditions is based on the concept of stochastic and conditional β–convergence. We apply the Seemingly Unrelated Regression Augmented Dickey–Fuller (SURADF) technique which is the combination of SURADF and Augmented Dickey-Fuller (ADF) test to detect the stochastic catch–up and stochastic convergence club. Ordinary Least Square (OLS) and panel data analysis are used to detect the β–conditional catch–up and the possibility to form the β–conditional convergence club. U.K. is selected as the benchmark country of catch–up. The control variables for convergence club include GDP in constant U.S Dollar term, general government final consumption expenditure in percentage of GDP, trade in percentage of GDP, total population of each country, inflation in percentage and foreign direct investment net inflow in percentage of GDP. The data is in annual frequency spanning from 1960 to 2009. The data are obtained from International Financial Statistics (IFS) and World Economic Outlook Database (WEO).

We compare the results of two groups of economies, i.e. European and Asian. The countries selected depend on the data availability. The selected Europe countries include Austria, Belgium, Finland, France, Iceland, Ireland, Italy, Norway, Switzerland and Turkey. The Asian countries consist of Malaysia, India, Indonesia, Philippine and Thailand.

ADF and SURADF –Stochastic Catch–up and Stochastic Convergence Club

Augmented Dickey–Fuller (ADF) test is an augmented version of the Dickey–Fuller test. In statistics or econometrics field, it is used as a unit root test for any large and complicated time series model. The result of the ADF statistic test is a negative value. A higher negative value implies stronger rejection of the hypothesis that there is a unit root at some level of confidence (Holmes, 2007).

The general model for ADF test is written as

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta \Delta y_{t-1} + ... + \delta_{\rho-1} \Delta y_{t-\rho+1} + \varepsilon_t$$

Where α is a constant, β is the coefficient on time series and ρ is the lag order of the autoregressive process which is determined before applying the test (Chien and Lee, 2007). To test for the unit root, we state the null hypothesis $H_0 : \gamma = 0$ and the alternative hypothesis $H_1 : \gamma < 0$.

SURADF, as its name stated, is a method derived from Augmented Dickey–Fuller test to test unit root based on the system of ADF equations which can be written as (Baharumshah and Borsic, 2008).

$$\Delta y_{1,t} = \alpha_1 + \beta_1 y_{1,t-1} + \sum_{j=1} \varphi_j \Delta y_{1,t-j} + u_{1,t}$$

$$\Delta y_{2,t} = \alpha_2 + \beta_2 y_{2,t-1} + \sum_{j=1} \varphi_j \Delta y_{2,t-j} + u_{2,t}$$

$$\vdots$$

$$\vdots$$

$$\Delta y_{N,t} = \alpha_N + \beta_N y_{N,t-1} + \sum_{j=1} \varphi_j \Delta y_{N,t-j} + u_{N,t}$$

Where φ_j is the autoregressive coefficient for series *j* and $\beta_j = (\varphi_j - 1)$. The dependent variable *y* in this study is represented by GDP of each economy. By using SUR procedure to estimate this system, the *n* different null and alternative hypotheses can be tested individually with the test statistics as (Chan *et al.*, 2005)

$$\begin{array}{ll} H_0^1 : \beta_1 = 0 & H_A^1 : \beta_1 < 0 \\ H_0^2 : \beta_2 = 0 & H_A^2 : \beta_2 < 0 \\ \vdots & \\ H_0^N : \beta_N = 0 & H_0^N : \beta_N < 0. \end{array} \qquad (1)$$

SURADF is chosen as it enables researchers to identify how many and which series within the panel are responsible for rejecting the null hypothesis of non–stationary and also to determine which panel member are actually stationary or non–stationary. Moreover, SURADF is able to tackle the problems associated with the existence of cross sectional dependency among the series in the panel (Holmes, 2007). The test power of ADF unit root test procedure is enhanced by SURADF test (Chien and Lee, 2007).

We apply SURADF for two purposes, i.e. to detect the catching up effect in growth to the benchmark economy and to check the possibility to form a convergence club in two groups of economies. In testing for the catching up effect, we seek to compare the growth (GDP) of each economy relative to that of benchmark economy of U.K., i.e. y is represented by $\log \frac{GDP_i}{GDP_{uk}}$. The reject of null hypothesis implies the detection of catching up effect to the growth of U.K.

In order to test for the convergence club, we construct the relative GDP of each region to the average income of the region. We can express the y as $\log \frac{GDP_i}{GDP_{avg}}$ where i indicate either Europe or Asia. If the country GDP able to converge to the average value of the relative region, we say that the country can form a stochastic convergence club within the selected region.

Panel Data Analysis – Beta Conditional Catching Up Effect

Panel data are used as a measurement when we have repeated one or more variables on repeated cross–sectional time series model. The reason why panel data is chosen is due to its advantages such as more variability and degree of freedom, less collinearity and its estimates are more efficient (Bruderl, 2005). Generally, we express the equation for the fixed effects model as follows:

$$y_{i,t} = \alpha_i + \beta_1 x_{i,t} + \varepsilon_{i,t}$$

where α_i is the intercept for each entity which is constant, β is the coefficient for independent variable x and $\varepsilon_{i,t}$ is the error term. $y_{i,t}$ is the dependent variable where i is the entity and t is representing time variable (Oscar, 2010). The expected value of error term is zero and its variance is represented by σ_y. The fixed effects estimator of the slope coefficient β which estimates the model by using OLS method is

$$\hat{\beta} = \left(X'X\right)^{-1} X'Y.$$

In this study, the fixed effect model is carried out rather than random effect model because it is not necessary to assume the independent of explanatory variables on individual specific effects when we condition on the individual specific effects. Our conditional convergence equation is formulated as below:

$$\log y_{i,t} - \log y_{uk,t} = \alpha + \beta y_{uk,t} + \gamma x_{i,t}^{j} + \varepsilon_{i,t} \qquad (2)$$

where α (constant) and β are coefficients, is the error term with expected value zero and variance σ_t^2, i is the index for each country and j is the determinant or control variables included in this study. y_t and y_{uk} are the GDP of country i and GDP of United Kingdom respectively. In this case, we seek to investigate if the country i will catch–up to the income level of U.K. The vector column of x_t^j contains all the control variables set in this study, include inflation, trade, population, general government consumption expenditure (GCE) and foreign direct investment net inflow (FDI). A negative and significant value of β obtained from this test implies that the hypothesis of conditional convergence do hold in the analysis of Adnan. *et al.* (2010) and Hsiao (2003).

OLS – Beta Conditional Catch–up and Beta Conditional Convergence Club

By applying (2) with OLS method, we are able to test the conditional catching up effect for the individual economy in the two regions. Same equation is being carried out and we may test for the conditional catching up effect with the control variables that included in this study such as GDP in terms of constant U.S. dollar, general government final consumption, trade, the total population of each country, inflation and foreign direct investment net inflow. Under the single equation of OLS, (2) is estimated and can be written as

$$\log y_t - \log y_{uk} = \alpha + \beta y_{uk} + \gamma x_t^j + \varepsilon_t . \qquad (3)$$

In order to test the possibility to form the beta convergence club, we extended (2) to test for the conditional convergence club. The left hand side term of the equation can be changed to ratio of GDP of each country to the average of GDP for two different regions (Europe and Asia). Now the dependent variable is represented by the GDP or each economy relative to the average of GDP of Europe or Asian groups, that is $(\log GDP_t - \log GDP_{avg})$ or $(\log y_t - \log y_{avg})$ where y_{avg} is the average GDP of a group of countries for a specific period, y_t is the GDP for each individual economy. The augmented of (2) used to test the conditional convergence club can be written as

$$\log y_t - \log y_{avg} = \alpha + \beta y_{avg} + \gamma x_t^j + \varepsilon_t . \qquad (4)$$

RESULTS

In this section, the results obtained are divided into two main parts, which are catching up and convergence club. In section A, results for different types of catching up are explained and in section B, we have the results on the possibility of forming a convergence club among two different regions.

Catching Up

In this section, we compare the results of two different approaches, that is, stochastic convergence and conditional β–convergence. Stochastic convergence interprets the catch–up effect based on the properties of the series data while β–convergence interprets catch–up based on theoretical models and conditional factors. Applying different concepts and interpretation may produce different results.

The hypothesis that poorer countries tend to grow faster than richer countries is actually the idea of convergence in economies, or catch–up effect. The catch–up hypothesis states that the when the productivity level is high in one or more countries as compared to a number of other countries, the

latter group of countries will start a catching up process by adopting more advance technology from the developed countries. In this study, we set the null hypothesis as the economies are unable to catch–up with the benchmark economies. We express the hypotheses as follows:

H_0: $\beta_i = 0$ H_1: $\beta_i < 0$.

Rejection of null hypothesis implies a negative and significant value of the slope coefficient, we conclude that the countries' economies able to catch–up with the benchmark country. By applying the SURADF test, we test for the catch–up ability of those selected countries from Europe and Asian relative to the United Kingdom. By editing the left hand side of (1), $\Delta y_{i,t}$ becomes a new variable where $\Delta y_{i,t}$ is the GDP of countries *i* divided by the GDP of U.K. The result is shown in Table I.

From Table I, most of the selected countries in this study will converge to the level of GDP of U.K. and we say that they are able to catch–up with U.K. level. Meanwhile Turkey and India are the only countries that do not have the ability to catch–up with the U.K. in terms of country's GDP. The negative sign of the coefficient indicates a decline in the difference in GDP between countries *i* and U.K. From Table I, we can see that the absolute coefficients for most of the Asian countries are higher than the coefficients for Europe countries. This implies that most of the selected Asian countries are able to catch–up with the benchmark country faster than selecting Europe countries in this study. It follows the theory that poorer or developing countries are able to catch–up with the richer or developed countries at a faster rate. In this study, Asian countries are assumed to be the relatively poorer countries or developing countries compare to the European countries as richer countries or developed countries.

Apart from this, we are interested in finding which country from the selected Europe and Asian economies are able to catch–up with the benchmark country, the United Kingdom. In order to test whether or not some of the selected Europe and Asian countries are able to catch–up with the benchmark country (U.K.) under the conditional of control variables, an OLS method is applied (refer to (3) from Section III) and the results are shown in Table I.

A negative and significant value of the slope coefficient (β) represents catching up the ability of the country. From the table above, we conclude that Belgium, France, India and Philippines are the countries that have a significant and negative value of the slope coefficient (β), thus they are able to catch–up with U.K. as time goes on. The hypothesis of neoclassical (lower GDP countries tend to grow faster compared to higher GDP countries) appears to be inconsistent with the cross–country evidence.

Based on the coefficient value for each of the countries, we conclude that the Asian countries are able to catch–up with the benchmark country faster than the Europe countries by conditioning since

its absolute coefficient value is higher compared to the coefficient for Europe countries. This result is similar to the result of stochastic catching up in the previous section.

Convergence Club

In this section, we again apply stochastic convergence and β–convergence in examining the convergence club formation. Nevertheless, using different concepts and interpretation may give different outcomes. Not all countries in this study able to form a convergence club with the others Europe countries. However, the result showing Asian countries listed in this study is able to form a convergence club among their region. The overall results show that both Europe and Asian countries are able to form a convergence club among their regions.

Besides testing the catch–up ability of countries relative to the United Kingdom, we are interested in testing whether or not the GDP of each the selected country will converge to the same average value of GDP. If the countries able to converge to the average value, we say that converge club is created for the group of countries. Same as the editing done before, this time the denominator has been changed from GDP of U.K. to become the average value of GDP for the European and Asian region separately.

From the result generated and listed in Table II, we can see that most of the selected countries in this study able to form a convergence club. However, Austria, Ireland and Norway are the three countries that do not form a convergence club for the same group of countries as shown in this SURADF test. Among the Asian countries in this study, we have tested that all of the countries able to form a convergence club since all of them have the tendency to converge to the same average value of GDP (significant coefficient obtained). For the countries of India, Indonesia and Thailand, one percent increase in the GDP leads to a decline in growth rate.

Based on the result, we conclude that there are possible to form two convergence clubs in Europe and Asian. The convergence club of Europe can be formed by Belgium, Finland, France, Iceland, Italy, Switzerland and Turkey excluded of Austria, Ireland and Norway. The convergence club of Asian consists of India, Indonesia, Malaysia, Philippines and Thailand. The results are based on the stochastic properties of the GDP data for these economies. By analyzing the value for coefficient for all the countries, we can see that the absolute values of coefficient for most of the European countries are higher than the absolute coefficient for Asian countries. This implies that European countries have faster rates in forming the convergence club then the Asian countries do.

Besides testing the conditional convergence using SURADF method, we have tested for the convergence club with conditional convergence for each of the countries by using (4) from Section III but with the changes of the y_{uk} to become the average value of GDP for two different regions (Europe and Asia). We apply the OLS method to test for the convergence club with conditional

convergence for each country. The results are shown in Table II. From Table II, we can see that all countries having a significant value of β coefficient. This implies that each country's GDP will converge to the average value of GDP for their relative region (Europe and Asia). As a result, we conclude that these two groups of regions (Europe and Asia) are able to form two different convergence clubs based on their region.

On the other hand, we apply panel data analysis to test for the overall convergence club with conditional convergence for two different regions, that is, Europe and Asia with the same equation but different method (Panel Data Analysis). The results are shown in Table III.

By using β–convergence concept as in Table II, the OLS results reveal that all economies in Asia and Europe can form convergence club. However, using panel data analysis (as in Table III) by categorizing the economies in Europe and Asia, the results show that there is no convergence club in Europe and there is possible to form a convergence club in Asia. The differences of the OLS and panel results permit extended investigation. The possible explanation for the difference of the results could due to short or lack of data and many variables included in the panel data analysis. This leads to the low power of panel data analysis.

By comparing the absolute coefficient value for both the regions, in overall, the coefficient Asian countries show that they are able to form a convergence club faster than the forming of the convergence club for Europe countries by conditioning. The result is different with the stochastic convergence club since stochastic convergence does not involve any control variables as the conditional variables.

CONCLUSION AND SUGGESTION

There are some contradiction and inconsistency between theoretical concepts and results from actual data over the sample period in this study. By using two different methods (SURADF and OLS), we have tested the two different catching up, that is, stochastic catching up and conditional catching up. Results of stochastic catching up are showing that only Turkey and India are not able to catch–up with the benchmark country, U.K. However, the conditional catching up tests shows that all economies in Europe and Asia are able to have conditional catch–up under conditional factors. Different results have been obtained due to the different concepts and interpretations.

On the other hand, stochastic convergence club and conditional convergence club are tested by using SURADF and OLS method respectively. Based on the stochastic properties of the GDP data, convergence club of Europe can be formed by most of the selected economies in this study. Same goes to the convergence club of Asian, results obtained show that all selected Asian economies in

this study able to form a convergence club. Using β–convergence concept, the two groups of regions (Europe and Asia) are able to form two different convergence clubs based on their region.

Some improvements or enhancements can be done in this study. Further enhancement can be considered where more countries or more control variables can be included such as literacy level, illiteracy level, exchange rate, employment rate, consumer price index etc. The length of sample span can be increased to have more specific results since time goes on day by day, year by year. In this study, we have chosen to compare between Asian and Europe economies. For future research, one can test the convergence between developed countries and developing countries.

TABLE-1. RESULT OF CATCHING UP

Country	SURADF	OLS	
	Coefficient	α	β
Europe			
Austria	-0.0715***	-1.9986***	6.29E-14
Belgium	-0.0914***	-1.5393***	-8.70E-14**
Finland	-0.1802***	-2.2984***	-2.11E-14
France	-0.0799***	0.2117***	-8.60E-14***
Iceland	-0.3082***	-5.2328***	9.69E-14***
Ireland	0.0631***	-3.4408***	4.58E-13***
Italy	-0.1246***	-0.1682***	2.01E-14
Norway	-0.1064**	-2.273***	1.34E-13***
Switzerland	-0.1004**	-1.5790***	-3.15E-14
Turkey	-0.1360	-1.9997***	1.60E-13***
Asia			
India	-0.1040	-0.8094***	-1.35E-13***
Indonesia	-0.210***	-2.1719***	1.21E-13*
Malaysia	-0.1102**	-3.2324***	2.75E-13***
Philippines	-0.3867***	-2.7409***	-1.24E-13***
Thailand	-0.1120***	-2.8381***	2.60E-13***

Note: *** represents 1% significance level

** represents 5% significance level

* represents 10% significance level

TABLE-2. RESULT OF CONVERGENCE CLUB

Country		SURADF	OLS
		Coefficient α	β
Europe			
Austria	-0.0314	-1.8355***	-1.97E-12***
Belgium	-0.0720**	-2.1678*	-2.96E-12***
Finland	-0.3001***	-2.4622***	-3.60E-12***
France	-0.0739***	1.7638***	-1.75E-12***
Iceland	-0.4431***	-4.0641***	-2.33E-12***
Ireland	-0.0215	-5.4626***	-6.56E-13**
Italy	-0.1032***	1.2824	-2.11E-12***
Norway	-0.0749	-4.9882***	-1.99E-12***
Switzerland	-0.1837***	0.1362	-1.83E-12***

Turkey	-0.1217**	-1.9757***	-3.08E-12***
Asia			
India	-0.1170***	0.9687***	-6.81E-12***
Indonesia	-0.1375***	-0.7000*	-5.77E-12***
Malaysia	-0.1012**	-1.4010***	-3.61E-12***
Philippines	-0.1381**	-0.7703***	-4.37E-12***
Thailand	-0.0901***	-1.2588***	-3.79E-12***

Note: *** represents 1% significance level

** represents 5% significance level

* represents 10% significance level

TABLE-3. RESULT OF CONDITIONAL CONVERGENCE BASED ON PANEL DATA ANALYSIS

	Coefficient
Europe	
α	-0.7202***
β	2.03E-13
Gross Domestic Product	-1.06E-13*
Inflation	-0.0039***
Trade	0.0025
Foreign Direct Investment Net Inflow	-0.0014
Government Consumption Expenditure	-0.0178
Total Population	8.34E-09*
S.E. of Regression	0.1496
Durbin Watson Statistic	0.2283
Asian	
α	0.0438
β	-9.44E-13***
Gross Domestic Product	8.47E-13**
Inflation	-0.0055*
Trade	0.0029***
Foreign Direct Investment Net Inflow	0.0135**
Government Consumption Expenditure	-0.0281*
Total Population	-1.11E-09*
S.E. of Regression	0.1353
Durbin Watson Statistic	0.3789

Note: *** represents 1% significance level

** represents 5% significance level

* represents 10% significance level

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