

Monetary Union and Real Convergence: A Look at the Patterns of Economic Growth in East Asia

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Abstract

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 capital income. If Northeast Asia is separately considered, there is far stronger evidence in favor of real growth convergence. The evidence is not very clear, however, for the 5 ASEAN countries. This result suggests that the prospect for furthering economic and monetary integration in East Asia is not gloomy. For, the widening income divergences, if maintained, can lead to the separation of the economically depressed regions or countries from a given union, jeopardizing the integration process itself. Despite such convergence trend, 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 is imperative, if East Asia aims at deepening the integration. In this case, of course, the transfer of income from the rich countries to the poor cannot be overemphasized.

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Introduction

There is now growing literature that argues for economic and monetary cooperation on the basis of the growing economic interdependence in East Asia. For instance, the intra-regional trade now accounts for almost half of East Asia's total trade. Intra-regional trade has also been enhanced by the opening up of large regional markets such as China. In terms of financial flows, there is also an increase in the intra-regional FDIs promoting greater regional financial linkages. The eruption of the Asian financial crisis helped countries in the region to be more and more aware of the growing trade and financial interdependence. All these suggest that the economic condition for monetary cooperation in East Asia is now ripe than ever.

Regarding the future of regional cooperation, however, pessimistic view seems to prevail so far (for instance, Eichengreen(2002)) because countries in East Asia were considered so diverse and too backward in its degree of development. This suggests that it is imperative for East Asia to reduce the regional economic and social disparities, especially, per capita income differences among themselves and thereby to nurture regional solidarity. For, regional integration can aggravate the already large existing differences in terms of per capita income further, putting the integration process itself in danger. On the theoretical and empirical level, indeed, there is no proof that economic and monetary integration necessarily leads to the convergence of economic performances across nations. Some studies suggest rather the opposite case is true (for example, Krugman(1993) and Hanson(1998)) Also, the loss of the exchange rate as a policy instrument can make real adjustment much more costly.

It is thus important to ask about the pattern of income convergence in East Asia. For, if the inter-regional or inter-national differences in income levels tend to increase over time or perpetuate themselves, then there will be a gloomy prospect for furthering the integration, unless some programs to reduce the widening income gap in the region (such as the Regional and Cohesion Funds established by the EU) are accompanied. 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, 1992(a), 1992(b)), Sala-i-Martin(1996)) indicate there was a significant degree of real economic convergence in the US (across different states), in Japan (across different prefectures) and in Europe (across different European nations). Even for China, it seems that the same convergence

pattern holds (Fang Cai(2001)). In the case of East Asia as a whole, however, there was so far no research done. This may be mostly due to the difficulty for collecting the data about regional income levels in many East Asian countries, which were unavailable until very recently. For instance, the gross regional product data became available, for China, since 1978, for Indonesia, since 1983, and for Korea, since 1985.

This study shows that East Asia as a whole tends to converge to each other in terms of per capital income. If Northeast Asia is separately considered, it shows that there is far stronger evidence in favor of real growth convergence. The evidence is not very clear, however, for 5 ASEAN countries. This result provides a positive argument for furthering the real and monetary integration in East Asia. Despite such convergence tendency, however, there remains relatively wider income disparities between regions and nations in East Asia than in other parts of the world, suggesting that a common effort to further reduce the income gap is imperative, if East Asia aims at deepening the integration.

The organization of this study is as follows. In Section II, we examine the current economic disparities in East Asia, especially, the extent of economic disparities and trend of convergence at the national level. In Section III, we investigate whether the per capital incomes in East Asia converges to each other, focusing on the σ -convergence and β -convergence with the use of gross regional domestic product data for the most advanced 10 East Asian countries. In Section IV, a comparison with the European Union is made concerning the convergence pattern. In Section V a conclusion is presented.

II. A Preliminary Look: Convergence at the national level

We will first consider the economic convergence at the national level in East Asia, using the data available through the Penn world studies conducted by Alan Heston, Robert Summers and Bettina Aten. The version 6.1 including the GDP data up to 2000 was published in 2002.

Table 1 gives some ideas about the extent of the economic disparities and convergence of incomes at the national level for 10 East Asian countries (Japan, China, Korea, Hong Kong, Taiwan and ASEAN 5). Two interesting facts emerge. First, the economic disparities measured in terms of per capita GDP (or personal income) turn out far larger in the East Asian region than in any other parts of the world. For instance, if we consider the per capita income of the poorest countries in East Asia as of 2000, the per capita GDP of the countries such as China, Indonesia and the Philippines accounts

for nothing but 14-15 % of the per capita GDP of Japan.¹ In contrast, the per capita GDP of Greece and Portugal, the poorest country in Europe, represents still 64-70% of the per capita GDP of Germany (See, for example, Table 4).

Table 1: Relative per capita GDP for different countries in East Asia

| | 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 | 0.43 | 0.22 | 0.23 | 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, Robert Summers and Bettina Aten, Penn World Table Version 6.1, 2002

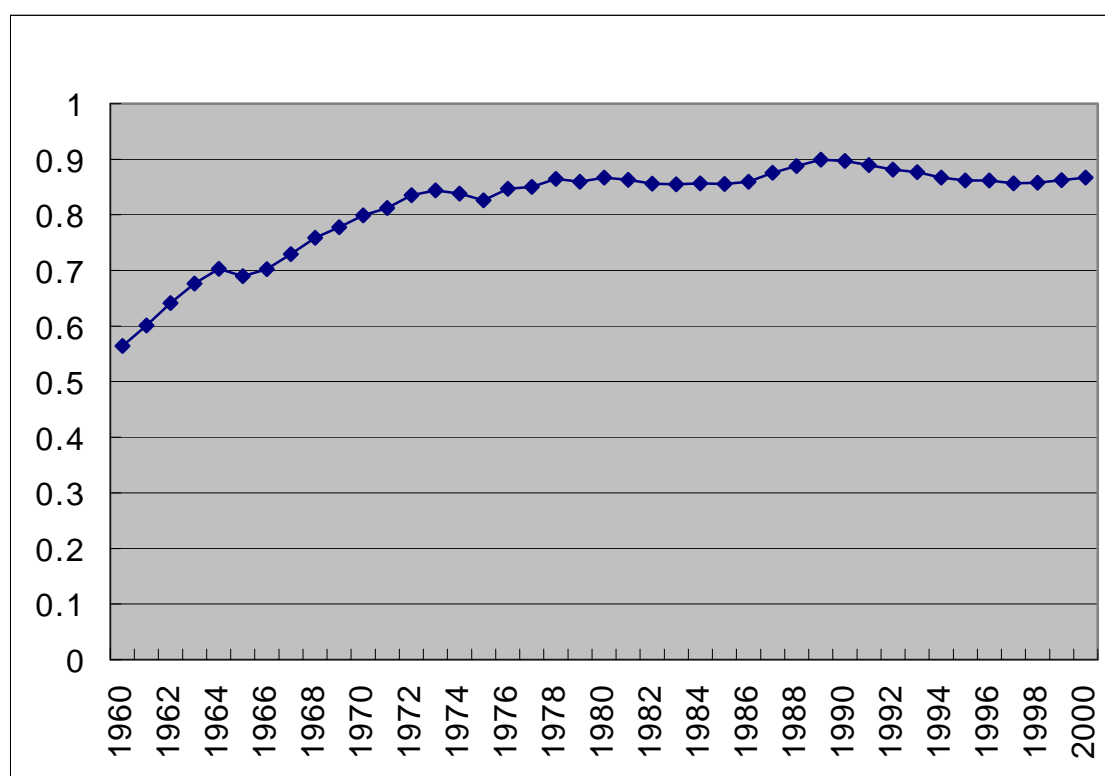
Second, over the forty years' time span, there is no sign of the income gap between Japan and other developing countries being reduced for most of East Asian countries. Rather it seems that the differences in per capita income between countries in East Asia have increased. Especially for the poorest countries such as China, Indonesia and the Philippines, the income gap relative to Japan seems widening. The convergence trend is clear only for Asian Tigers (Korea, Taiwan and two small city countries such as HK and Singapore).

However, as Figure 1 shows, over the last twenty years, the widening income differences measured by the standard deviation of the log per capita GDP for 10 East Asian countries seemed to be slowed down. Indeed, most developing East Asian countries have recorded rapid growth rates, starting to catch up with Japan, the richest country in the region until the 1990s. For instance, China, after its economic reform in 1978, has started to catch up with Japan. The reduction of the income gap between Japan and other developing East Asian countries has been especially remarkable since

¹ 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.

the 1990s because of Japanese deep depression over more than 10 years. Nonetheless, it is true that there is still a large and important income gap left between Japan and these countries.

Figure 1: Dispersion of the log of GDP per capita for 10 East Asian Countries



Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, 2002

III. Convergence at the regional level

So far the catching up process is examined at a national level. However, this analysis has some drawbacks. First of all, the number of data observation is small (10 countries). Moreover, a big country like China is considered equal in its importance to a small city country such as Hong Kong and Singapore. It suggests a need to address the question of economic convergence at the regional level.

1. Methodology and data

To investigate the convergence at the regional level in detail, we rely on the two standard convergence indicators developed by Barro and Sala-I-Martin, i.e., σ -convergence and β -convergence across regions. According to them, σ -convergence relates to poor regions growing faster than rich ones, and β is obtained from estimating the following equation.

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

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

In the actual estimation of the equation (1), regional dummies are added. If $\beta < 0$, then σ -convergence holds. As Sala-i-Martin (1996) pointed out, however, σ -convergence is only a necessary condition for β -convergence. As in the above case, σ is defined as the sample standard deviation of the log of the per capita income, and measures how the distribution of per capita income evolves over time.

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

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

We thus consider σ -convergence, in addition to β -convergence. In fact, if σ declines over time, then β -convergence holds. To estimate β and calculate σ , we use per capita regional gross domestic product data for the various countries in East Asia. The data for the regional gross domestic products (GRDP) are obtained from each national statistical office in East Asia. However, long series data is available only for such countries like Japan. The data only covers the period 1980-2000. For the whole East Asian 10 countries, we have the GRDP data for 225 regions (See Appendix for the list of these regions).

For Japan, the GRDP is calculated for 47 Prefectures, the largest administrative unit, by the Economic Planning Agency of Japan and published in the ‘Annual Report on Prefectural Accounts’.

China has 31 Provinces. Among these Provinces, the GRDP for the province Chungking is not available except for the recent data. With the data for Chungking omitted, GRDP data for 30 Provinces are used. These are published by each of the provincial statistical office.

For Korea, the GRDP data has been published since 1985 by the National Statistical Office, Korea. As of 2002, there are 16 administration units in Korea with 1 metropolitan city, Seoul, 6 special cities and 9 provinces. Because the special 6 cities are located inside each of the 9 provinces and there are strong cultural and economic linkages between these cities and provinces, they are considered forming only one region. Thus, the GRDP per capita is calculated only for 10 regions.

For Indonesia, the GRDP data for 27 regions have been collected since 1983 by the BPS-Statistics Indonesia. But since the independence of East Timor, the GRDP for Timor is excluded and only the data for 26 regions is published.

For Philippines, the GRDP data have been published in the 'Regional Accounts of the Philippines' since 1975. These data are obtained from the Economic and Social Statistics Office, National Statistical Coordination Board.

For Thailand, the GRDP data for 72 among 73 regions (Changwat) are collected by the National Statistical Office. The data for Mukdahan region is available only from 1983 and thus omitted. Compared to the administrative unit in other countries of East Asia, this administrative unit is too small. Indeed, 72 regions can be regrouped into larger 7 regions. However, because the regrouping of 72 provinces into 7 regions does not change our results, we report only the results for 72 regions.

For Malaysia, the GRDP data for 14 regions is available only for every 5 years since 1970. These are contained in each of the 'Malaysia Plan' published from the Malaysia Government Planning. In particular, the GRDP after 1980 is obtained from the Fifth and Seventh Malaysia Plans.

The figures for these GRDP are expressed in terms of each of the national currency unit (current or constant). To compare the per capita GRDPs of each East Asian country to each other over the period 1980-2000, we must denominate them in constant international dollar. To this end, we first divide the GRDP for each region of a given nation by the national per capita GDP and calculate the ratio of per capita GRDP to a national average for each region of a given nation. Because the PW table publishes per capita GDP in constant international dollars, we multiply it by the GDP denominated in constant international dollar to obtain the GRDP in the same constant international dollar.

2. Results

(i) Analysis of \exists and Φ convergences across nations

Table 2 shows OLS regressions for the regions of the 10 East Asian countries over the period 1980-2000 and over the two sub-periods 1980-1990 and 1990-2000. The regressions in the first equation of Table 2 include only a constant term and log of the initial income as independent variables. The estimated coefficients are negative, which means that the regions in East Asia are converging in their per capita income levels, although this result is not very robust. The second equation of Table 2 adds country dummies, which yields enormous explanatory power for the growth rate of the regions in East Asia (The same is true for European regions, Barro and Sala-i-Martin(1992(a))). The addition of the country dummies makes the estimates of \exists in the first equation markedly more stable and confirms the economic convergence. Broken down by the period, the \exists -convergence holds both in the 1980s and 1990s.

Table 2: Regressions for GRDP per capita across East Asian Regions (215 regions)

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

Note 1: Country dummies are included in so far as their explanatory power is significant. For the whole East Asia, country dummies only for Korea, Indonesia and the Philippines are added.

Note 2: Figures in parentheses represent the standard errors.

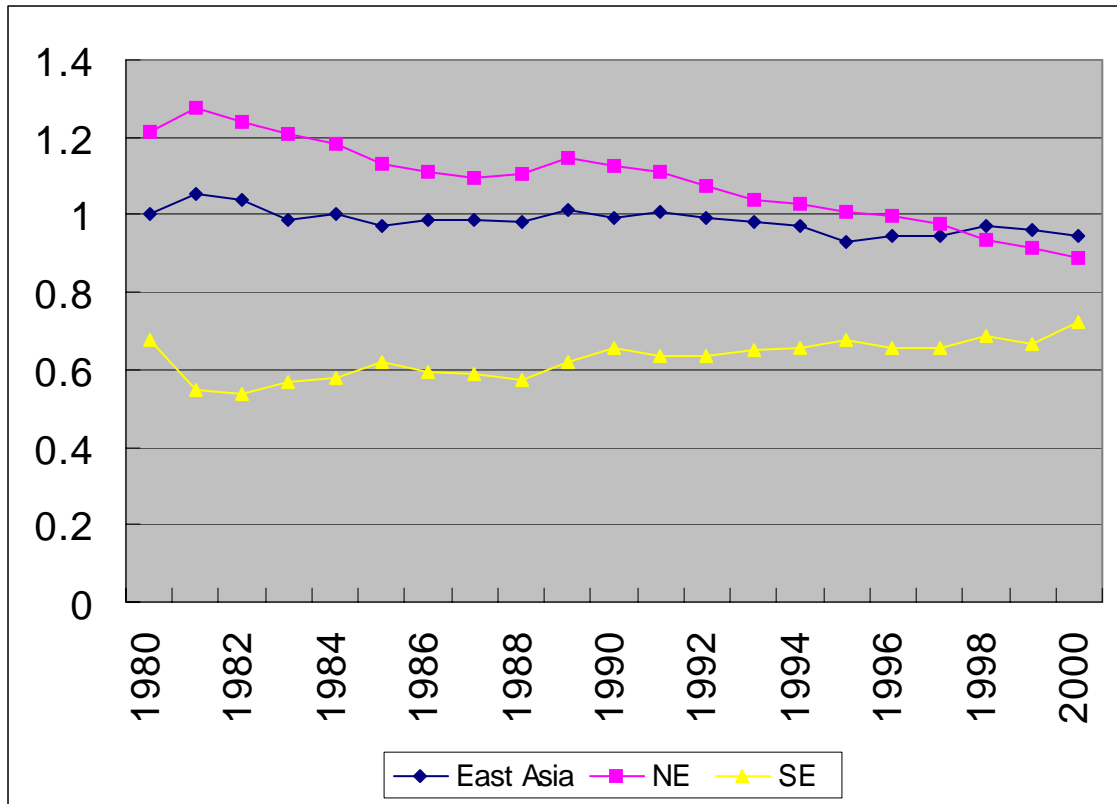
Because East Asia is composed of two diverse sub-regions, Northeast Asia and Southeast Asia (ASEAN 5), Ξ -convergence is separately examined for these sub-regions. Then, there turns out a strong convergence in the income per capita in the case of Northeast Asia. The coefficients Ξ are more strongly significant and the explanatory power of the equation measured by the R^2 is to a larger extent improved across all periods. Moreover, reflecting the economic depression of Japan, the richest nation in Northeast Asia, the Ξ -convergence is more apparent in the 1990s. However, the Ξ -convergence is far weaker in the case of Southeast Asia. The convergence pattern is not observed even in the 1990s.

Figure 2 (a, b, c) shows the robustness of the Ξ -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 Ξ is strongly negative and stable in the case of Northeast Asia, it is weakly so in the case of whole East Asia and ASEAN 5.

(INSERT Figure 2-a, 2-b, 2-c)

Looking now at Figure 3 for the Φ -convergence, we find an analogous pattern. For the East Asia as a whole, there seems a slight Φ -convergence pattern. The Φ -convergence is very clear for the Northeast Asia. In contrast, it seems that Southeast Asia does not show any Φ -convergence pattern at all. It is, however, to note that the economic disparity measured by Φ -convergence was initially far lower and is still lower in the Southeast Asia than in the Northeast Asia, which, with the rapid catch up of China, the poorest country in 1980, could reduce its Φ value greatly.

Figure 3: Dispersion of GRDP per capita across East Asian regions



(ii) Analysis of \exists - and Φ -convergences within nations

Here we focus our attention on the within-nation results. Table 3 shows the within nation \exists -convergence results. Then, three groups of countries are distinguished. First of all, the \exists -convergence at 95% significance level holds only for Japan and Indonesia, the poorest country in Southeast Asia considered. Broken down by the period, the \exists -convergence in Japan turns out in the 1990s, while, in Indonesia, it holds only in the 1990s. Secondly, for Great China including Hong Kong and Taiwan, Korea and Thailand, the \exists -convergence turns out very weak and significant only at the 90% confidence level. The \exists -convergence for Great China is consistent with the results of \exists -convergence for China obtained by Fang Cai (2001). Thirdly, for the Philippines and Malaysia including Singapore, there seems no \exists -convergence at all.

Table 3: Regressions for GRDP per capita within East Asian nations

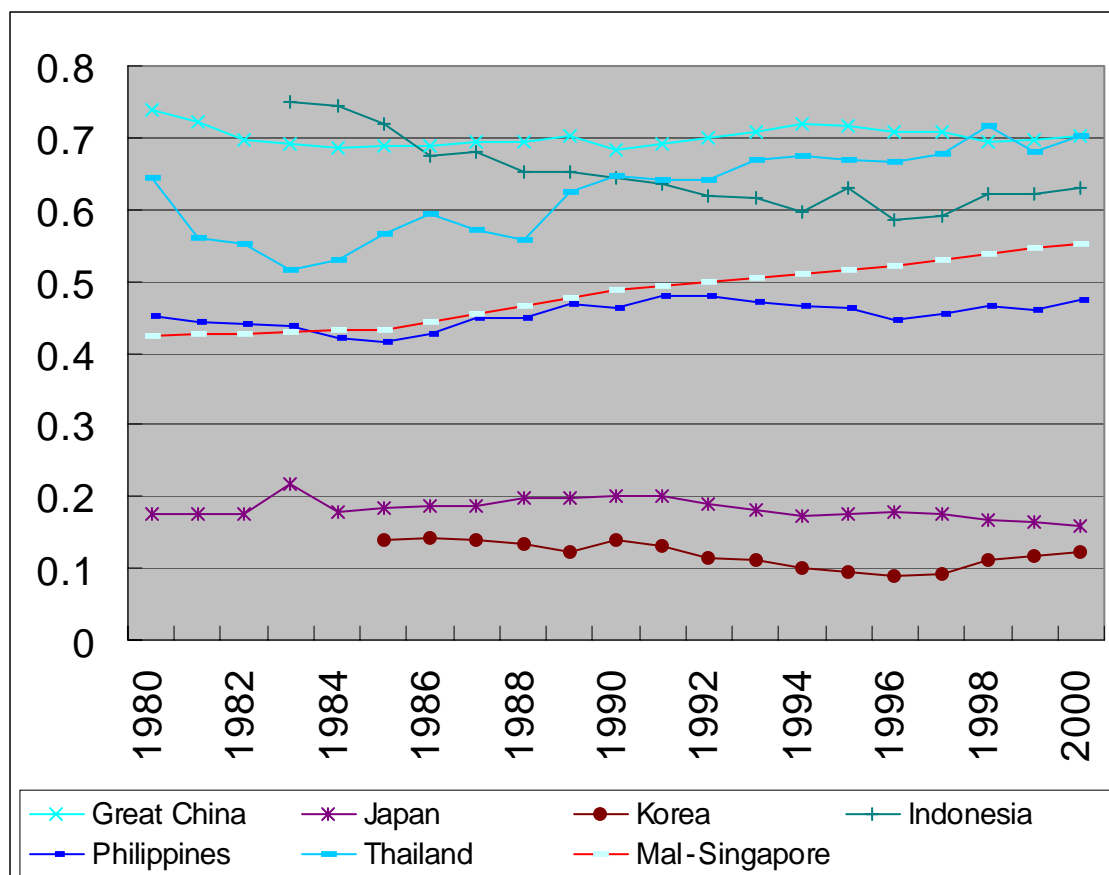
| | Whole period | | 1980-1990 | | 1990-2000 | |
|-------------------|----------------------|------------------|----------------------|------------------|----------------------|------------------|
| | \exists | R2 | \exists | R2 | \exists | R2 |
| G. China (32) | -0.0068+ (0.0036) | 0.11 (0.0148) | -0.0109*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

Note: Figures in parentheses represent the standard errors.

Figure 4 shows the within-nation Φ -convergence results. The Φ -convergence is most apparently observable in the case of Indonesia, while slightly so in the case of Japan and Korea. For other countries in East Asia, the general pattern is that the Φ values stagnate or increase over time. In the case of Japan and Korea, it is notable that the absolute value of Φ is all across periods very low, which signifies that there is no big room for further reducing the economic gap between regions.

Comparing the within-nation Φ to across-nation Φ in Figure 1, we find also that Φ values are far smaller within nations than across nations. For instance, Φ ranges between 0.12 (for Korea) and 0.70 (for China) in 2000, while it reaches 0.86 in 2000 for all of East Asia. It implies that the economic solidarities measured by smaller Φ values are stronger among regions of given nations than among nations of East Asia. Each nation in East Asia, through its governmental transfers and taxes, are playing a non-negligible role in narrowing inter-regional income gap. However, on the East Asian level, there is no such effort.

Figure 4: Dispersion of GRDP per capita within 7 East Asian countries or regions



IV. Comparison with Europe

Compared to East Asia, the European experience shows clear evidence in favor of the economic convergence. Table 4 summarizes the convergence pattern at the national level for 15 EU member countries. It is noteworthy that the three countries, Portugal, Greece and Spain, which were most backward in the 1960s, have been constantly catching up with Germany. For instance, the per capita GDPs of Portugal, Greece and Spain have increased from 39%, 47% and 53% of that of Germany to 70%, 64% and 79% respectively during the period 1960-2000. The case of Ireland is the most dramatic. In 1960, the per capita income of Ireland was just 58% of that of Germany but in 2000, it exceeded the per capital income of Germany by 15%.

Table 4: Relative per capita GDP for the 15 EU member countries

| | 1960 | 1970 | 1980 | 1990 | 2000 |
|-----|------|------|------|------|------|
| GER | 1 | 1 | 1 | 1 | 1 |
| AUT | 0.83 | 0.90 | 0.99 | 1.01 | 1.04 |
| BEL | 0.88 | 0.98 | 1.03 | 1.02 | 1.04 |
| DNK | 1.25 | 1.29 | 1.15 | 1.11 | 1.16 |
| ESP | 0.53 | 0.73 | 0.72 | 0.74 | 0.79 |
| FIN | 0.85 | 0.92 | 0.98 | 1.04 | 1.04 |
| FRA | 0.89 | 0.99 | 1.02 | 1.02 | 0.98 |
| GBR | 1.10 | 0.97 | 0.90 | 0.94 | 0.97 |
| GRC | 0.47 | 0.68 | 0.74 | 0.61 | 0.64 |
| IRL | 0.58 | 0.58 | 0.63 | 0.72 | 1.15 |
| ITA | 0.78 | 0.91 | 0.96 | 0.99 | 0.95 |
| LUX | 1.33 | 1.22 | 1.12 | 1.37 | 1.92 |
| NLD | 1.05 | 1.07 | 1.02 | 1.00 | 1.06 |
| PRT | 0.39 | 0.51 | 0.57 | 0.63 | 0.70 |
| SWE | 1.15 | 1.19 | 1.08 | 1.06 | 1.03 |

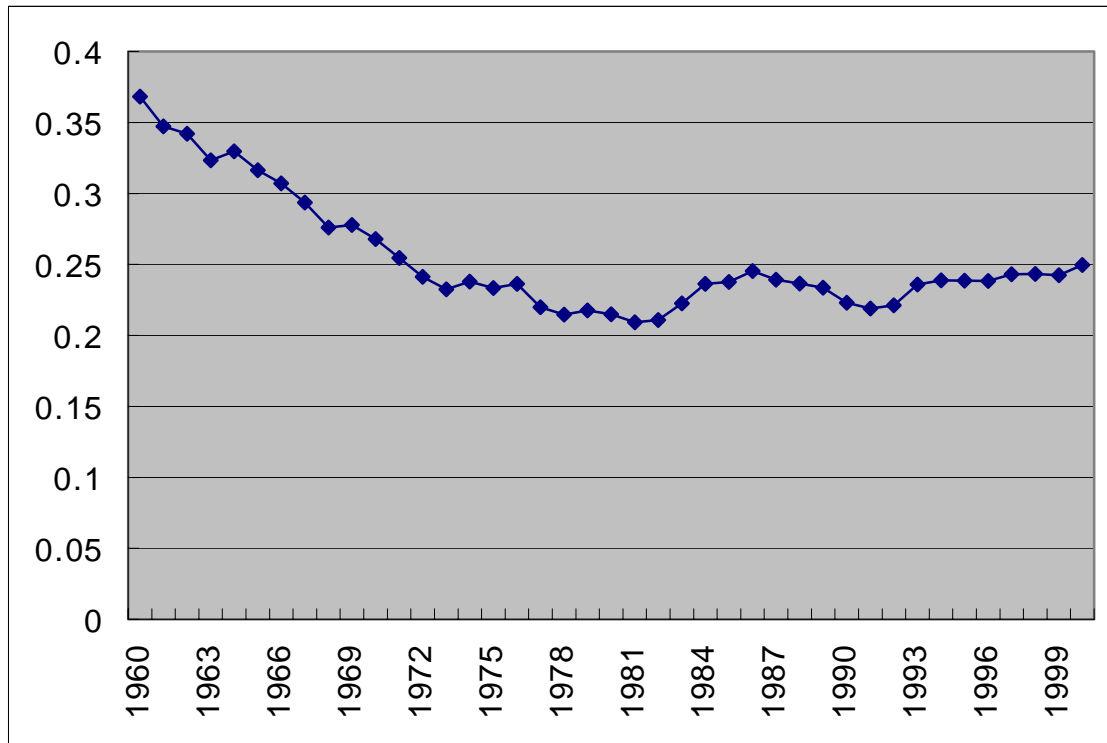
Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, 2002

Figure 5 shows the behavior of Φ for the 15 EU member countries over the period 1960-2000. First of all, it is interesting to note that the pattern of Φ in Europe is exactly opposite to that in East Asia. In East Asia, Φ tends to increase until 1980 and stabilizes since then, while in the case of Europe, Φ tends to decline until the 1980 and stabilizes at lower value since then. This contrasting pattern is likely due to the fact that after years of European integration, intra-regional trade in Europe was saturated at about the mid-1980s, with its trade share stabilizing at around 64-5%. On the other hand, in East Asia, the intra-regional trade was facilitated especially through the economic reform of China in 1978 and the Plaza Accord regarding the Japanese yen in 1985. Thus, the convergence in Europe weakens after the mid-1980s, despite a strong tendency for poor countries to catch up with rich countries over the long period. It is, however, to note that the level of economic disparity among European countries is far smaller than that among East Asian countries.

Similar patterns are observed when the convergence behavior of European countries are examined at the regional level. For instance, Barro and Sala-i-Martin(1992) and Sala-i-Martin (1996) found evidence for unconditional β -convergence across European regions, let alone for the US and Japan. Their results applied to Europe and European countries are summarized in Table 5. The coefficients β are unambiguously

negative in all cases considered. Analogously, the value of Φ declines over time for all 5 European countries.

Figure 5: Dispersion of the log of GDP per capita across the 15 EU member countries



Source: Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.1, 2002

Table 5: \exists -convergence for Europe during 1950-1990

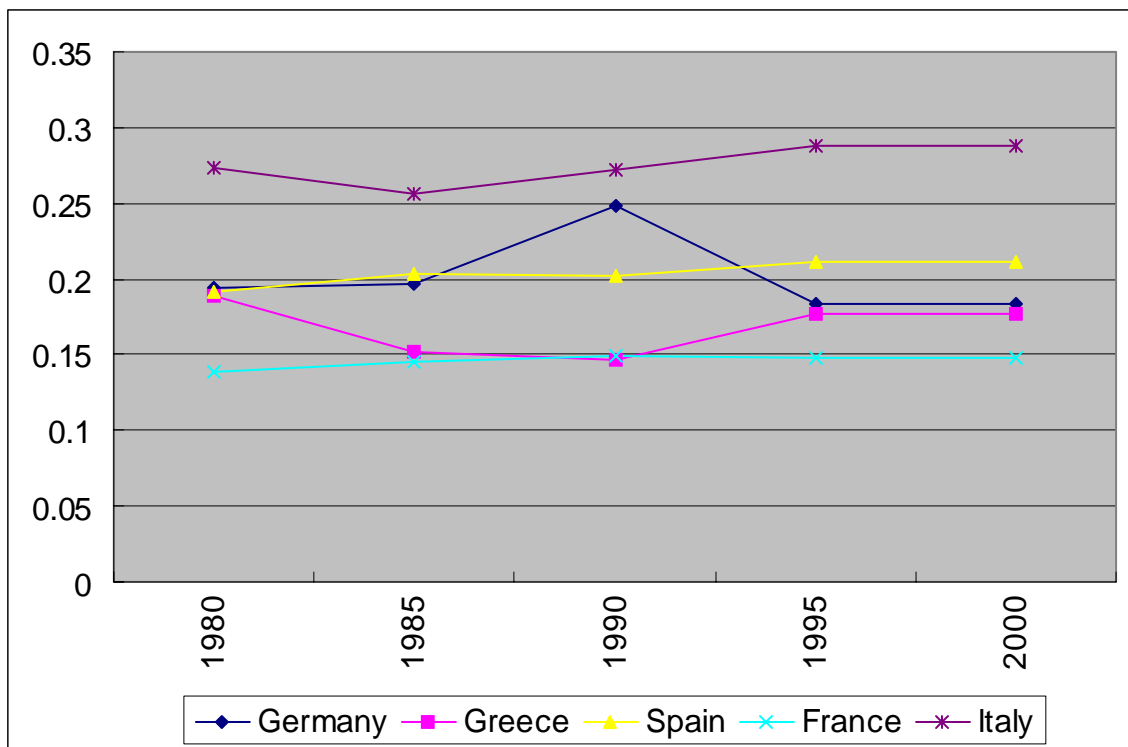
| | \exists (standard error) | R2(standard error of Reg.) |
|---------------------------------|----------------------------|----------------------------|
| Europe Total (90 Regions) | -0.015(0.002) | |
| Germany (11 regions) | -0.014(0.005) | 0.55(0.0027) |
| UK (11 regions) | -0.030(0.007) | 0.61(0.0021) |
| France (21 regions) | -0.016(0.004) | 0.55(0.0022) |
| Italy (20 regions) | -0.010(0.003) | 0.46(0.0031) |
| Spain (17 regions) ¹ | -0.023(0.007) | 0.63(0.0040) |

Note 1: The case of Spain is for the period 1955-87.

Source: Sala-i-Martin (1996)

However, when recent period data are considered, these results are no longer obtained. Indeed, Boldrin (2001) finds that updating their data set, the coefficient of Φ -convergence is either positive or insignificant. The Φ -convergence is neither evident. This might be because the per capita income in Europe has already achieved sufficiently high level. In contrast to the case of East Asia, the lowest GRDP per capita found in Greece or Portugal reaches already about 15,000 dollars (constant international dollars) in Europe.

Figure 6: Dispersion of GRDP per capita within 5 European countries



Source: Boldrin(2001) and Eurostat

Comparing the within-nation Φ to the across-nation Φ in Figure 5, we find also that they are not much different from each other. For instance, as Figure 6 shows, over the period 1980-2000, the values of Φ for 5 European countries are between 0.30 and 0.15, while the value of Φ is between 0.25 and 0.20 for the 15 EU member countries. It implies that nations in the EU are as strongly tied to each other as regions of a given nation. This might be due to the common effort on the European level to reduce the national income gap through the programs such as the Regional and Cohesion Funds. Indeed, right after its successful launch in 1958, the EU have been emphasizing the need for common action in favor of solidarity, to correct the possible rising imbalance

across nations and regions. This is clear from the fact that in the case of Europe, even the idea of a 'Community', let alone a 'Union' already imply some kind of solidarity. (Pelkman(1997)) The case of Ireland is a typical example showing that a successful catch up can be achieved through the program of Regional and Cohesion Funds. In contrast, there is no such effort in East Asia, which explains that economic disparities are more important across nations than among regions of given nations, as we already examined.

Conclusion

Regarding the future of regional cooperation in East Asia, a pessimistic view seemed to prevail so far, because countries in East Asia were so diverse in terms of per capita income. 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. Thus, to boost and maintain regional cohesion, a particular awareness must be given to regional income disparities. It means that the regional income transfer through diverse means including aids must be made from the rich regions or countries to the poor ones. In the case of European Union, indeed, this solidarity goal is achieved through the centralization of EU budget. In particular, the Structural and Cohesion Funds, together with European Investment Bank, contributes to narrow the income gap between member countries and thereby to tie different member countries to the Union. In the case of East Asia, however, there is no such effort made on the East Asian level so far. Thus, the convergence of per capita income in East Asia looks far more important question than in Europe. This study shows that East Asia as a whole tends to converge to each other in terms of per capital income. If Northeast Asia is separately considered, it shows that there is far stronger evidence in favor of real growth convergence. The evidence is not very clear, however, for 5 ASEAN countries. This result provides a positive argument for pursuing the real and monetary integration in East Asia, even without emphasizing too much the solidarity in East Asia. Despite such convergence tendency, it is, however, true that there remains relatively wider income disparities between regions and nations in East Asia than in Europe, suggesting that a common effort to further reduce the income gap is imperative, if East Asia aims at deepening the integration. In this case, of course, the transfer of income from the rich countries to the poor cannot be overemphasized.

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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 | Rayong |
| 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 | | |

Figure 2-a: Convergence across East Asia

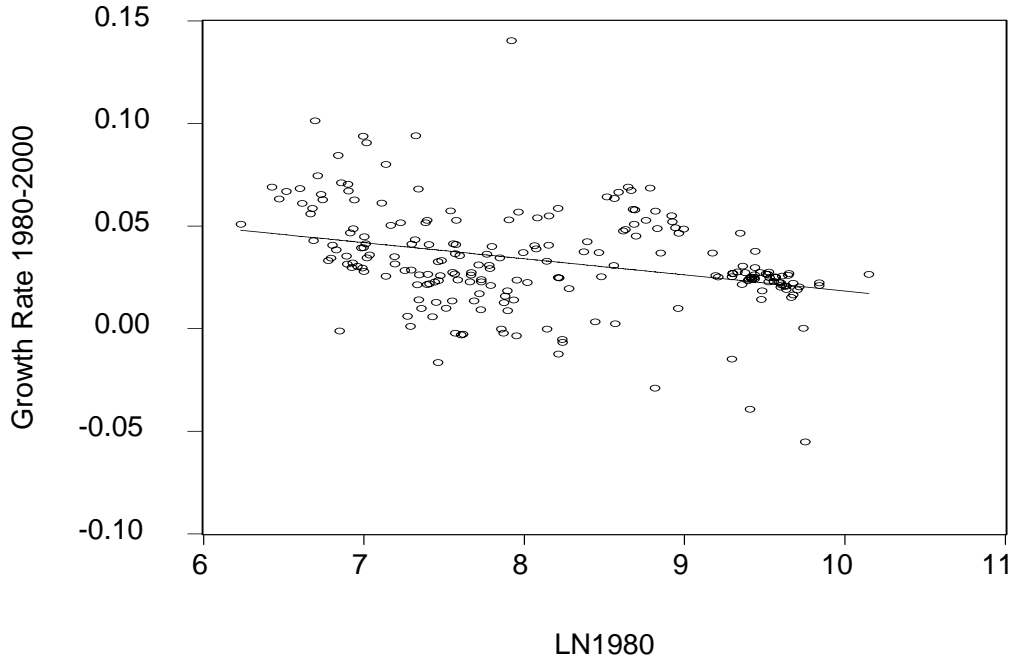


Figure 2-b: Convergence across Northeast Asia

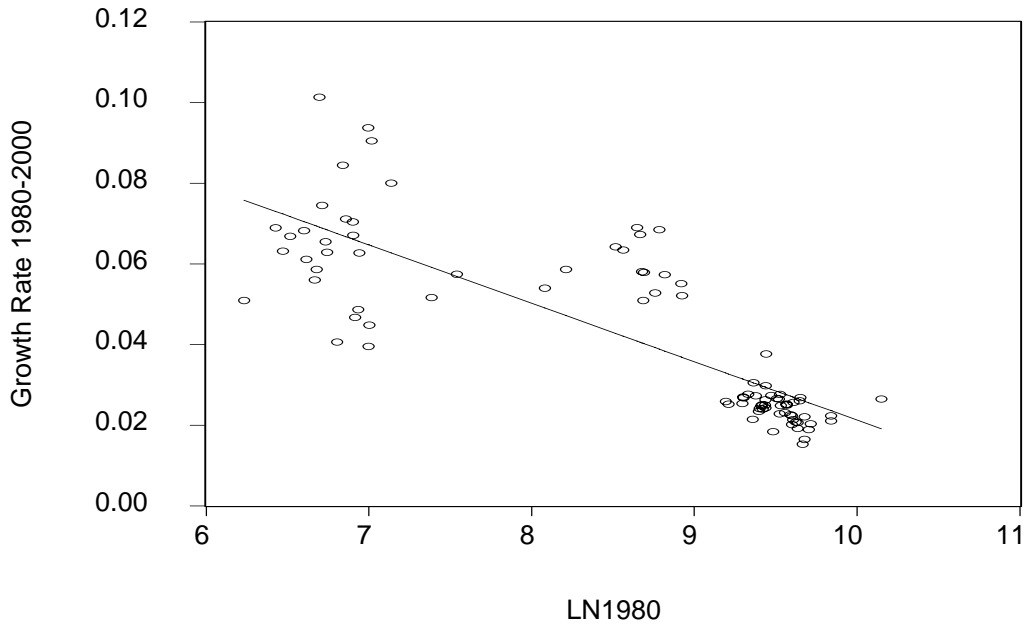


Figure 2-c: Convergence across Southeast Asia

