Income Convergence across Nations and Regions in East Asia[*]

Moon, Woosik

Using the Gross Regional Domestic Product data for 10 East Asian countries, this study shows that East Asia as a whole tends to converge to each other in terms of per capita income. If Northeast Asia is separately considered, there is far stronger evidence in favor of real growth convergence. This result suggests that the prospect for furthering economic and monetary integration in East Asia is not so gloomy. Despite such convergence trend, however, there are still relatively wider income disparities among regions and nations in East Asia than within Europe, suggesting that a common effort to reduce the income gap is needed for deeper integration.

1. INTRODUCTION

There is an increasing amount of literature that argues for economic and monetary cooperation based on the growing economic interdependence in East Asia. For instance, intra-regional trade now accounts for almost half of total trade in East Asia. The large emerging regional market such as China has also strengthened intra-regional trade. In terms of financial flows, there has been an increase in intra-regional FDI, promoting greater regional financial linkages. The outbreak of the Asian financial crisis helped countries in the region to become more aware of the growing trade and financial interdependence. Combined, these suggest that the economic condition for monetary cooperation in East Asia is now riper than ever.

Regarding the future of regional cooperation, however, the pessimistic view seems to have prevailed so far (for instance, Eichengreen 2003; Kim 2002). As East Asian countries are considered so diverse, some of them are too behind in their development, and strengthened trade intensity could merely be a reflection of GDP in East Asian countries rather than enhanced trade integration. Considering that regional integration can widen the already existing differences in per capita income that endanger the integration process itself, it is imperative that East Asia reduce regional economic and social disparities, especially per capita income differences. On a theoretical and empirical level, there is no proof that economic and monetary integration necessarily leads to the convergence of economic performances across nations. Some studies suggest that the opposite case may hold true (Krugman 1993; Hanson 1998). In addition, the loss of the exchange rate as a policy instrument can make real adjustment much more costly.

It is thus important to raise the question of how the pattern of income convergence in East Asia has evolved. If the inter-regional or inter-national differences in income levels increase over time or perpetuate themselves, then there will be gloomy prospects for furthering integration unless some programs to reduce the widening income gap in the region follow (such as the Regional and Cohesion Funds established by the EU). This study attempts to

---

look at the growth patterns across nations and regions in East Asia, more precisely, whether nations and regions in East Asian will achieve similar levels of the real output per capita.

Previous studies (Barro and Sala-i-Martin 1990, 1992a, 1992b; Sala-i-Martin 1996) indicate that there was a significant degree of real economic convergence in the U.S. (across different states), in Japan (across different prefectures) and in Europe (across different European nations). Even for China, it seems that a similar pattern of convergence holds (Fang 2001). In case of East Asia as a whole, however, no research has been done so far. This may be mostly due to the difficulty in collecting standardized income data at the regional level for many East Asian countries, as this data was unavailable until recently (gross regional product data became available from 1983 for Indonesia and from 1985 for Korea).

This study shows that East Asia as a whole tends to converge in terms of per capita income. If Northeast Asia is considered separately, it shows that there is far stronger evidence in favor of real growth convergence. The evidence is not very clear, however, for ASEAN 5. This result provides a brighter prospect for furthering the real and monetary integration in East Asia. Despite such a convergence tendency, however, there remain relatively wider income disparities between regions and nations in East Asia than those in case of Europe, Japan and the U.S., suggesting that a common effort to further reduce the income gap will be imperative if East Asia wants to deepen its integration.

The organization of this study is as follows. In Section II, we discuss the methodology used to test the real convergence and the data. In Section III, we show the current economic disparities in East Asia, in particular, the extent of economic disparities and trend of convergence at the national level. Section IV investigates whether per capita incomes in East Asia converge, focusing on the β-convergence and σ-convergence, using gross regional domestic product data for the 10 most advanced East Asian countries. Section V briefly examines the convergence patterns of 12 European nations, both at the national and regional levels. The pattern of European convergence will serve as a benchmark for the East Asian real convergence study. Section VI gives a conclusion.

2. METHODOLOGY AND DATA

2.1. Methodology

To investigate convergence at the national and regional levels, we rely on the two standard convergence indicators developed by Barro and Sala-i-Martin (1992a), that is, β-convergence and σ-convergence across regions. According to Barro and Sala-i-Martin, β-convergence relates to poor regions growing faster than rich ones, and β is obtained from estimating the following equation.

(1) $\dfrac{1}{T}\log(\dfrac{y_{it}}{y_{i,t-T}}) = a + \beta\log(y_{i,t-T}) + \mu_{it}$

where y_{it-T} is the real per capita income in region i at the beginning of the interval. T is the length of the interval and u_{it} is the error term assumed to have mean of zero and the same variance for all regions.

If $\beta < 0$, then β-convergence holds. In the actual estimation of the equation (1), regional dummies are added. As Sala-i-Martin (1996) pointed out, however, β-convergence is only a

necessary condition for σ-convergence. The σ-convergence examines the sample standard deviation of the log of the per capita income and shows how the distribution of per capita income evolves over time.

$$(2) \quad \delta_t^2 = (1/T)\sum_{i=1}^{T}(\log(y_{it}) - u_t)^2$$

where u_t is the sample mean of log (y_{it}).

If the value of σ declines over time, then σ-convergence holds. We consider σ-convergence as well as β-convergence to grasp the real pattern of convergence. To estimate β and calculate σ, data for the per capita regional gross domestic product in the countries of East Asia are used.

2.2. Data

In order to examine the patterns of convergence across nations and region for Europe and East Asia, we need to look at two types of GDP per capita data, that is, GDP data by country and by region. There are some important benefits for considering per capita GRDP (Gross Regional Domestic Product) separately. First of all, it is clear that countries cannot be considered as having equal weighting for the analysis of convergence. For instance, a country such as Hong Kong may be as important in its size as a small region of China, but it is considered to have an equal weight to China in the cross-sectional analysis if national GDP per capita data is used. There is no doubt that convergence analysis based on the regional GDP per capita is more appropriate in this case. In addition, economic agglomeration effect and formation of clustering can be more obvious phenomena on the regional level than in the national level. Indeed, according to the literature named New Economic Geography (For example, Krugman 1993; Hanson 1998), it is the region, not the nation that creates agglomeration effects leading to the income divergence between regions. It is, however, important to clarify how "regional disparities" are defined, because economic convergence can depend on the definition of region.[1]

Therefore, we will base our study on the regional and national GDP per capita data. For comparisons by countries, constant-value national GDP per capita data from the Penn World studies (conducted by Alan Heston, Robert Summers and Bettina Aten) are used. The new 6.1 version published in 2002 includes quite a long series of national GDP data up to 2000 from the early 1950s and 1960s. We focus on 10 most advanced Asian countries (Japan, Korea, China, Taiwan, Hong Kong and ASEAN 5 -Indonesia, Malaysia, Singapore, the Philippines and Thailand), which can provide data with the longest series.

With regards to the regional data for East Asian countries, there seldom exist any long

---

[1] For instance, regional statistics in Europe use the NUTS(Nomenclature des unites territoriales statistiques) classification and the European Commission has chosen NUTS-2 level of dis-aggregation rather than more aggregated NUTS-1 or more dis-aggregated NUTS-3 levels. The choice of a particular level of disaggregation has a great relevance for regional disparities. Because, as Steinherr and Funck et al. (2004) indicated, at NUTS-2 level, the UK shows the largest regional income disparity while France shows a very homogenous income distribution. At the NUTS-3 level, however, it is France that exhibits the widest income disparity. Moreover, European Commission distributes its regional policy funds on the basis of NUTS-2 classification.

series data. The regional data was not available until recently in most of East Asian countries. Moreover, there is no harmonized classification system for the whole of East Asia and we have to take in each national classification for regions as set by each national statistical office. For the 10 East Asian countries, then we can consider per capita GRDP data for 225 regions (see Appendix for the list of these regions). The GRDP data only covers the 1980-2000 periods, as longer series data is only available for Japan.

The detailed description of each of these regional data is as follows. First, for Japan, per capita GRDP for the 47 prefectures, Japan's largest administrative unit, is calculated by the Economic Planning Agency and published in its 'Annual Report on Prefectural Accounts.' Among China's 31 provinces, GRDP data published by each of the provincial statistical offices is used for 30 provinces (GRDP data has only been recently made available for Chungking Province). For Korea, GRDP data since 1985 is available, as published by the National Statistical Office of Korea. As of 2002, there are 16 administration units in Korea (the metropolitan city of Seoul, six 'special' cities and nine provinces). For the six 'special' cities, which are enclosed by each of the nine provinces and have strong cultural and economic linkages with their surrounding provinces, separate statistics are not available for as early as 1985, so they form amalgamated regions. Thus, GRDP per capita is only calculated for 10 regions. In Indonesia, data has only been published by the BPS-Statistics Indonesia for 27 regions since 1983, with data on 26 regions used due to the recent independence of East Timor. For the Philippines, GRDP data has been published in the 'Regional Accounts of the Philippines' since 1975, from the Economic and Social Statistics Office of the National Statistical Coordination Board. For Thailand, GRDP data of 72 out of 73 regions from the National Statistical Office has been adopted, with data for the Mukdahan region (available since 1983) omitted.[2] For Malaysia, GRDP data for 14 regions has been available since 1970 but has only been released every five years.[3]

The data for the GRDP per capita is expressed in terms of each nation's currency unit (current or constant). For an international comparison over the periods 1980-1999 (or 1980-2000), we must denominate them in constant international dollars. To do this, we first divide per capita GRDP for each region of a given nation by the national per capita GDP and calculate the ratio of per capita GRDP to the national average for each region of a given nation. Then, we multiply the ratio of each per capita GRDP to the national average with per capita GDP obtained from the Penn World Table, which leads to per capita GRDP values denominated in the same constant international dollar.

3. CONVERGENCE AT THE NATIONAL LEVEL

Table 1 gives some ideas on the extent of economic disparity in East Asia and the pattern of income convergence at the national level for 10 East Asian countries. Two interesting facts emerge. First, the economic disparities measured in terms of per capita GDP (or personal income) turn out to be far larger in the East Asian regions than in any other parts of

---

[2] Compared to the administrative unit in other countries of East Asia, Thai administrative units are too small. Indeed, 72 regions can be regrouped into seven larger regions. We, however, report the results for 72 regions, since regrouping the 72 provinces into seven regions does not change our results.

[3] These are contained in each of the Malaysia Plan published by the Malaysia Government Planning. GRDP data after 1980 is obtained from the Fifth and Seventh Malaysia Plans.

the world. For instance, per capita GDPs of the countries such as China, Indonesia and the Philippines accounted for only 14-15 percent of Japan's per capita GDP in 2000, marking a sharp contrast with the European cases of Greece and Portugal, the poorest countries belonging to the EU, which still takes up per capita GDPs of 60-70% of that of Germany. This observation implies that East Asia is characterized by far larger income disparities than Europe (Moon, Kim and Yoon 2004).

Table 1. Relative per Capita GDP for Different Countries in East Asia

| Year	1960	1970	1980	1990	2000
JPN	1	1	1	1	1
CHN	0.15	0.07	0.07	0.08	0.15
HKG	0.68	0.57	0.81	0.94	1.08
IDN	0.21	0.09	0.12	0.13	0.15
KOR	0.33	0.24	0.31	0.45	0.64
MYS	0.47	0.25	0.31	0.29	0.40
PHL	0.44	0.21	0.21	0.14	0.14
SGP	0.48	0.46	0.73	0.81	1.18
THA	0.24	0.16	0.17	0.22	0.28
TWN	0.31	0.24	0.38	0.49	0.76

Source: Alan Heston et al. (2002)

Second, over the past 40 years, there has not been any sign of the income gap being reduced between Japan and most developing countries in East Asia. Rather, it seems that the disparity in per capita income among East Asian countries has been enlarged. In particular, for poorer countries such as China, Indonesia and the Philippines, the income gap relative to Japan has widened or remained the same. The strong convergence is only observed in the four Asian Tigers (Korea, Taiwan, Hong Kong and Singapore) relatively recently.

It is also observed that there is no β-convergence for the East Asian 10, as is shown in Figure 1(a). Figure 1(b) suggests that the failure of β-convergence in East Asia over the periods 1960-2000 is mainly due to the fact that income differentials became widened than narrowed up until the 1980s. The trend has been reversed since 1980s and the national income gap began to narrow when the Japanese economy had matured into one of the most advanced economies in the world (Figure 1(c)).

Figure 2, which reports the behavior of σ, reconfirms this trend. It suggests that the widening income differences, as measured by the standard deviations of log of per capita GDP for the 10 East Asian countries, slowed down after 1980. Indeed, most developing East Asian countries have recorded rapid growth rates since 1980, starting to catch up with Japan, the richest country in the region until the 1990s.

It is notable that China started to catch up with Japan after its economic reform in 1978. The reductions in the income gap between Japan and other developing East Asian countries have been especially remarkable since the 1990s, as severe economic recession has prevailed in Japan for more than 10 years. Nonetheless, it is true that there is still a large and important income gap between Japan and other countries.

Figure 1(a). National convergence in East Asia 1960-2000
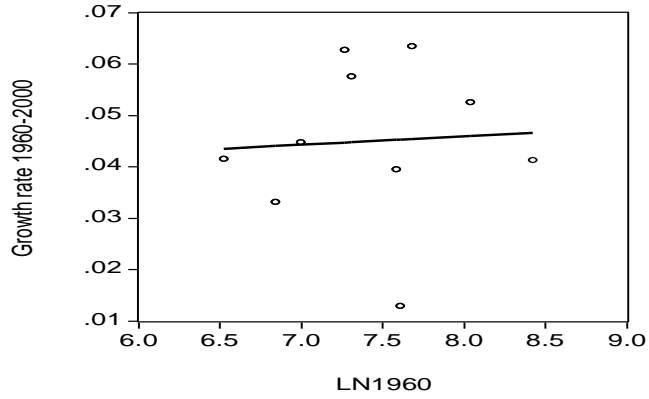
Figure 1(b). Convergence 1960-1980
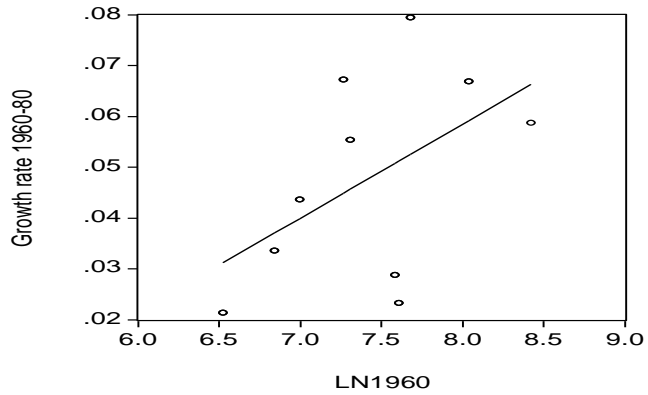
Figure 1(c). Convergence 1980-2000
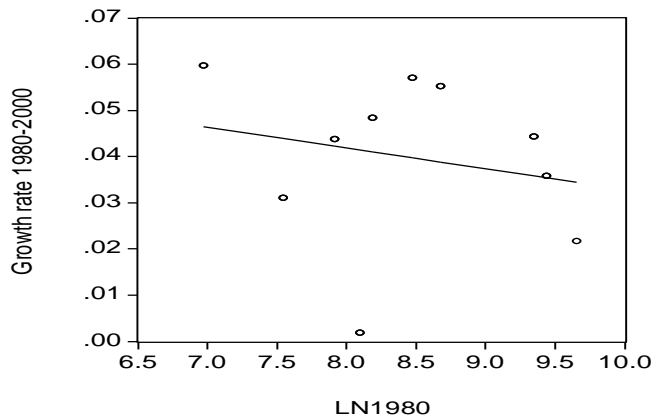
Figure 2. σ–convergence across 10 East Asian nations
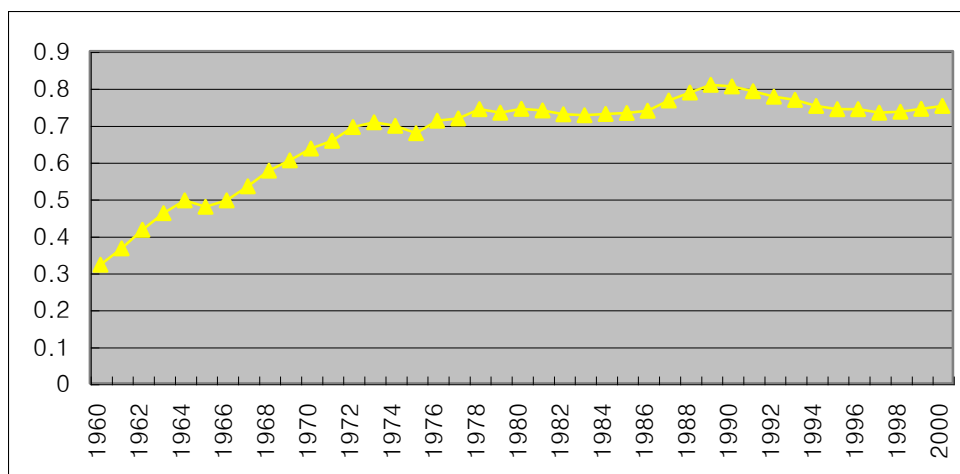
Source: Alan Heston et al. (2002)

4. CONVERGENCE AT THE REGIONAL LEVEL

4.1. Convergence across nations

This section examines the convergence at the regional level. Table 2 reports the OLS regression results for the regions in the 10 East Asian countries over the 1980-2000 period and the 1980-1990 and 1990-2000 sub-periods. For the sample range, regression has been conducted on the whole sample of East Asia, and two subgroups of Northeast and Southeast Asia (ASEAN 5). In a given sample range and time span, the upper equation in each box (the basic model) includes a constant term and log of the initial income as independent variables, while the lower equation adds a country dummy as an independent variable to the countries who produce significant explanatory power for the growth rate of the regions in East Asia.[4] In the basic model of East Asia, the estimated coefficients are all negative, which means that income levels of the regions in East Asia are converging (although this result is not very robust for the 1980s). The addition of the country dummies makes the estimates of β markedly more significant and confirms stronger economic convergence. Broken down by period, β-convergence holds both in the 1980s and 1990s with dummies.

In the second and third rows, β-convergence is separately examined for sub-regions of Northeast and Southeast Asia. It is interesting to note that stronger evidence of convergence in income per capita emerges in Northeast Asia. The β coefficients are more significant and the explanatory power of the equation measured by the R2 is largely improved across all periods in Northeast Asia. β-convergence is more apparent in the 1990s in Northeast Asia, which may be related to the severe economic depression in Japan in the 1990s. In contrast to the case of Northeast Asia, Southeast Asia shows a slightly different pattern: β-convergence appears far weaker in Southeast Asia. The pattern of convergence did not emerge even in the 1990s.

---

[4] The same method is applied to the case of the European regions in Barro and Sala-i-Martin (1992a).

Table 2. Regressions for GRDP per Capita across East Asian Regions (215 regions)

	Whole period		1980-1990		1990-2000	
	β	R2	β	R2	β	R2
East Asia						
-Basic	-0.0079*	0.11	-0.0041*	0.02	-0.0082*	0.09
	(0.0015)	(0.0226)	(0.0020)	(0.0291)	(0.0018)	(0.0259)
-With	-0.0105*	0.47	-0.0075*	0.43	-0.0125*	0.31
dummies	(0.0012)	(0.0176)	(0.0015)	(0.0224)	(0.0017)	(0.0228)
Northeast Asia						
-Basic	-0.0145*	0.69	-0.0083*	0.24	-0.0222*	0.69
	(0.0011)	(0.0125)	(0.0016)	(0.0179)	(0.0016)	(0.0168)
-With	-0.0148*	0.79	-0.0088*	0.65	-0.0224*	0.72
dummies	(0.0009)	(0.0100)	(0.0011)	(0.0123)	(0.0015)	(0.0161)
Southeast Asia						
-Basic	-0.0074*	0.04	-0.0121*	0.07	0.0041	0.01
	(0.0031)	(0.0231)	(0.0040)	(0.0302)	(0.0032)	(0.0242)
-With	-0.0073*	0.33	-0.0119*	0.32	0.0006	0.17
dummies	(0.0026)	(0.0195)	(0.0035)	(0.0261)	(0.0031)	(0.0224)

Note 1: Country dummies are included insofar as their explanatory power is significant, so that
dummies are given for Korea, Indonesia and the Philippines.

Note 2: Figures in parentheses represent the standard errors. Figures with * mean that they are
significant at 95% confidence level.

Figure 3 (a), (b) and (c) shows the robustness of the β-convergence through scatter plots between the average GRDP per capita during 1980-2000 and the log of GRDP per capita in 1980. While the slope of β is strongly negative and stable in the case of Northeast Asia, it is weakly so in the case of whole of East Asia and ASEAN 5.

The result of the σ-convergence in regions in East Asia takes a similar shape to the β-convergence; there is a slight pattern of σ-convergence for the whole of East Asia, a clear pattern of σ-convergence for Northeast Asia and no conspicuous pattern of σ-convergence in Southeast Asia (Figure 4). It is, however, noteworthy that economic disparity measured by σ-convergence was initially far lower and is still lower in Southeast Asia than in Northeast Asia, although values of σ-convergence have substantially decreased in Northeast Asia, mainly due to the rapid catch-up of China in the 1980s.

4.2. Convergences within Nations

Here we focus our attention on the intra-national results; Table 3 shows the results of intra-national σ-convergence. Three groups of countries are distinguished. First of all, the β-convergence at the 95-percent significance level holds only for Japan and Indonesia, the latter being considered the poorest country in Southeast Asia. Broken down by period, β-convergence in Japan is shown in the 1990s, while it only holds in the 1980s in Indonesia.

Figure 3 (a). Regional Convergence of East Asia
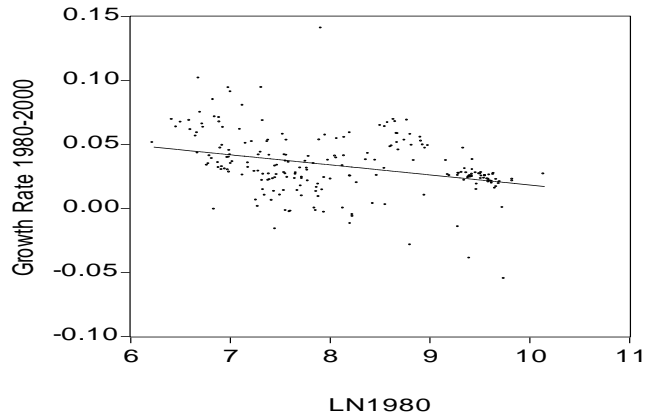
Figure 3 (b). Regional Convergence of Northeast Asia
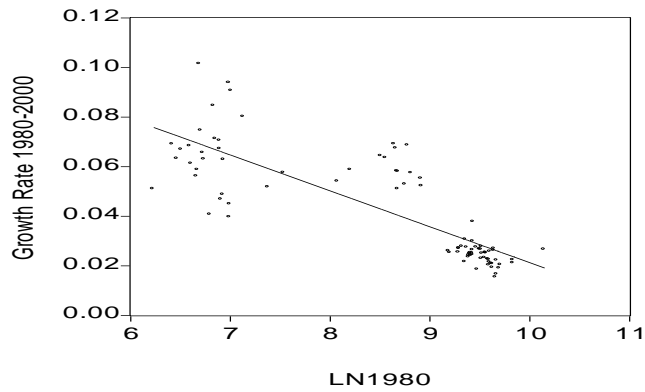
Figure 3 (c). Regional Convergence of Southeast Asia

Figure 4. σ–convergence Across Regions in East Asia

Table 3. Regressions for GRDP per Capita within East Asian Nations

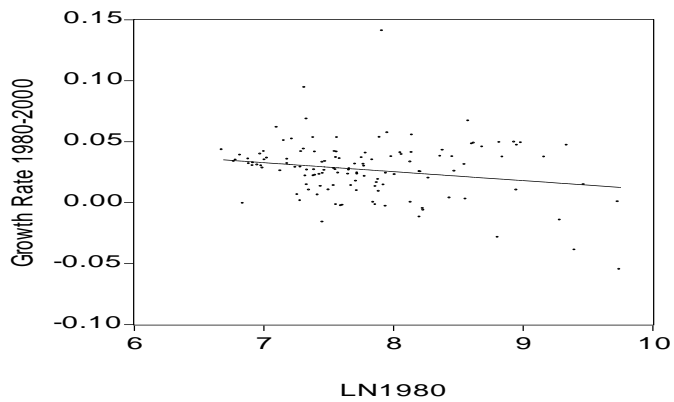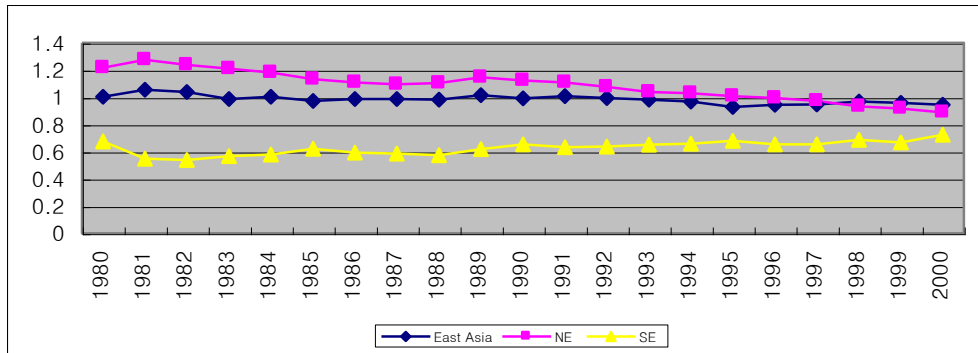|	Whole period		1980-1990		1990-2000	
	β	R2	β	R2	β	R2
G. China	-0.0068+	0.11	-0.0109*	0.17	-0.0017	0.00
(32)	(0.0036)	(0.0148)	(0.0044)	(0.0181)	(0.0055)	(0.0209)
Japan	-0.0076*	0.16	0.0094	0.07	-0.0237*	0.52
(47)	(0.0026)	(0.0030)	(0.0052)	(0.0062)	(0.0034)	(0.0047)
Korea	-0.0254+	0.27	-0.0104	0.02	-0.0427	0.29
(10)	(0.0148)	(0.0061)	(0.0244)	(0.0101)	(0.0233)	(0.0098)
Indonesia	-0.0159*	0.30	-0.0233*	0.42	-0.0108	0.07
(26)	(0.0050)	(0.0186)	(0.0056)	(0.0211)	(0.0081)	(0.0261)
Thailand	-0.0077+	0.05	-0.0111+	0.05	0.0016	0.00
(72)	(0.0040)	(0.0218)	(0.0056)	(0.0303)	(0.0042)	(0.0230)
Phil	0.0010	0.01	0.0011	0.00	0.0009	0.00
(13)	(0.0040)	(0.0062)	(0.0055)	(0.0087)	(0.0054)	(0.0087)
Mal-Sing	0.0078	0.06	0.0093	0.06	0.0064	0.02
(15)	(0.0083)	(0.0132)	(0.0101)	(0.0161)	(0.0106)	(0.0194)

Note: Figures in parentheses represent standard errors. Figures with * and + mean that they are significant respectively at 95% and 90% confidence level.

Second, for Greater China, including Hong Kong and Taiwan, as well as Korea and Thailand, β-convergence turns out to be significant at the 90- percent confidence level. The result of β-convergence for Greater China is consistent with the results of β-convergence for China obtained by Fang (2001). Third, for the Philippines and Malaysia, including Singapore, there seems no β-convergence at all.

Figure 5 shows the results of intra-national σ-convergence. The σ-convergence is most apparent in the case of Indonesia, while slightly so in the case of Japan and Korea. For other countries in East Asia, it is difficult to find a conspicuous pattern of σ-convergence, such that the values of σ stagnate or increase over time. In the case of Japan and Korea, it is notable that the absolute value of σ is lower than any other countries over the whole period, implying that the two countries maintain milder regional disparity than other East Asian countries.

Figure 5. σ–convergence within 7 East Asian Countries or Regions
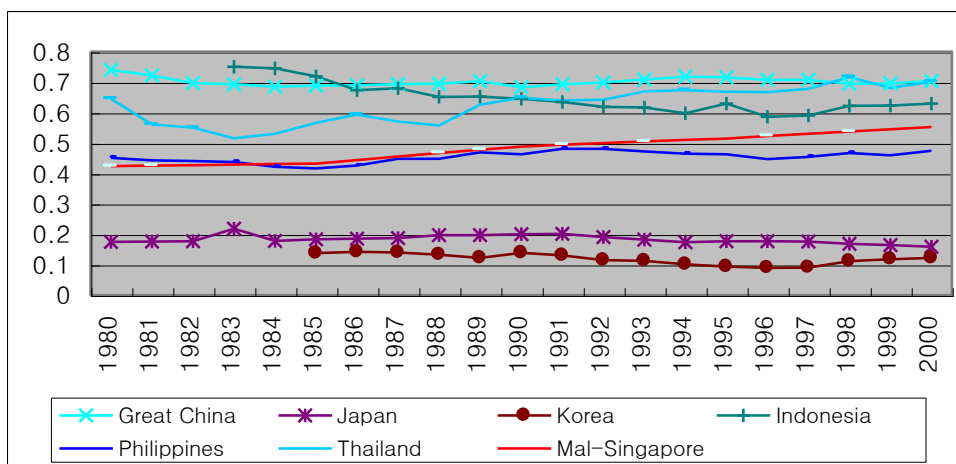
Comparing the results of intra-national σ with those of σ across nations, we find that σ values are far smaller within nations than across nations. For instance, intra-national σ ranges between 0.12 (Korea) and 0.70 (China) in 2000, while σ across nations reaches 0.86 in 2000 for all of East Asia. This implies that the economic solidarity measured by smaller σ values is stronger among regions within a nation than among nations in East Asia. Each nation in East Asia, through its governmental transfers and taxes, are playing a non-negligible role in narrowing the inter-regional income gap, while there is neither such efforts nor institutional building on the East Asian level.

5. COMPARISON WITH EUROPE AND IMPLICATION

This section compares the current state of income disparities in East Asia with those in Europe. Figure 6 gives some idea about the extent of the economic disparities measured both in terms of per capita GDP and per capita GRDP in 12 European Union and 10 East Asian countries. First, the values of σ measured on the basis of per capita GDP remained quite stable around 0.7-8 in East Asia all through the period 1980-2000, while they were ten times smaller in Europe, around 0.05-0.08. Given that many countries in East Asia are still developing economies, while countries such as Japan are already completely developed economies, it is clear that the economic disparities turn out far larger in East Asia than in Europe. For instance, if we consider the per capita income of the poorest countries in East Asia as of 2000, the per capita GDP in China accounts for nothing but 15 % of the per capita GDP in Japan. Similarly, the per capita GDP in Indonesia and Philippines represent 16% of the Japanese per capita GDP.[5] In contrast, the per capita GDP of Portugal, the poorest country in Europe, represents still 71 % of the per capita GDP of Germany. Indeed, except for Luxembourg, the smallest and the richest country in Europe, most countries in current Europe are quite similar in their per capita income levels, given such wide income disparities

---

[5] In fact, the economic disparities are far larger if such countries like new members of ASEAN (Vietnam, Laos, Cambodia etc) and North Korea are included.

across nations.

Quite similar pattern is observed for the income disparity measured on the basis of GRDP data. In Europe, the values of σ are very low and they are not very much different from those measured on the basis of per capita GDP data. In contrast, the values of σ in East Asia are all greater than 0.9 and in many cases, even exceed 1.

Figure 6. σ–values across nations and regions in East Asia and Europe
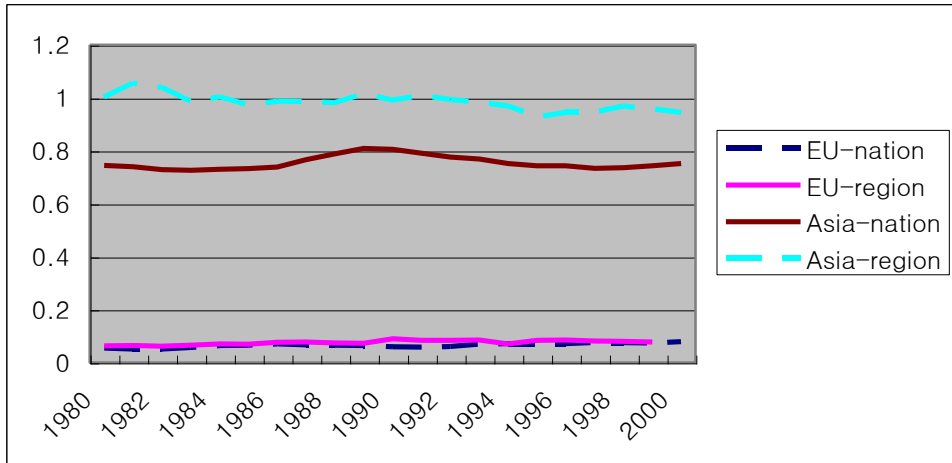
Source: Moon, Kim and Yoon (2004).

The large income difference that exists in East Asia is neither new nor surprising. What might be remarkable is the smaller income difference in Europe. The smaller income disparities in Europe than in East Asia reflect many factors and policy differences. One important lesson we can draw from European experience is, however, the importance of regional policy within and across European nations.

Regional policy in some individual European countries such as Germany has been long renowned for its strong equalizing effect. For instance, there is a horizontal income transfer system in Germany called 'Länderfinanzausgleich'. This system came into existence after the World War II to foster national homogeneity and uniformity of living conditions and thereby to achieve inter-regional solidarity. The main procedure of this system is the horizontal redistribution through which the Länder (states) whose tax revenues fall below some predetermined range (for instance, 92%) receive compensation from the Länder, whose tax revenues exceed some range (for instance, 110%). The sum of payments received always equals the sum of disbursements and thus the scheme is a complete clearing system. The equalizing effects of the länderfinanzausgleich are considerable. The program guarantees that the fiscal capacity of all states attains at least 95 percent of the average tax capacity. (See for example, De Grauwe 2000; Spahn 2001). Regional policy in Spain and Ireland is also considered very successful in reducing economic disparities. (See for example Funck, B. & L. Pizzati 2003).

Regional policy was also very important at the European level, because large income difference could be a serious block to European economic integration. In fact, the wide income divergences, if they are maintained, can generate political tensions, leading to the separation of the economically depressed regions or countries from the given federation or

union. This makes the convergence of income a necessary condition for regional integration even from a political perspective. This was especially true in the case of Europe. According to neoclassical growth theory, there was no place for regional policy. For, through the removal of barriers to trade of commodities and capital, the factors of production would be redistributed to the different regions and used in their most efficient way, stimulating a convergence of incomes. Nevertheless, there was strong evidence that even the founders of EU did not believe that free market would bring about such a convergence [6]. The implementation of common policies (agricultural, regional and social) by the EU right after its successful launch in 1958 suggested already the need for common action in favor of solidarity, i.e., correcting the possible rising imbalance across regions. In fact, in the case of Europe, even the idea of a 'Community', let alone a 'Union', already implies some kind of solidarity (Pelkman 1997).

Thus, if East Asia is to be developed into a regional Community, the wide income gap problem must be tackled immediately and in this case, the transfer of income from the rich countries or regions to the poor ones cannot be overemphasized because the existing economic imbalances can not be solved quickly any longer through the removal of trade barriers or exchange rate movements.

6. CONCLUSION

With regard to the future of regional cooperation in East Asia, a pessimistic view has prevailed so far, as countries in East Asia have been so diverse in terms of per capita income. Substantial income divergences, if they are maintained, can generate political tensions, leading to the separation of the economically depressed regions or countries from the East Asian society. In order to boost and maintain regional cohesion, a particular attention must be given to regional income disparities. Thus, to know whether or not the convergence of per capita income in East Asia prevails is important.

This study shows that East Asia as a whole tends to converge with itself in terms of per capita income, although the tendency is not as strong as seen in Europe. If Northeast Asia is considered separately from East Asia as a whole, there is far stronger evidence in favor of real growth convergence, while the evidence is not very clear for the five ASEAN countries (Indonesia, Malaysia, Singapore, the Philippines and Thailand). This result may provide a positive argument for pursuing real and monetary integration in East Asia, even without overly emphasizing solidarity in the region. Despite such convergence tendency, however, there remain relatively wider income disparities between regions and nations in East Asia than in Europe, suggesting that a common effort to reduce the income gap further is imperative if East Asia aims to deepen its integration. In the case of the European Union, this solidarity goal is achieved through the means of regional policy. This means that the regional income transfer through diverse means, including aid, must be made from the richer regions or countries to the poorer ones.

---

[6] The preamble of the Treaty of Rome, for instance, mentions 'the harmonious development' as one of its economic objectives.

APPENDIX: MAPS OF REGIONS

China

1	Beijing	9	Shanghai	17	Hubei	25	Tibet
2	Tianjin	10	Jiangsu	18	Hunan	26	Shaanxi
3	Hebei	11	Zhejiang	19	Guangdo	27	Gansu
4	Shanxi	12	Anhui	20	Guangxi	28	Qinghai
5	I-Mongol	13	Fujan	21	Hainan	29	Ningxia
6	Liaoning	14	Jiangxi	22	Sichuan	30	Xinjiang
7	Jilin	15	Shandong	23	Guizhou	31	
8	Heilongji	16	Henan	24	Yunnan	32	

Japan

1	Hokkaido	13	Tochigi	25	Kyoto	37	Ehime
2	Aomori	14	Fukui	26	Mie	38	Kochi
3	Akita	15	Gifu	27	Hyogo	39	Yamaguchi
4	Iwate	16	Yamanashi	28	Osaka	40	Nagasaki
5	Yamagata	17	Saitama	29	Nara	41	Fukuoka
6	Miyagi	18	Tokyo	30	Tottori	42	Oita
7	Niigata	19	Ibaraki	31	Okayama	43	Saga
8	Fukushima	20	Shiga	32	Kagawa	44	Kumamoto
9	Ishikawa	21	Aichi	33	Tokushima	45	Miyazaki
10	Toyama	22	Shizuoka	34	Wakayama	46	Kagoshima
11	Nagano	23	Kanagawa	35	Shimane	47	Okinawa
12	Gumma	24	Chiba	36	Hiroshima		

Korea

1	Seoul	4	Chungnam	7	Chungbuk	10	Cheju
2	Incheon-Kyungki	5	Chunbuk	8	Daegu-Kyungbuk		
3	Kangwon	6	Chunnam	9	Pusan-Kyungnm		

Indonesia

1	Daerah Istimewa Aceh	8	Lampung	15	Nusa Tenggara Barat	22	Sulawesi Tengah
2	Sumatera Utara	9	D.K.I. Jakarta	16	Nusa Tenggara Timur	23	Sulawesi Selatan
3	Sumatera Barat	10	Jawa Barat	17	Kalimantan Barat	24	Sulawesi Tenggara
4	Riau	11	Jawa Tengah	18	Kalimantan Tengah	25	Maluku
5	Jambi	12	D.I. Yogyakarta	19	Kalimantan Selatan	26	Irian Jaya
6	Sumatera Selatan	13	Jawa Timur	20	Kalimantan Timur		
7	Bengkulu	14	Bali	21	Sulawesi Utara		

Thailand

1	Mae Hong Son	19	Nakhon Sawan	37	Si Sa Ket	55	Chachoengsao
2	Chiang Mai	20	Phichit	38	Kanchanaburi	56	Rayoung
3	Chiang Rai	21	Phetchabun	39	Suphan Buri	57	Chanthaburi
4	Phayao	22	Chaiyaphum	40	Ang Thong	58	Trat
5	Nan	23	Khon Kaen	41	Phra Nakhon Si Ayutthaya	59	Prachuap Khiri Khan
6	Lamphun	24	Maha Sarakham	42	Saraburi	60	Chumphon
7	Lampang	25	Kalasin	43	Ratchaburi	61	Ranong
8	Phrae	26	Roi Et	44	Nakhon Pathom	62	Phangnga
9	Tak	27	Mukdahan*	45	Nonthaburi	63	Surat Thani
10	Sukhothai	28	Yasothon	46	Pathum Thani	64	Phuket
11	Uttaradit	29	Ubon Ratchathani	47	Nakhon Nayok	65	Krabi
12	Kamphaeng Phet	30	Uthai Thani	48	Prachin Buri	66	Nakhon Si Thammarat
13	Phitsanulok	31	Chai Nat	49	Phetchaburi	67	Trang
14	Loei	32	Sing Buri	50	Samut Songkhram	68	Phatthalung
15	Udon Thani	33	Lop Buri	51	Samut Sakhon	69	Satun
16	Nong Khai	34	Nakhon Ratchasima	52	BangKok	70	Songkhla
17	Sakon Nakhon	35	Buri Ram	53	Samut Prakan	71	Pattani
18	Nakhon Phanom	36	Surin	54	Chon Buri	72	Yala
						73	Narathiwat

Note: The data for Mukdahan is not available since 1980 and thus omitted.

Philippines

1	ILOCOS REGION	5	BICOL REGION	9	WESTERN MINDANAO	13	METRO MANILA
2	CAGAYAN VALLEY	6	WESTERN VISAYAS	10	NORTHERN MINDANAO		
3	CENTRAL LUZON	7	CENTRAL VISAYAS	11	SOUTHERN MINDANAO		
4	SOUTHERN TAGALOG	8	EASTERN VISAYAS	12	CENTRAL MINDANAO		

Malaysia

1	Perlis	5	KL	9	Kelantan	13	Sabah
2	Kedah	6	Selangor	10	Pahang	14	Sarawak
3	Pulau Pinang	7	Negeri Sembilan	11	Terengganu		
4	Perak	8	Melaka	12	Southern-Johor		

REFERENCES

Alan Heston, Robert Summers and Bettina Aten, 2002, *Penn World Table Version 6.1*. Center for International Comparisons at the University of Pennsylvania, October.

Barro, R and X. Sala-i-Martin, 1990, "Economic Growth and Convergence across the United States," *NBER working paper*, July.

Barro, R and X. Sala-i-Martin, 1992(a), "Convergence across States and Regions," *BPEA* 1, pp. 107-158.

Barro, R and X. Sala-i-Martin, 1992(b), "Regional Growth and Migration: A U.S.-Japan Comparison," *Journal of the Japanese and International Economies*: 312-46.

Boldrin, Michele and Fabio Canova, 2001, "Inequality and Convergence in Europe's Regions: Reconsidering European Regional Policies," *Economic Policy* 32: 205-53.

De Grauwe, P., 2000, *Economics of Monetary Union*, Oxford.

Eichengreen, Barry, 2003, "What to Do with the Chiang Mai Initiative?" *Asia Economic Papers* 2(1), pp. 1-49.

Fang Cai, 2001, "Regional Disparity and Regional Development Policy," In Kyung Tae Lee, ed., *China's Integration with the World Economy: Repercussions of China's Accession to the WTO*, KIEP, December.

Funck, B. & L. Pizzati, 2003, "European Integration, Regional Policy and Growth," *World Bank* (May).

Hanson, Gordon H, 1998, "North American Economic Integration and Industry Location," *Oxford Review of Economic Policy* 14(2):30-44.

Kim, Heungchong, 2002, "Has Trade Intensity in ASEAN+3 Really Increased? – Evidence From a Gravity Analysis," *KIEP Working Paper* 02-12.

Kletzer, K. & J. von Hagen, 2001, "Monetary Union and Fiscal Federalism", In Wyplosz, C. ed., *The Impact of EMU on Europe and the Developing Countries*, Oxford University Press.

Krugman, Paul, 1993, "Lessons of Massachusetts for EMU," In F. Torres and F. Giavazzi, eds., *Adjustment and growth in the European Monetary Union,* Cambridge University Press: London.

Malaysia Government, 1986, *Fifth Malaysia Plan*: 1986-1990.

Malaysia Government, 2002, *Seventh Malaysia Plan*: 1996-2000.

Moon, Kim and Yoon, 2004, "Monetary Union and Real Convergence Compared: Europe and East Asia", *KIEP discussion paper* 04-01.

Pelkmans, J., 1997, *European Integration: Methods and Economic Analysis*, Netherlands Open University.

Sala-i-Martin, X, 1996, "Regional cohesion: Evidence and theories of regional growth and convergence," *EER* 40: 1325-1352.

Spahn, Paul Bernt, 2001, Maintaining fiscal equilibrium in a federation: Germany", from: www.desequilibrefiscal.gouv.qc.ca/en/pdf/spahn.pdf

Moon, Woosik. Associate Professor of Graduate School of International Studies, Seoul National University, San 56-1, Sillim-dong, Gwanak-gu, Seoul, 151-742, Korea. Tel: 82-2-880-8524, E-mail: mwoosik@snu.ac.kr