

《Chapter 2》 Convergence and Experiences

Income and HDI Convergence in the Mekong Economies: Regional Development Revisited

Sirima Bunnag¹

Received: 25 September 2018 / Accepted: 25 October 2018

© Social Science Review (2018) Saitama University, Japan

Abstract Developing countries in Southeast Asian Nations that have the connection to the Mekong River have been classified as a Mekong economy. They have different level of income with other ASEAN countries. The study has selected the Cambodia, Lao PDR, Myanmar, Vietnam and Thailand to test the convergence hypotheses. This paper attempts to investigate whether the gap of income among these countries will narrow over time and investigate the convergence of the human development in the Mekong Economy as well. The empirical results show that there is the sign convergence of income convergence among the Mekong economy. The HDI convergence has been also found. The study provides an insight into the integration of economy of Mekong who would be significant driver of economic growth and development in ASEAN.

Keywords Income and HDI convergence, Mekong Economy

JEL Classification O10, O40, O53

¹ Faculty of Economics, Chulalongkorn University
E-mail: Sirima.B@chula.ac.th

Acknowledgements: I would like to thank Saitama University for inviting me to participate in the Mekong Project at Saitama University.

Thanks to Professor Hiroyuki Taguchi, Prof. Kitti Limskul as well as participants for comments and suggestions.

1 Introduction

The regional integration of ASEAN comprises of countries with different level of income ranged from lower-middle-income to high-income economies. The increasing diversity of growth rate casts doubt to many researchers whether developing countries in ASEAN can catch-up with high-performance countries in Asia and other developed countries around the world. Most of the empirical works concerning convergence concentrated on the ASEAN founding members, known as ASEAN-5 and mainly considered the effect of globalization or human capital on convergence.

In our study, we are interested in a group of the country that has a common connection to the Mekong River namely the 'Mekong Economy'². We have selected 5 ASEAN member countries which are located along the Greater Mekong Sub-Region (GMS). These are Cambodia, Lao PDR, Myanmar, Vietnam, and Thailand respectively to analyze the convergence. In this study, countries in consideration are classified by the World Bank as lower-middle income countries. However, within the past 15 years, the average GDP per capita growth rate of these 4 countries was substantially high (approximately 5 percent or greater) compared to other ASEAN economies and Thailand.

The objective of our paper relies on the neoclassical growth theory which has hypothesized the economic convergence of economies. The lower per capita income may catch up with the economy with higher per capita incomes. The convergence hypothesis has gained popularity since the mid-1980. In economic theory, convergence can be interpreted in 3 ways; the absolute convergence, conditional convergence, and convergence club³. This paper will mainly focus on the two different notions of convergence, namely *unconditional* and *conditional* convergence. The result of our findings will have further implication on Mekong economic policy on growth and development.

2 Literature Reviews

Barro and Sala-i-Martin (2004) defined *unconditional* convergence (sometimes also known as *absolute convergence*) as follows: *If countries are similar in their structural parameters related to preferences and technologies, then poor countries grow faster until they catch up to the richer ones.* However, there are many factors that may lead to convergence or divergence. Conditional convergence then extends the unconditional convergence definition by including the relevant factors that define the steady state of a country, like population growth rate, the propensity to save, and the level of technology, and countries

2 See the coverage of Mekong Economy in the Overview paper of this Special SU Journal by Limskul (2018).

3 The case of *convergence club* is that case when initial conditions matter and economies that have the same initial conditions will only converge, and *convergence club* exist. (Galor, 1996). Wolff (2014) also pointed that the concept of convergence club is related to the concept of conditional convergence that equilibrium levels may differ by country and each particular country may approach its own unique equilibrium.

further away from their own steady-state grow faster. In this case, convergence does not happen automatically but depends on structural variables.

Empirical studies on testing convergence hypothesis have had mixed results and they depend on the countries/regions/country groups, on data sources, on models and time period of analysis. Wolff⁴ (2014) has discussed the econometric issues that attempt to investigate and test the convergence hypothesis. He has pointed out that there could be estimation problems using cross-sectional ordinary least squares (OLS) regressions. Different types of problems are such as the specification error, the measurement error, the unobserved heterogeneity in the parameter estimates, and the possibility of '*endogeneity*' of some of the explanatory variables (simultaneous bias). Wolff has proposed the alternative solution to the econometric problems is to use panel data estimation instead of cross-section analysis. Panel data estimations have several advantages that allow researchers to control for omitted variables that are persistent over time. The estimation will control for unobserved *heterogeneity* in the initial efficiency level, and instruments such as lagged values of the explanatory variables can be used and that could reduce measurement error and *endogeneity* bias. Hence, this study tends to test the convergence hypothesis using the panel data estimation.

There are many aspects related to convergence. In economics, the term of convergence has been defined in many approaches such as real convergence, nominal convergence or structural convergence. In other words, the term "*convergence*" can be interpreted in different ways such as *catching up to reference value or decline of inequalities*. Previous empirical studies showed mixed results of convergence and divergence depending on countries, region, country groups, on data sources, on models and time period of analysis, or methods of estimation. The *σ -convergence* is widely used for cross-sectional approach by using the standard deviation of log real GDP per capita values and income convergence tend to be recognized if the standard deviation shows a negative trend. In other words, the σ -convergence predicts that the cross-country difference of per capita income levels would tend to decrease over time. The *β -convergence* hypothesizes that poorer countries will tend to grow faster than the richer countries. The *panel* approach and the time series approach have studied β -convergence either unconditionally or conditionally. There is absolute or unconditional convergence if countries per capita income converges to a steady-state value, irrespective of other conditions within a given country. If happened, then there is *a tendency towards equalization of per capita income* or in other words, the *catching up process* has occurred in the country. On the other hand, conditional convergence allows each country to have a different level of per capita income towards which it is converging.

Previous income convergence studies use cross-country regression analysis by estimating the average growth rate of GDP per capita (over some period of time) on the initial level of per capita income and on country characteristics. The notable study was from Barro and Sala-i-Martin in 1992. The conclusion of

⁴ Wolff, Edward N. (2014) *Productivity Convergence: Theory and Evidence* Cambridge University Press, New York.

income convergence is such that if the negative correlation was found between the average growth rate and the initial income. However, this classic income convergence estimation was criticized by Friedman (1992) and Quah (1993) that these regressions did not give us much information on cross-country income dispersion. Moreover, there is also the limitation of the cross-section data that there is only one point for a country. And, to overcome the limitation, the convergence research gradually moved from the cross section to the *panel approach*. Islam (2003) discussed the advantages and disadvantages of using the panel data approach in the analysis of convergence. The advantage of the panel approach is that it can correct the omitted variable bias problem by allowing for *technological differences* across countries. Some disadvantages of using the panel data approach are such as the possibility of small sample bias and the short frequency.

Another alternative approach for testing the convergence hypothesis is to use time series econometric methods and focus on the direct evaluation of the *persistence of transitivity* of per capita *income differences* between economies. Most of these studies proceeded from standard reduced form equations of the output process.

Previous studies on convergence in the human development index were not as many as income convergence. At least 4 literatures mainly considered HDI convergence; Mazumdar (2002), Sutcliffe (2004), Noorbakhsh (2006), and Asongu (2014). Some studies focus only on living standards instead of HDI, Hobijn and Franses (2001), and Neumayer (2003).

3 Brief Stylized Facts of Mekong Economy

Table 1 shows selected indicators of Mekong economy or in short the CLVM economies including Thailand in 2016. Population growth and the labor force growth of Thailand is the lowest compared to other countries. The CLMV economies, on the contrary, have approximately growth rates of 5 percent, and labor force growth has exceeded population growth except for the case of Vietnam.

It will be an opportunity for Cambodia, Lao-PDR and Myanmar to take advantage of abundant labor force before the countries approach the aging population period. International trade has also played an important role in the economy of Cambodia, Vietnam, and Thailand. The net inflow of FDI to Thailand has decreased to only 0.74 percent of GDP while other countries can still attract foreign investment into the countries. In 2015, Human development index (HDI) for CLM were lower than the average of 0.631 for countries in the middle human development group and below the average of 0.720 for countries in East Asia and the Pacific. Vietnam's HDI is above the average of 0.631 but still below the average of 0.720 for countries in East Asia and the Pacific. Thailand's HDI is above East Asia and the Pacific but still below the average of 0.746 for countries in the high human development group.

Table 1 Selected indicators of CLMVT in 2016

Indicators	Cambodia	Lao-PDR	Myanmar	Vietnam	Thailand
Population growth (%)	1.62	1.32	0.92	1.11	0.35
Labor Force growth (%)	1.75	2.07	1.10	0.71	0.28
Real GDP (constant 2011 US\$ Billions)	54.62	38.76	280.56	552.06	1,079.99
Real GDP per capita (constant 2011 US\$)	3,251	5,859	5,284	6,062	15,454
Real GDP growth (%)	5.35	5.4	5.24	5.19	2.89
Gross Fixed Capital Formation (% of GDP)	21.685	29.008	34.716	23.678	24.019
Trade (% of GDP)	126.95	75.09	39.07	184.69	121.66
FDI, Net inflow (% of GDP)	11.43	9.87	5.18	6.14	0.74
Human Development Index a/ (HDI)	0.563	0.586	0.556	0.683	0.740
Mean years of schooling	4.7	5.2	4.9	8.0	7.6
Expected years of schooling	11.7	11.2	10.0	12.7	14.3
Life expectancy	0.581	0.718	0.754	0.757	0.851
Inflation, GDP Deflator (Annual %)	3.46	3.02	3.56	1.11	2.36

Note: a/ the data shown in the table was from the year 2015.

Source: World Bank database online (2018), UNDP (2016)

The growth rates of the Mekong economy are moving in the same direction. The Mekong economy like any other developing countries is affected by the fluctuation of world economic crisis i.e., Asian Financial Crisis in 1997-98 as well as Global Financial Crisis 2008-09 respectively. We have shown the domestic stability of the Mekong which has clearly depicted the domestic instability measured by inflation rates at the median value of Mekong. The Asian financial crisis which had started by Thailand has caused the price instability during 1997-98. The global financial crisis likewise had caused instability during 2008-09 in the Mekong as well. The growth of labor productivity has been affected by the crises during the same events. (See Fig. 1).

Interestingly, the Asian financial crisis had not disturbed the growth of trade openness during 1997-98 as compared with the global financial crisis. This may be because the former had weakened Thai national currency as well as the Mekong national currency with respect to the rest of the world. Hence, the weakening currency has further propelled the export of goods and services of Mekong as the existing demand for export was not affected by the AFC at all. In the global financial crisis, on the contrary, the world's demand for Mekong exports has been subsided after American import demand has fallen, the world has as well as Mekong trade and her openness has erupted as shown in Fig. 2. The fluctuation of private flow of FDI (not shown here) behaved likewise according to the AFC and GFC.

Human Development Index (HDI) is a composite index that uses three important dimensions of human development; longevity, knowledge, and a decent standard of living. The index is the geometric mean of normalized indices for each of the three dimensions. Longevity or a long and healthy life is measured by life expectancy at birth, knowledge level is measured by mean years of education among the adult population, and standard of living is measured by Gross National Income (GNI). The HDI, as

well as the human capital investment in terms of the 'years of schooling' of the Mekong, (measured at the median score), is neither affected by the AFC nor GFC. They are rather long-term variables of the economic development of the Mekong on the supply side. The HDI and human capital investment have been increased over-time in the Mekong. This implies that Mekong economy is fundamentally growing with the quality of foreign direct investment flow to search for the quality human with rising average labor productivity.

Therefore, there is a high possibility that Mekong economy will exhibit the convergence on the growth of income as well as human development aspect as hypothesized by the Neoclassical Theory. In the foregoing section, we describe the econometric model and variables description as well as model estimation respectively. Our testing hypothesis is simply: *Will Mekong economy be able to catch-up to other ASEAN economies if they were able to sustain their current growth? And, does HDI being involved in convergence process? Or does human development convergence exist in the Mekong economies?*

In our analysis, we intend to test the convergence hypothesis of a specific economy of the CLMV and Thailand. This is in the spirit of our main theme of Mekong economy. The convergence hypothesis covers both the income convergence as well as the HDI convergence accordingly.

4 Econometric Model

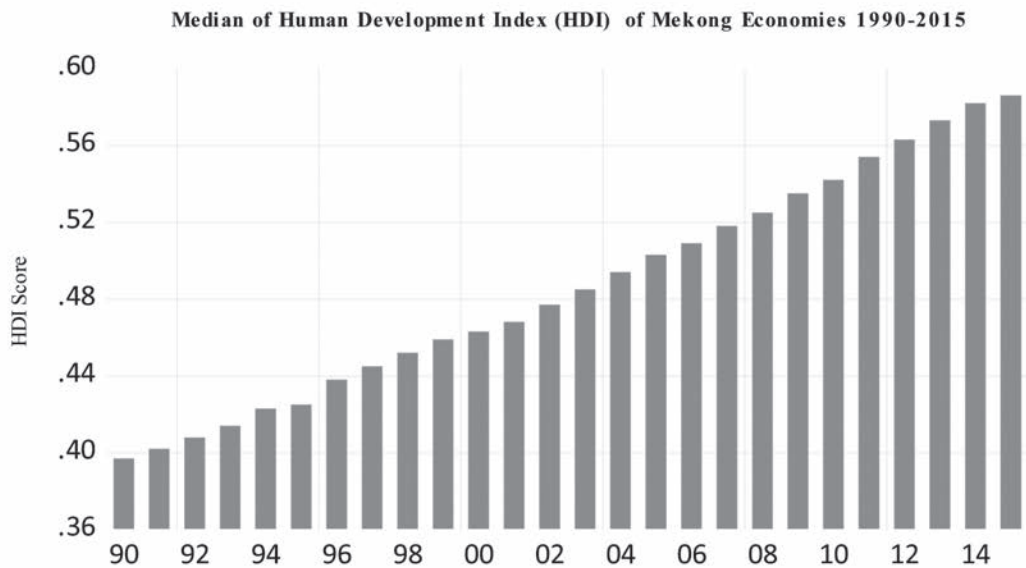
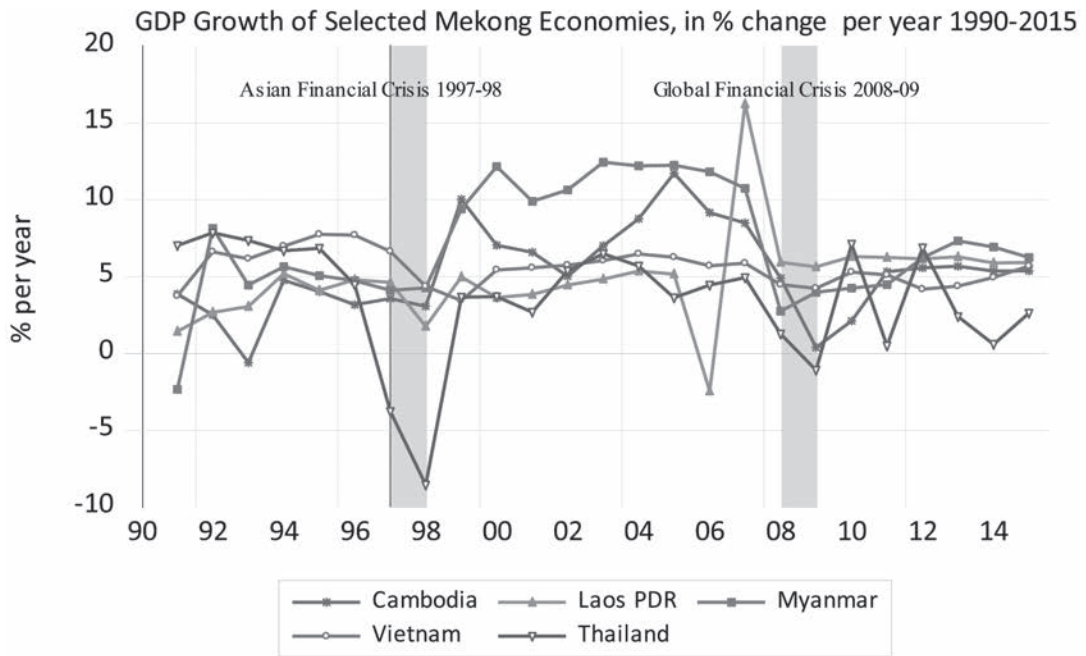
Asongu (2014) followed the estimation made by Fung (2009) that the two equations for estimation are as follows:

$$(1) \ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t}$$

$$(2) \ln(Y_{i,t}) = a \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t}$$

where $a = 1 + \beta$, $Y_{i,t}$ is the measure of per capita income or human development in country i -th at period t ; $W_{i,t}$ is a vector of determinants of per capita human development (note to be strictly exogenous); η_i is a country-specific effect, ξ_t is a time-specific constant, and $\varepsilon_{i,t}$ is an error term. To be consistent with the neoclassical growth model, β should have the negative sign and should be interpreted the countries with relatively close to their steady state of per capita growth will experience a slowdown in the growth of per capita human development (Narayan *et al.*, 2011). For equation (2), if $0 < |a| < 1$, then $Y_{i,t}$ is dynamically stable around the path, with a trend growth rate the same as that of W_t , and with a height relative to the level of W_t . The variables contained in $W_{i,t-\tau}$ and the individual effect η_i are proxies for the long-term level the market is converging to. However, the above two equations have been modified to dealing with the issue of endogeneity and the following equation was used to estimate the case of African Development.

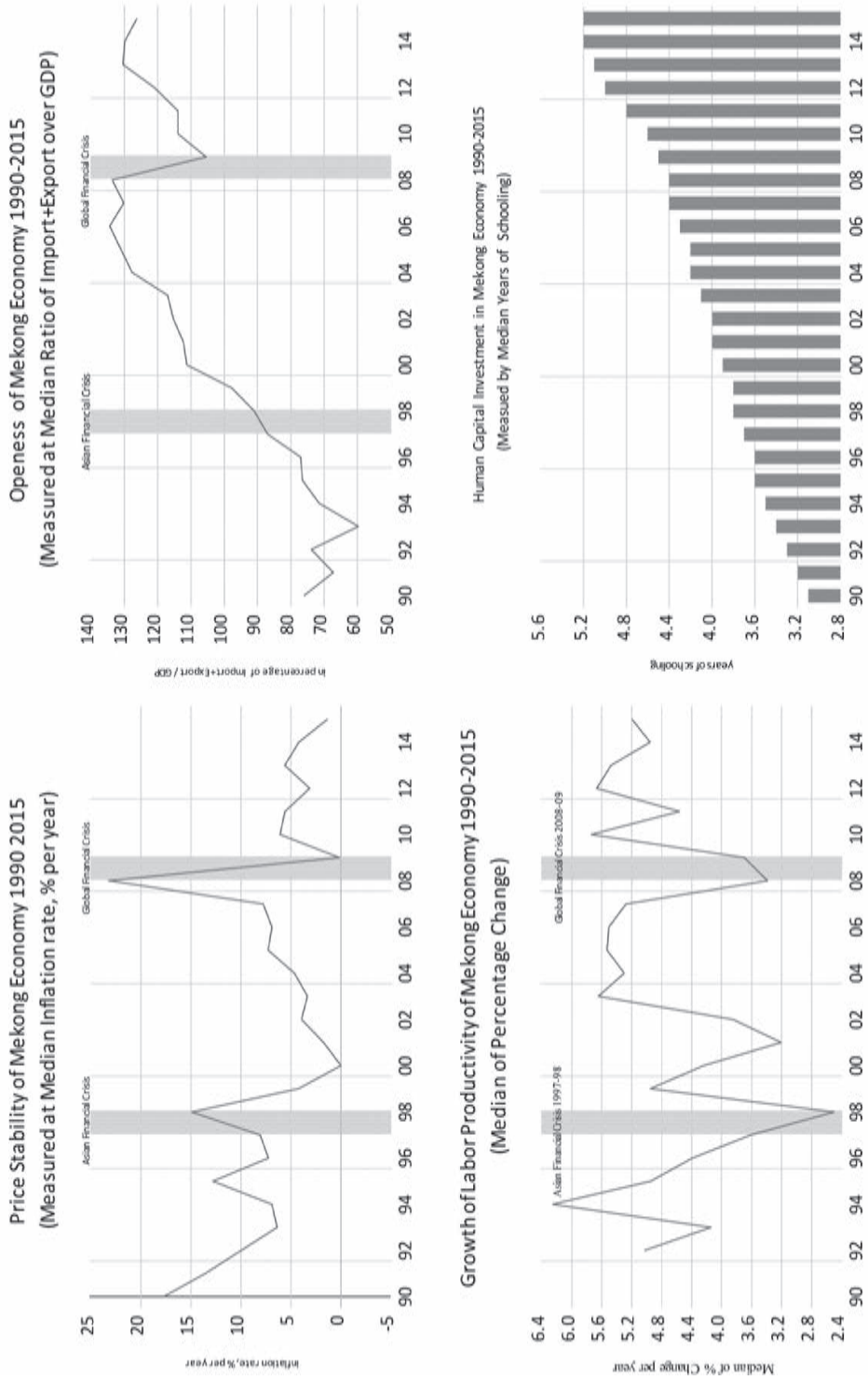
Fig.1 GDP growth and Human Development Index of Mekong Economies



Source: GDP growth rates are from The Maddison Project Database, (2018)

Source: HDI is from the UNDP, <http://hdr.undp.org/en/data>.

Fig.2 Price Stability, Openness, Labor Productivity and Mean Years of Schoolings of the Mekong Economy 1990-2015 (At Median Value)



Source: This study from the Madison database, *ibid.*, (2018)

$$(3) \ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = a((\ln(Y_{i,t-\tau}) - \ln(Y_{i,t-2\tau})) + \delta(W_{i,t-\tau} - W_{i,t-2\tau}) + (t - t - \tau) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}))$$

Interpretation of results should be as follows. When the absolute value of the estimated lagged coefficient is greater than zero but less than one ($0 < |a| < 1$), there will be the existence of convergence. General interpretation associated with the lagged difference is that the past differences have a less proportionate impact on future differences, which means that the variation of Y is decreasing over time as the country converging to the steady state. In this case, the β value ($a = \beta - 1$) will show convergence if $\beta < 0$.

The estimation by Noorbakhsh (2007) is different from Asongu (2014) and set up the estimated equation to test unconditional and conditional convergence as follow.

$$(4) \ln\left(\frac{X_{it+T}}{X_{it}}\right) = \alpha + \beta \ln(X_{it}) + \sum_{j=1}^k \lambda_{ij} S_{ji} + u_{it} \text{ for } k = 0, 1, 2, \dots, K$$

where $X_{it} = \frac{X_{it}}{\bar{X}_t}$ is the ratio of X in the *i*th country to the average for the sample of countries under consideration. $\ln\left(\frac{X_{it+T}}{X_{it}}\right)$ is the growth of variable X in the *i*th country over the period of *t* and *t* + T. The unconditional convergence is to test $\ln\left(\frac{X_{it+T}}{X_{it}}\right) = \alpha + \beta \ln(X_{it})$ and the conditional convergence is to test the full equation. A negative value of β would be an evidence of convergence. Variables selected to include into the model as controlled variable are labor force, gross fixed capital formation (% of GDP), foreign direct investment (% of GDP), openness or trade (% GDP). These variables were selected on the ground of contributing to the growth of income and to the components of the human development index.

The work of Chakraborty and Chakraborty (2018) on economic convergence among the Indian States shows the similar concept of estimating economic convergence at the state level. They set up the model specification as

$$(5) GRW_{it} = a + b_1 \ln IPC_{it} + b_2 \ln X_{it} + u_{it}$$

where GRW_{it} is the growth rate of per capita GDP, $\ln IPC_{it}$ is the initial level of per capita income, X_{it} is the control variables, and u_{it} is the error terms. They specify the controlled variables into 3 groups; economics, financial factors, and socio-demographic factors. As one can see, equation (5) has a similar concept as equation (4) to test unconditional and conditional convergence. I have also adjusted equation (5) and added variables for estimating income convergence and shown in equation (6).

$$(6) GRW_{it} = a + b_1 \ln IPC_{it} + b_2 \ln gfcfr_{it} + b_3 \ln fdishare_{it} + b_4 \ln tradeshare_{it} + b_5 HDI_{it} + u_{it}$$

where IPC_{it} is the initial level of per capita income, $gfcfr_{it}$ is gross fixed capital formation (% of GDP), $fdishare_{it}$ is the FDI (% of GDP), $tradeshare_{it}$ is trade share (% of GDP) or openness, HDI_{it} is human development index, and u_{it} is the error terms.

Besides variables that were commonly used to analyze the convergence hypothesis such as openness

in trade and finance, education and human capital, this study will employ human development into the test. Konya and Guisan (2008) followed Mazumdar (2002), Sutcliffe (2004) and Noorbakhsh (2007) tried to study convergence among countries in terms of a more comprehensive measure of development than per capita income. That is they tried to find out whether there exists a tendency for human development convergence over the past three decades.

In our study, the dependent variables are the Real GDP per capita growth rate and the HDI where I use that dataset from the Maddison Database Project 2018⁵ and the UNDP, respectively. The choice of control variables was selected based on the literature on convergence and also the availability of consistent data series of selected countries in this study. In the beginning, the control variables are such as trade, inflation, domestic investment (represent by gross fixed capital formation), foreign direct investment, and labor productivity (using GDP per person employed as representative). Some other variables, such as means years of schooling and expected years of schooling were introduced into the test of income convergence.

Table 2 Descriptive statistics of the dependent and controlled variables.

	Mean	SD	Maximum	Minimum	Observations
<u>Dependent Variables</u>					
Real GDP per capita (constant 2011, International \$)	42,21.54	316.213	15,020	863	130
Human Development Index (HDI)	0.53	0.01	0.74	0.35	130
<u>Controlled Variables</u>					
Labor force ('000 person)	26,886.96	1692.301	56,489.77	1927.173	130
Gross Fixed Capital Formation (% GDP)	25.70	0.75	41.65	10.69	99
Foreign Direct Investment (% GDP)	4.53	0.27	13.06	0.25	122
Openness (Trade (% GDP)	91.12	4.05	184.69	0.17	122
Mean years of schooling(yr-school)	4.69	0.1367	8.0	5.6	130
Expected years of schooling(Exp-yrs-school)	9.624	0.1758	13.9	6.1	130
Life expectancy rate (Life-Exp)	0.706	0.0089	0.862	0.517	130
Infant Mortality rate (IMR)					
Inflation (Consumer Prices, annual %)	10.74	1.48	125.27	-1.70	124

Source: Maddison Database Project 2018, UNDP, World Bank Database

The descriptive statistics of the variables in Table 2 show that there is quite some degree of variation in the data used in this study and the estimated results could be reasonable. However, in order to test the existence of the multicollinearity among variables, we first tested by estimate the correlation matrix. Table 3, then presents the correlation coefficients of variables. There is a high positive relationship

5 Bolt, Jutta, Robert Inklaar, Herman de Jong and Jan Luiten van Zanden (2018), "Rebasing 'Maddison': new income comparisons and the shape of long-run economic development" Maddison Project Database, version 2018., Maddison Project Working Paper, no. 10, available for download at www.ggd.net/maddison.

between initial income and HDI including other components of HDI. Moreover, trade openness has a high correlation with *hdi* and other components of *hdi* as well. The *infant mortality rate* has a high negative relationship with *initial income*, *trade openness*, and all components of *hdi*. There is a moderate relationship between *gross fixed capital formation and initial income*, *hdi*, *means year of schooling and life expectancy*. The initial income also has a moderate relationship with trade and inflation.

Table 3 Correlation Analysis

	ln_ipc	ln_gfcfr	ln_fdishare	ln_tradeshare	inflation	hdi	means year of schooling	expected years of schooling	life	imr
ln_ipc	1									
ln_gfcfr	0.54526	1								
ln_fdishare	-0.08747	-0.23781	1							
ln_tradeshare	0.50820	0.00701	0.33545	1						
Inflation	-0.30814	-0.09287	-0.0836	-0.30792	1					
Hdi	0.92506	0.52443	0.1049	0.700311	-0.38169	1				
means year of schooling	0.83524	0.42796	0.13340	0.696933	-0.32952	0.95850	1			
expected years of schooling	0.79692	0.29190	0.22014	0.754268	-0.39536	0.93581	0.909514	1		
life expectancy	0.71603	0.56203	0.20486	0.636982	-0.36645	0.89799	0.865702	0.83769	1	
Imr	-0.76105	-0.49045	-0.19961	-0.637822	0.39889	-0.91259	-0.849726	-0.86549	-0.97523	1

Source: calculated by the author

Table 4 Definitions and Source

Variables	Variable Definitions	Sources
ipc	real GDP per capita	Maddison Project 2018
hdi	Human Development Index	UNDP
Labor Force	Total Labor Force	World Bank (WDI)
gfcfr	Gross Fixed Capital Formation (% GDP)	World Bank (WDI)
fdishare	Foreign Direct Investment (% GDP)	World Bank (WDI)
tradeshare	Value of Imports plus Exports as percent of GDP	World Bank (WDI)
means year of schooling	Means year of schooling	UNDP
expected years of schooling	Expected years of schooling	UNDP
life expectancy	Life expectancy rate	World Bank (WDI)
Imr	Infant mortality rate	UNDP
Inflation	Inflation, consumer prices (annual %)	World Bank (WDI)

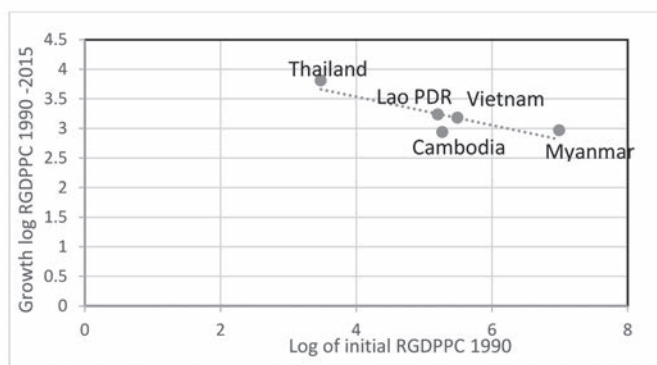
4 Empirical Results

This section will report the findings. The time period of study is from 1990 to 2015. Annual data of real GDP per capita was obtained from the Maddison Database Project 2018. First checking the tendency for convergence of the two dependent variables; log of real GDP per capita and HDI. Figure 3

and Figure 4 show that there is a tendency for convergence that is there is a *negative correlation* between the average growth rate and the initial value. Blasko (2016) uses the indicator σ to show that tendency for convergence or divergence depending on the value of sample variance. The other commonly used characteristics for application of σ -convergence are cross variation indicators; variance, standard deviation and coefficient of variation and the main determinant for analysis of σ -convergence is the coefficient of variation.

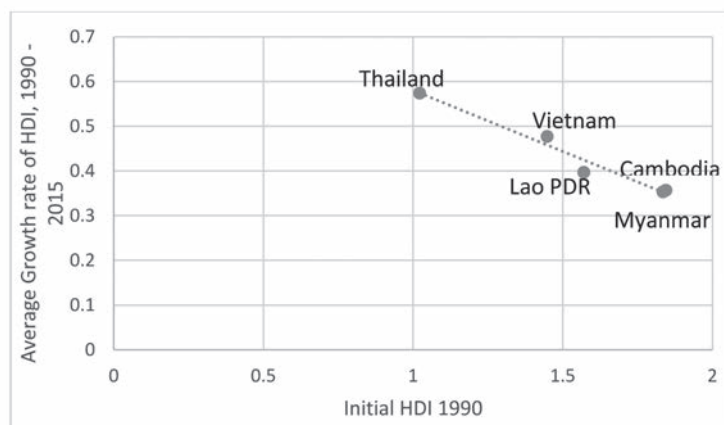
Both graphs in Figure 5 show a downward trend in the coefficient of variation (CV) from 1990 to 2015. It can be concluded (using both the negative correlation and the CV) that there is a tendency for income convergence and HDI convergence from 1990 to 2015 among CLMVT countries.

Fig.3 Scatter plot of the log of real GDP per capita in 1990 and growth of log real GDP per capita 1990 - 2015



Source: Own calculation based on the Maddison Database Project 2018

Fig.4 Scatter plot of log HDI in 1990 and growth of log HDI 1990 - 2015



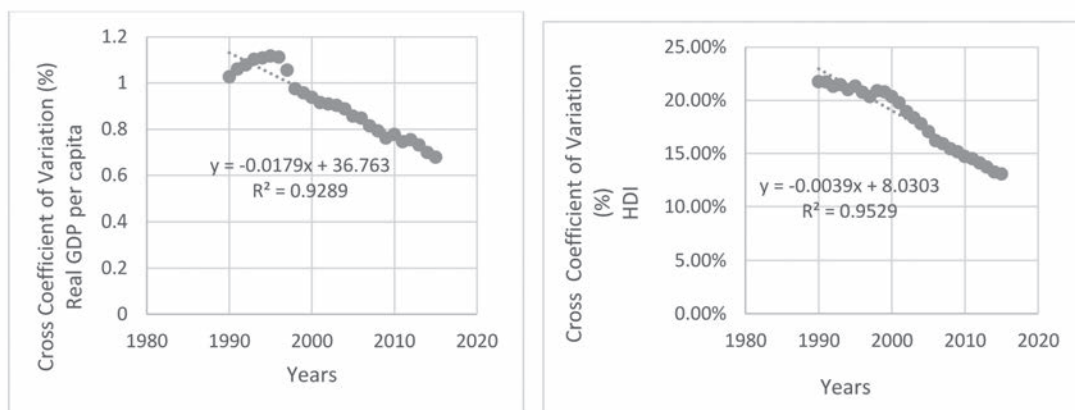
Source: Own calculation based on HDI database 2016

After the basic consideration on convergence, the next step is to concentrate on the presence of unconditional and conditional convergence of income based on equation (6). The estimated results of unconditional convergence (both income convergence and HDI convergence) suggested that there is the evidence of unconditional income convergence among the Mekong Economies with the confidence of 95 percent.

The *b1* coefficient of all models (for income convergence) is negative and highly significant. Gross fixed capital formation (as % of GDP) has a positive sign for all models and highly significant indicating that domestic investment has a positive impact on growth. In addition, the foreign direct investment has a positive sign and all are significant. For trade openness, coefficients in all models have positive signs and significant (Fixed effect model). This is contradicting to our basic belief on the openness which should speed up convergence. This may indicate that policy on the trade openness of the Mekong economies is very prudent. This is different from Thailand which has a very high degree of openness. We have observed the contagion effect of the external shock by the AFC and GFC on trade share respectively. This led Mekong economy to be very cautious about the openness.

Overall, all estimated models provide support for the conditional convergence in the Mekong economies over the period of 1990 to 2015. Labor productivity does have a significant impact on growth and also human development in the region. Inflation does not have a significant impact as the magnitude of the coefficient is rather small and not significant. In summary, the results implied that within the Mekong region there happened to be the convergence of income both unconditional and conditional convergence.

Fig.5 The cross-sectional of a coefficient of variation (CV) for real GDP per capita and HDI



Source: Own calculation

The next step is to explore whether there is convergence in human development in the Mekong economies. The null hypothesis was rejected and implies that there is a conditional convergence of HDI

among countries in the Mekong region. Here, in this paper, the rising growth differential among Mekong economy will drive HDI up not down as conventionally expected. The first model when the level of income increases will tone down the growth differential hence a convergence. In current HDI model, income increases will drive the HDI instead. The larger economy that has small growth of income will consistent with the rising of HDI but less than those of smaller economy. However, the increasing of the labor productivity among the Mekong will tone down the HDI differential as the welfare of each economy will move closer to one another as a result. Likewise, the increase of openness or trade share will narrow down the differential in human development index among the Mekong as well.

Table 5 Estimated results of unconditional and conditional convergence of income

Dependent Variable Gr_gdppc	Unconditional convergence	Conditional Convergence Model 1	Conditional Convergence Model 2	Conditional Convergence Model 3	Conditional Convergence Model 4
Variables					
Constant	12.92862*** (4.520176)	6.26937** (1.86848)	-17.43877*** (-2.398564)	-21.18727*** (-3.034985)	-22.75357*** (-3.450421)
Initial per capita income (ln_IPC)	-0.897294*** (-2.526374)	-1.849955*** (-4.572007)	-14.28433*** (-4.789154)	-32.8441*** (-5.583289)	-32.79657*** (-6.187376)
Gross Fixed Capital Formation (% of GDP) (ln_gfcfr)		9.506863*** (4.384199)	9.71445*** (4.506792)	8.696446*** (4.234986)	10.19319*** (5.13351)
FDI (% of GDP) (ln_fdishare)		2.21462*** (2.652584)	3.323348*** (3.705159)	1.861459* (1.978167)	1.987772** (2.157695)
Trade (% of GDP) (ln_tradeshare)			0.426187 (0.972634)	0.15294 (0.362853)	
Productivity (ln_productivity)			13.88467*** (4.167687)	28.15641*** (5.500754)	28.12771*** (6.06462)
Inflation			0.024542 (0.540822)	0.06292 (1.40819)	
HDI lag				67.38692*** (3.142415)	65.66603*** (3.257723)
Mean year of schooling				-1.252882* (-1.810373)	-1.1289* (-1.679249)
Dummy 1997-1998	-4.043473*** (-4.050633)	-5.059158*** (-4.938129)	-5.465486*** (-5.713339)	-4.990747*** (-5.497371)	-4.517936*** (-4.978847)
Dummy 2008-2009	-2.234694*** (-2.233916)	-2.329858*** (-2.877314)	-1.724631*** (-2.110821)	-1.155738 (-1.458605)	
Adjusted R-squared	0.155917	0.384793	0.476582	0.539104	0.523436
F-statistic	8.634984	12.63373	11.12953	11.4102	15.5924

Note: Figure in parentheses are t-statistic *** significant at 1% level, ** significant at 5% and * significant at 10% level..

The coefficient implies that a 1 percent higher in income level, β decrease in growth rate. --> The higher, the faster the convergence.

Table 6 Estimated results of convergence of HDI

Dependent Variable Diff_LnHDI	Convergence model 1
Variables	
Constant	0.077211*** (3.840101)
Change in the growth of per capita income (DIF_LNRGDP1)	0.064077*** (3.179345)
Productivity (LN_PRODUCTIVITY)	-0.007055*** (-3.052699)
Trade (% of GDP) (LN_TRADESHARE)	-0.001712 (-1.645854)
Dummy 1998	-0.004984*** (-3.96248)
Dummy 2008	0.0015155* (1.729086)
Adjusted R-squared	0.268585
F-statistic	5.610567
Cross-section effect	Fixed

Note: Figure in parentheses are t-statistic *** significant at 1% level, ** significant at 5% and * significant at 10% level.

5 Conclusions and Discussion for the Mekong

We have tested convergence in income and HDI of countries in the Mekong economy using annual data of real GDP per capita and Human Development Index from 1990 to 2015. From the estimation, there has been evidence of catching up in income and HDI among these 5 economies despite economic growth and human development diversity. For the case of income convergence, domestic investment is among key factors along with trade openness while foreign direct investment and a macroeconomic indicator such as inflation do not have a strong impact. For the case of HDI, labor productivity and openness are the key factors for HDI growth differential.

These findings suggest that if countries in the Mekong region want to speed up, they should pay more attention to domestic investment, as well as prudent openness, and education that will affect the labor productivity. Policies for governments in this region are such that increase in investment, especially in human capital so that part of a component of HDI improve. In addition, the government of all countries in the Mekong region should increase more collaboration among countries on trade openness among themselves and with the rest of the world to raise the HDI. The policy on human resources investment will finally gain on the improve productivity.

Limitation of this study could be the choice of estimation method and selected variables used in this model. Most importantly we did not insert the official development assistance (ODA) which is the official flow of resources from the rest of the world. This may be another study by other paper of this journal.

Reference

- Asongu S (2014) African Development; Beyond Income Convergence. *South African Journal of Economics* Vol.82:3, 334 - 353.
- Barro R J and Sala-i-Martin X (1992) Convergence. *Journal of Political Economy*, 100: 223 - 251.
- Barro R J and Sala-i-Martin X (2004) *Economic growth* (2nd edition). MIT press, Cambridge, London.
- Blasko M (2016) Sigma convergence testing across selected European Countries *Journal of Theoretical and Applied Computer Science* Vol 10 No.2, 33 - 40.
- Chakraborty L, and Chakraborty P (2018) Federalism, fiscal asymmetric and economic convergence: evidence from the Indian States *Asia-Pacific J. Region Science* 2:83-113.
- Friedman M (1992) Do old fallacies ever die? *Journal of economic literature*, Vol. 30(4): 2129 - 2132.
- Fung M K (2009) Financial development and economic growth: Convergence or divergence? *Journal of International Money and Finance*, 28: 56 - 67.
- Hobijn B, and Franses P H (2001) Are living standards converging? *Structural Change and Economic Dynamics* 12, 171 - 200.
- Islam N (2003) What have we learned from the convergence debate? *Journal of Economic Surveys* Vol 17. No.3, 309-362.
- Konya L and Guisan M-C (2008) What does the Human Development Index tell us about convergence? *Applied Econometrics and International Development* Vol 8-1, 19 -40.
- Maddison Project Database, version 2018. Bolt, Jutta, Robert Inklaar, Herman de Jong and Jan Luiten van Zanden (2018), "Rebasing 'Maddison': new income comparisons and the shape of long-run economic development" Maddison Project Working Paper, no. 10, available for download at www.ggdc.net/maddison.
- Mazumdar K (2002). A note on cross-country divergence in the standard of living *Applied Economics Letters*, 9: 2,87 -90, DOI:10.1080/13504850110049388.
- Narayan P K et al (2011) Do market capitalization and stocks traded convergence? New global evidence. *Journal of Banking and Finance*, 35: 2771 - 2781.
- Neumayer E (2003) Beyond income: convergence in living standards, big time *Structural Change and Economic Dynamics* 14, 275 - 296.
- Noorbakhsh F (2007) International convergence or higher inequality in Human Development? Evidence for 1975 - 2002. Ch.9 in G. Mavrotas et.al (eds), *Advancing Development*, United Nations University.
- Quah D (1993) Galton's Fallacy and Tests of the Convergence Hypothesis. *Scandinavian Journal of Economics*. Blackwell 95 (4): 427 - 443.
- Reza R and Zahra K T (2008). Evaluation of the Income Convergence Hypothesis in Ten New Members of the European Union, A Panel Unit Root Approach *Panoeconomicus*, 2, str.157 - 166.
- Sutcliffe B (2004) World inequality and globalization *Oxford Review of Economic Policy*, 20: 15 - 37.
- Wolff E N (2014) *Productivity Convergence: Theory and Evidence* Cambridge University Press, New York.