



**UNIVERSITI PUTRA MALAYSIA**

***SECTORAL AND STRUCTURAL CONVERGENCE IN ASEAN  
ECONOMIES***

**CHONG CHOY YOKE**

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**SECTORAL AND STRUCTURAL CONVERGENCE IN ASEAN  
ECONOMIES**

**By**

**CHONG CHOY YOKE**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

**May 2016**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment  
of the requirement for the degree of Doctor of Philosophy

## **SECTORAL AND STRUCTURAL CONVERGENCE IN ASEAN ECONOMIES**

By

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**May 2016**

**Chairman: Muzafar Shah Habibullah, PhD**  
**Faculty: Economics and Management**

Income convergence is the key to allow further economic integration among Association of Southeast Asia Nation (ASEAN) member states, and to ensure greater integration with other partner countries. However, the gap between ASEAN-6 and less developed members (Cambodia, Laos, Myanmar and Viet Nam) remained an issue to be resolved in order to facilitate further integration. Limited analysis was identified on the sectoral data despite the importance of sectoral income and production structure to aggregate income convergence. Four specific objectives of study were formed: (1) to examine convergence in both the aggregate income and sectoral income, (2) to investigate possible emergence of convergence club, (3) to examine whether ASEAN member states experienced structural convergence and (4) to determine the source of income convergence within ASEAN. Stochastic convergence was examined among member states in the ASEAN from 1970 to 2012. It is found that the aggregate income of the Philippines, Cambodia, Laos and Viet Nam were catching-up with the average income of ASEAN. Meanwhile, more evidences of catching-up were detected within the manufacturing sector (Cambodia, Laos and Viet Nam) and construction sector (Indonesia, Malaysia, Singapore and Brunei). The CLV countries were performing well in the manufacturing sector leading to the catching-up in their aggregate income with regional average. The log  $t$  convergence test was employed for both the aggregate and sectoral income in detecting possible convergence club. There were no convergence in ASEAN as a whole in aggregate income but the growth rate of Singapore, Brunei, Indonesia, Viet Nam and Myanmar converged. The ASEAN members showed convergence in their growth rates in the manufacturing, construction, mining and utilities sector as well. Weak convergence was observed in service sector while non-convergence was identified in the agriculture sector. Singapore diverged with the rest in the agriculture sector. On the other hand, the inter-sectoral heterogeneity index and Krugman index was calculated for testing the structural convergence. Both the indices asserted that ASEAN member states had achieved a larger extent of structural convergence although not perfectly homogenized. The breakdown of Krugman indices revealed that mining and utilities sector to slow down the structural convergence for all and

the agriculture sector among CLMV countries. Therefore, reformation in agriculture sector among CLMV countries is needed to further expand their productivity growth for industrialization. The decomposing methodology enables the aggregate convergence to be categorised into the productivity growth effect within sector and the changing sectoral composition due to structural change. The outcomes explained that sectoral productivity growth dominated over the effect of structural change in ASEAN. In contrary to the literature, mining and utilities sector was the primary contributor to the catching-up process in ASEAN. Therefore, the expansion of these extractive industries is crucial in sustaining further development. The service sector and manufacturing sector remained their importance in driving the convergence process in ASEAN.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

## **PENUMPUAN SEKTOR DAN STRUKTUR DALAM EKONOMI ASEAN**

Oleh

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Penumpuan pendapatan adalah penting untuk meningkatkan integrasi ekonomi di kalangan negara-negara anggota ASEAN, dan juga dengan rakan-rakan perdagangannya. Walau bagaimanapun, jurang antara ASEAN-6 dan ahli yang kurang maju (Kemboja, Laos, Myanmar dan Viet Nam) merupakan satu isu yang perlu diselesaikan dalam usaha memudahkan integrasi lanjutan. Meskipun peranan pendapatan sektor dan struktur produktiviti untuk penumpuan pendapatan agregat dikenalpasti, namun analisis yang mengkaji data sektor adalah terhad. Sehubungan itu, empat objektif khusus kajian telah dibentuk: (1) untuk memeriksa penumpuan pendapatan agregat dan penumpuan pendapatan sektor, (2) untuk menyiasat kemungkinan kelab penumpuan, (3) untuk memeriksa sama ada negara-negara anggota ASEAN mengalami penumpuan struktur dan (4) untuk menentukan punca penumpuan pendapatan dalam ASEAN. Penumpuan stokastik telah dikaji antara negara-negara anggota ASEAN dari tahun 1970 hingga 2012. Pendapatan agregat bagi Filipina, Kemboja, Laos dan Viet Nam didapati *catching-up* dengan pendapatan purata ASEAN. Sementara itu, bukti-bukti *catching-up* telah dikesan dalam sektor pembuatan (Kemboja, Laos dan Viet Nam) dan sektor pembinaan (Indonesia, Malaysia, Singapura dan Brunei). Prestasi negara-negara Kemboja, Laos dan Viet Nam yang baik dalam sektor pembuatan membawa kepada peningkatan pendapatan agregat mereka supaya tanda *catching-up* dengan pendapatan purata ASEAN dikesani. Ujian penumpuan log  $t$  diaplikasikan pada pendapatan agregat dan pendapatan sektor untuk mengesan kemungkinan kelab penumpuan. Secara keseluruhannya, negara-negara anggota ASEAN tidak menyokong hipotesis penumpuan pada pendapatan agregat, tetapi kadar pertumbuhan negara Singapura, Brunei, Indonesia, Viet Nam dan Myanmar didapati menumpu. Sementara itu, kadar pertumbuhan di kalangan negara-negara anggota ASEAN menunjukkan penumpuan dalam sektor pembuatan, pembinaan, perlombongan dan utiliti. Kadar penumpuan yang lemah diperhatikan dalam sektor perkhidmatan manakala perbezaan dikenal pasti dalam sektor pertanian. Indeks *inter-sectoral heterogeneity* dan index *Krugman* digunakan untuk menguji penumpuan struktur. Nilai kedua-dua indeks ini menegaskan bahawa negara-negara anggota ASEAN telah mencapai tahap penumpuan struktur yang besar walaupun tidak sempurna dihomogenkan. Pecahan

indeks *Krugman* menunjukkan bahawa sektor perlombongan dan utiliti yang melambatkan penumpuan struktur untuk semua dan sektor pertanian di kalangan negara-negara CLMV. Oleh itu, reformasi dalam sektor pertanian dalam kalangan negara-negara CLMV diperlukan bagi perkembangan produktiviti pertanian mereka untuk manggalakkan perindustrian. Metodologi penguraian membolehkan penumpuan agregat untuk dikategorikan kepada kesan pertumbuhan produktiviti sektor dan kesan perubahan dalam komposisi sektor akibat perubahan struktur. Hasil kajian menunjukkan bahawa pertumbuhan produktiviti sektor mempunyai kesan yang lebih besar dalam penumpuan pendapatan agregat antara negara-negara anggota ASEAN. Bertentangan dengan kajian perpustakaan, sektor perlombongan dan utiliti merupakan penyumbang utama kepada penumpuan pendapatan agregat di ASEAN. Oleh itu, perkembangan industri ekstraktif adalah penting dalam mengekalkan pembangunan selanjutnya di ASEAN. Walau bagaimanapun, sektor perkhidmatan dan sektor pembuatan kekal sebagai sektor penting untuk memacu proses penumpuan pendapatan dalam ASEAN.

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I certify that a Thesis Examination Committee has met on 13 May 2016 to conduct the final examination of Chong Choy Yoke on her thesis entitled "Sectoral and Structural Convergence in Asean Economies" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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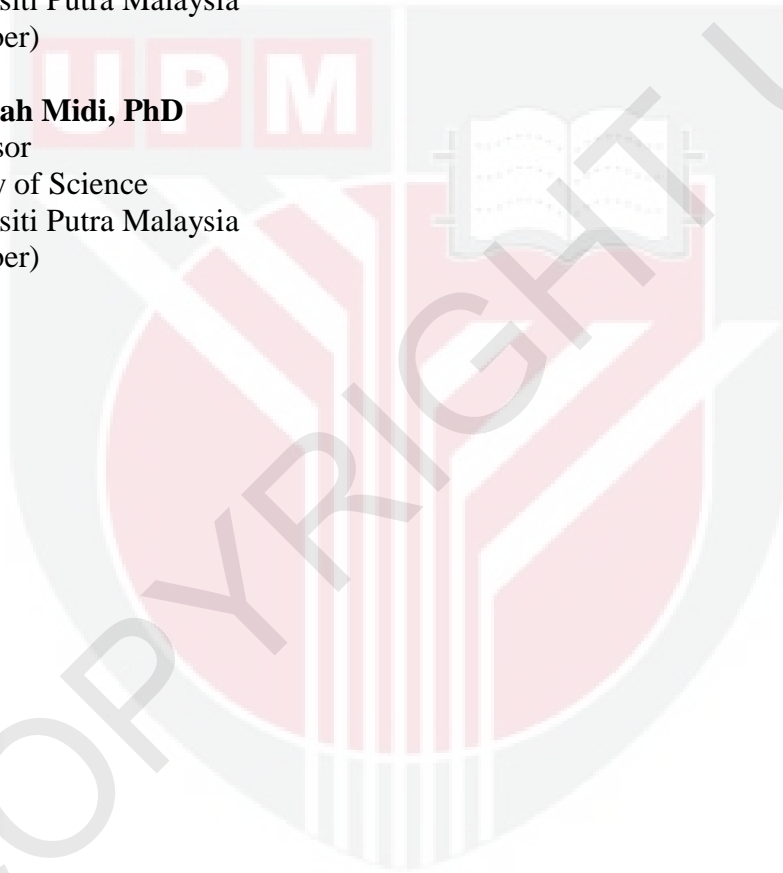
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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

Income convergence refers to a group of economies with their income to move toward the same point in the long run. In other words, it practically relates to poorer countries catching-up with the richer countries in the long run. Park (2000) stressed that income convergence is the main determinant for greater integration among member states in maintaining long run sustainability.

#### 1.1.1 Convergence Theory

The study of income convergence is an important test in the validation of the economic growth theory. According to Baumol (1994), the homogenization form of convergence hypothesis explained that there is some kind of economic forces to drive countries with different productivity levels to gradually close ranks. Baumol (1994) discussed two types of engines driving to convergence process, namely the contagion mechanism and common-forces mechanism.

Given a group of countries, which do not differ vastly in most of the characteristics (saving, population growth and technology), some of the countries in this group might achieve a notable superior growth performance than others. It is further suggested that the growth of these laggard economies will somehow “catch-up” to the advanced economies (higher achiever) due to the contagion effect. The explanation here is that the laggard ones have more to learn from the advanced counterpart; therefore, they tend to move towards the same direction in a faster speed. Consequently, the contagion process helps to offset a considerable portion of differentials among these countries, thereby denoted as a force of convergence. Such phenomenon is referred as the contagion model of convergence. In summary, the growth may not affect every economy initially in this model, but the unusual rapid growth in one economy elicits even faster growth in others that have lagged behind. Besides, technology transfer, capital accumulation, and migration of skilled labour from one economy to another are factors that facilitate growth contagion (Baumol, 1994).

On the other end, the hypothesis in common-forces convergence model describes that a number of economies influenced by same set of factors and drive them in the same direction toward a common terminal point (steady-state). The unique feature of this model is that such magnet (common steady state) will exert the greatest force on those economies located furthest from it instead of those economies closer to it. Hence, the furthest economies tend to move faster (Baumol, 1994).

Neoclassical growth model predicts that economic growth of an economy depends mainly on the diminishing returns of capital (Solow, 1956). Assuming identical technologies, countries with low capital stocks and per capita income would show higher marginal productivity and return to capital compared to the richer countries. Therefore, investments on these poorer countries boost faster growth in their production and hence allowing them to catch-up with the richer countries. When economies open to trade during the economic integration process, capital flows from more advanced countries to countries provoke the convergence process (Martin & Sanz, 2003). Briefly, neoclassical growth model predicts that countries with same preference but different initial income per capita level will somehow converge to the same steady-state in the long run (the absolute convergence). Nevertheless, absolute convergence has been shown empirically not compatible and hence leads to the arguments of conditional convergence. Under such convergence, economies are expected to be converged to their own and unique steady-state over the long run.

In contrast to the neoclassical growth model, Romer (1986) and Lucas (1988) shared different views in a newer growth model, namely the endogenous growth model. The authors stressed that the returns to the capital may not necessary diminish as human capital, unlike the physical capital, which has increasing rates of return. Therefore, there will be constant returns to capital indicating that economies will never reach a steady-state implying non-convergence. However, government intervention in policy making comprises important role on the long run economic growth by investing in human capital through education or research and development (Martin & Sanz, 2003).

However empirically, some studies still found divergence results. One reason cited in the literature in case with the absence of convergence is the presence of multiple steady-states rather than single common steady-state (Quah, 1996d). Convergence club hypothesis indicates that economies with similar structural characteristics and initial condition converge to their unique long run equilibrium and hence form a convergence club. However, it is not necessarily to have convergence across these convergence clubs. Galor (1996) posited that such club convergence hypothesis is still consistent with the neoclassical growth model allowing heterogeneity across individual economies. This hypothesis is also supported by Durlauf and Johnson (1995). The authors stated that traditional convergence studies use the linear model and such assumption was rejected in their study stating that not all countries follow the common linear model. It affirmed the existence of multiple convergence clubs after validating the compatibility of such multi steady-states model in their study. Empirical evidences on the presence of convergence clubs were found since 1990s and more discovered recently (Azariadis & Drazen, 1990; Azariadis, 1996; Quah, 1996a; Zhang, 2003; Carvalho & Harvey, 2005; Fritsche & Kuzin, 2011; Monfort, Cuestas & Ordóñez, 2013; Rodríguez-Benavides, López-Herrera & Venegas-Martínez, 2014).

### 1.1.2 Sectoral Convergence and Structural Convergence

Sectoral convergence refers to the convergence concerning sectoral income. In fact, it is straightforward to understand that overall regional income disparities originating from the inequalities within sectors across member states. Greater cross-border access, reduction in transaction cost along with the mobility of labour and capital through economic integration allows optimum allocation of resources. Hence, improved efficiency in production along with the capital accumulation helps boosting economic growth of the backward economies. In addition, Gerschenkron (1962) explained that relatively backward countries benefited by imitating from the advanced producer via knowledge spillover and technology diffusion, hence improving productivity in their sectoral income. Therefore, convergence in sectoral income within the region shall be expected over the economic cooperation.

On the other hand, structural change is an important factor in the development theory where it reveals the changes in sectoral output share. Structural convergence refers to the convergence in the production structure as a result from structural change. Structural convergence explains that economies which follow similar stages of development will converge to a structural “steady-state” producing more uniform sectoral mix of output (Wacziarg, 2001).

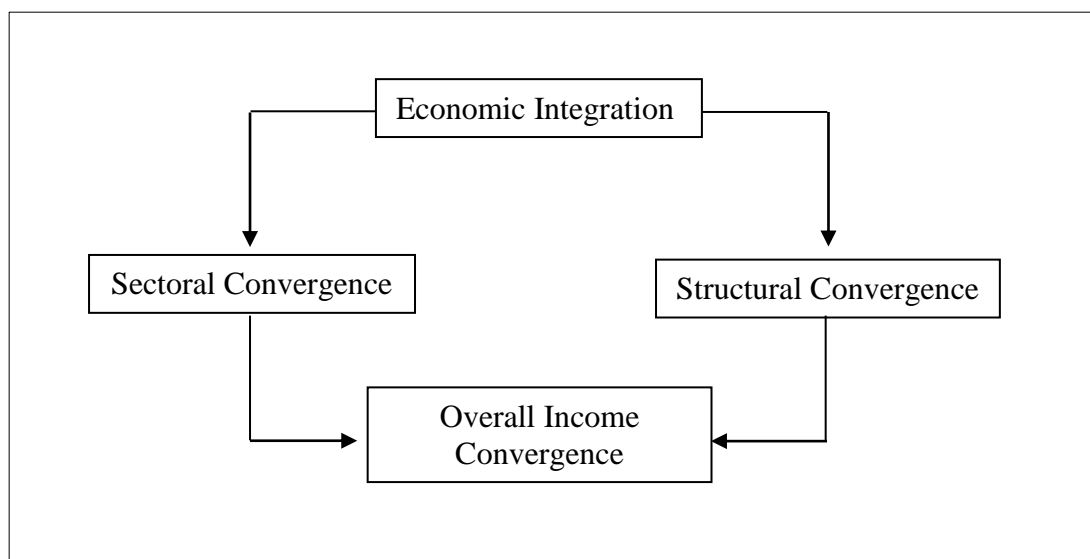
According to the theory of Fourastie (as cited in Krüger, 2008), it is claimed that production and employment will shift from the primary sector to secondary sector followed to the tertiary sector through development path. The less developed countries that benefited from a successful economic integration are able to promote further development and be on par with the movers of the economy. Therefore, homogeneity in the share of sectoral output shall be expected when all nations have undergone same path of development, which leads to convergence in income as well. Empirically, it is discovered that countries that converged in terms of their per capita income also tend to converge in the production structure (Bernard & Jones, 1996b; Chenery, 1960; Imbs, 2001; Wacziarg, 2001). Therefore, a study on structural convergence will help to reveal the process of development in the long run.

Meanwhile, many studies have emphasized that analysis pertaining aggregate productivity should consider both, within sectoral effect and the structural change effect (Bernard & Jones, 1996b; Cuadrado-Roura, García-Greciano & Raymond, 1999; Cunado & Sanchez-Robles, 2000; Paci & Pigliaru, 1997; Wong, 2006). As a result, it is crucial to examine on the convergence within sector across countries without ignoring the change in sectoral composition due to structural change.

The overall linkages of the concepts explained prior can be summarized in the conceptual framework as presented in Figure 1.1. In short, economic integration within a region allows the lagging country to catch-up with their more advanced counterparts in the sectoral productivity leading to sectoral convergence. Along with the increase in income per capita, the less developed country will experience structural transformation towards more productive sectors based on the three-sector hypothesis. In such, the lagging countries will have their production structure converge to the more advance countries reaching structural convergence. When member states able to catch-up in their sectoral income and the production structure



to those leaders, then only they can achieve overall income convergence within the region. In short, sectoral convergence and structural convergence is the requirement for overall income convergence.



**Figure 1.1: Conceptual Framework**

### 1.1.3 ASEAN

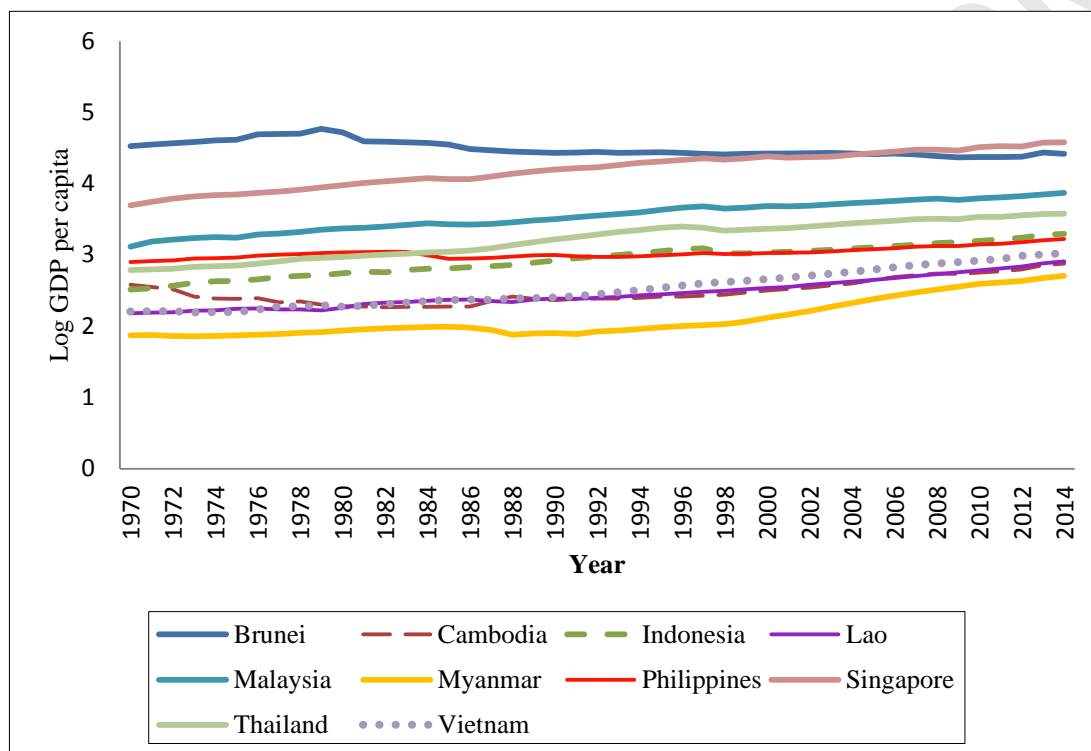
The Association of Southeast Asia Nation (ASEAN) was formed in 1967 comprising five founder member states consisting of Malaysia, Singapore, Indonesia, Thailand and the Philippines (hereafter referred to as ASEAN-5). Brunei Darussalam joined ASEAN-5 in 1984 becoming ASEAN-6 and was established with ten nations in 1999 by admitting Viet Nam, Laos, Myanmar and Cambodia consecutively (referred as the CLMV countries). The main goal for the establishment of ASEAN is to accelerate economic growth and development to create a prosperous and peaceful community through economic cooperation among the member states.

ASEAN served as a sizable market, which is larger than the European Union with over 500 million of population in year 1999. Besides, ASEAN has the world's largest labour force after China and India. Such properties are great attractions to foreign direct investment within and abroad, which is crucial for economic growth. Meanwhile, the huge labour force within ASEAN is one of the key to economic growth via human capital development. On the other hand, the less developed member states (CLMV) are more complementary than competitive to the more advanced member states (ASEAN-6) in terms of their production and trade structure. Therefore, ASEAN as a whole have increased competitiveness globally.

However, huge income inequalities between ASEAN-6 member states and CLMV countries will impede the integration within ASEAN. An economically strong ASEAN is crucial in strengthening the East Asian economic integration as well. Therefore, income convergence is vital for greater economic cooperation to maintain

sustainability. Nevertheless, gaps were detected in overall (aggregate) income, sectoral income along the development stages measured by the sectoral share of income.

Figure 1.2 displays the individual performance of member states from 1970 to 2014. In general, all member states showed increasing trend in their income per capita except for Brunei with a slight decrease. However, the gap still remains big with the CLMV to be far below the ASEAN-6 member states.

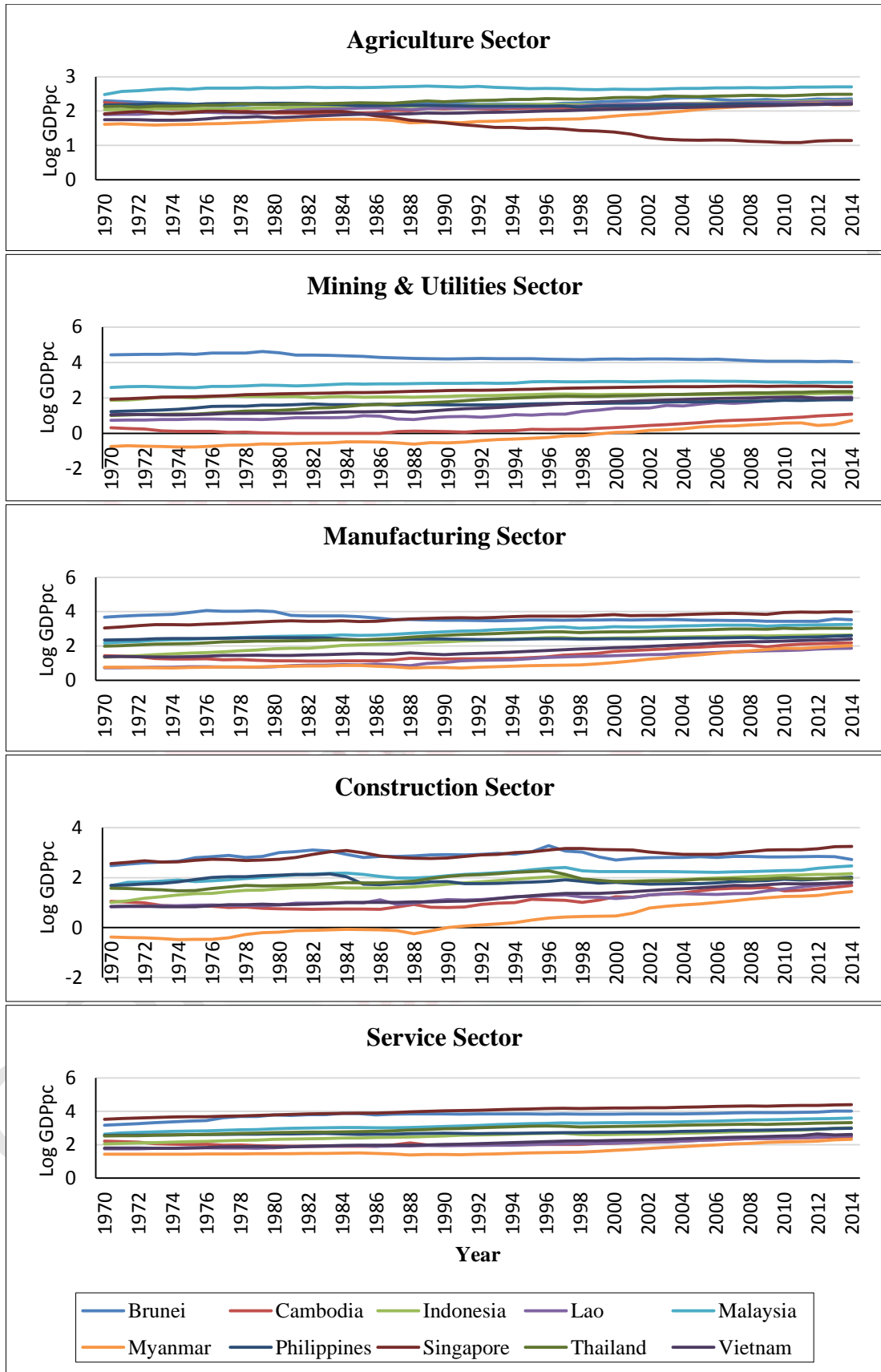


Source: United Nations Statistics Division (UNSD)

**Figure 1.2: Income per capita of ASEAN Member States**

In regards to the income per capita in the sectoral level, the performance of ASEAN member states are presented in Figure 1.3. Within ASEAN, most of the income within the agriculture sector is generated by Malaysia while Brunei as the leading member in the mining and utilities sector, respectively. Besides, the main contributor in the manufacturing, construction and service sector within ASEAN is Brunei followed by Singapore. However, Singapore surpassed the leadership in the later period. The sectoral income per capita among the CLM countries falling behind the more developed member states in all other sectors except for agriculture sector. Generally, narrowing in these disparities was not noted over time. Hence, the sectoral income seems to reveal similar behaviour observed in the aggregate income among the ASEAN economies.





Source: United Nations Statistics Division (UNSD)

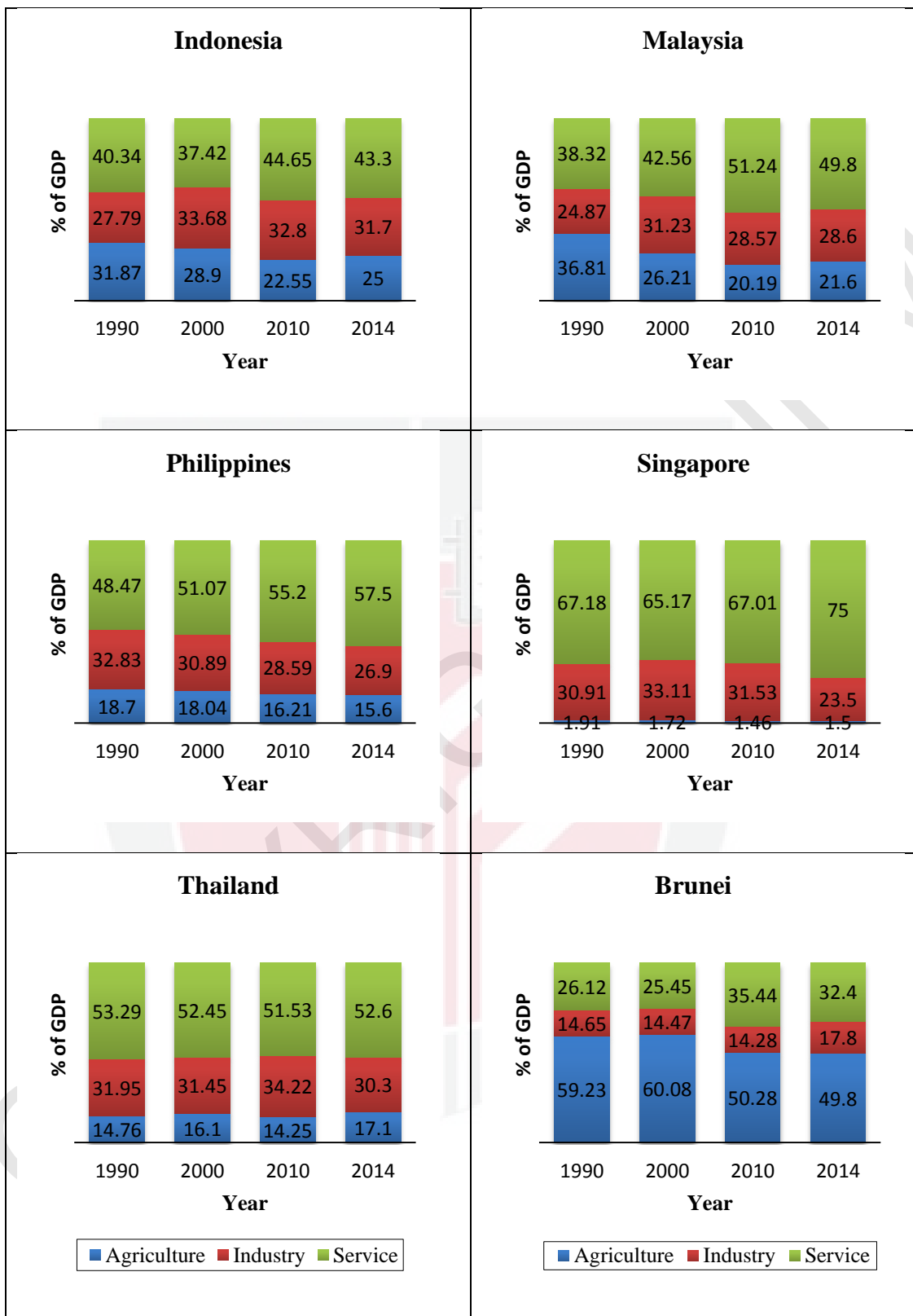
**Figure 1.3: Income per capita by Sectors of ASEAN Member States**

On the other end, the sectoral shares of the countries can benchmark the degree of economic development according to the three-sector hypothesis. Advanced economies are those with higher output share in the manufacturing and service sector while the more backward economies have a bigger share in the low productivity sector, i.e. the agriculture sector. Figures 1.4 (a) and (b) disclose the sectoral share for the ASEAN member states with their changes.

The ASEAN-5 member states have the biggest income share in the service sector while Brunei have the highest share in the agriculture sector due to their dominant activities in mining and utilities sector. Singapore and Thailand show more than 50% of their income share in the service sector. The Philippines has the service sector share by above 50% since year 2000 and keep increasing. Malaysia leads the aforementioned sector since year 2010 but experienced a slight drop in year 2014. Indonesia shows an increasing trend in their service sector share but at a slower pace.

The productivity in the CLMV countries still relies heavily on the agriculture sector. Their shares in this sector is approximately 2 to 3 times the shares of ASEAN-5 member states. Though, one common feature can be seen was that the agriculture share of these countries decreased over time and a notable rise of share in industry and service sector can be found indicated increase industrialisation especially after their admission into ASEAN in 2000. Hence, it ascertained that the assistance from the more developed members in ASEAN helped them to shift away from agriculture-dominant productivity toward the manufacturing or service sector leading to economic growth within the respective country.

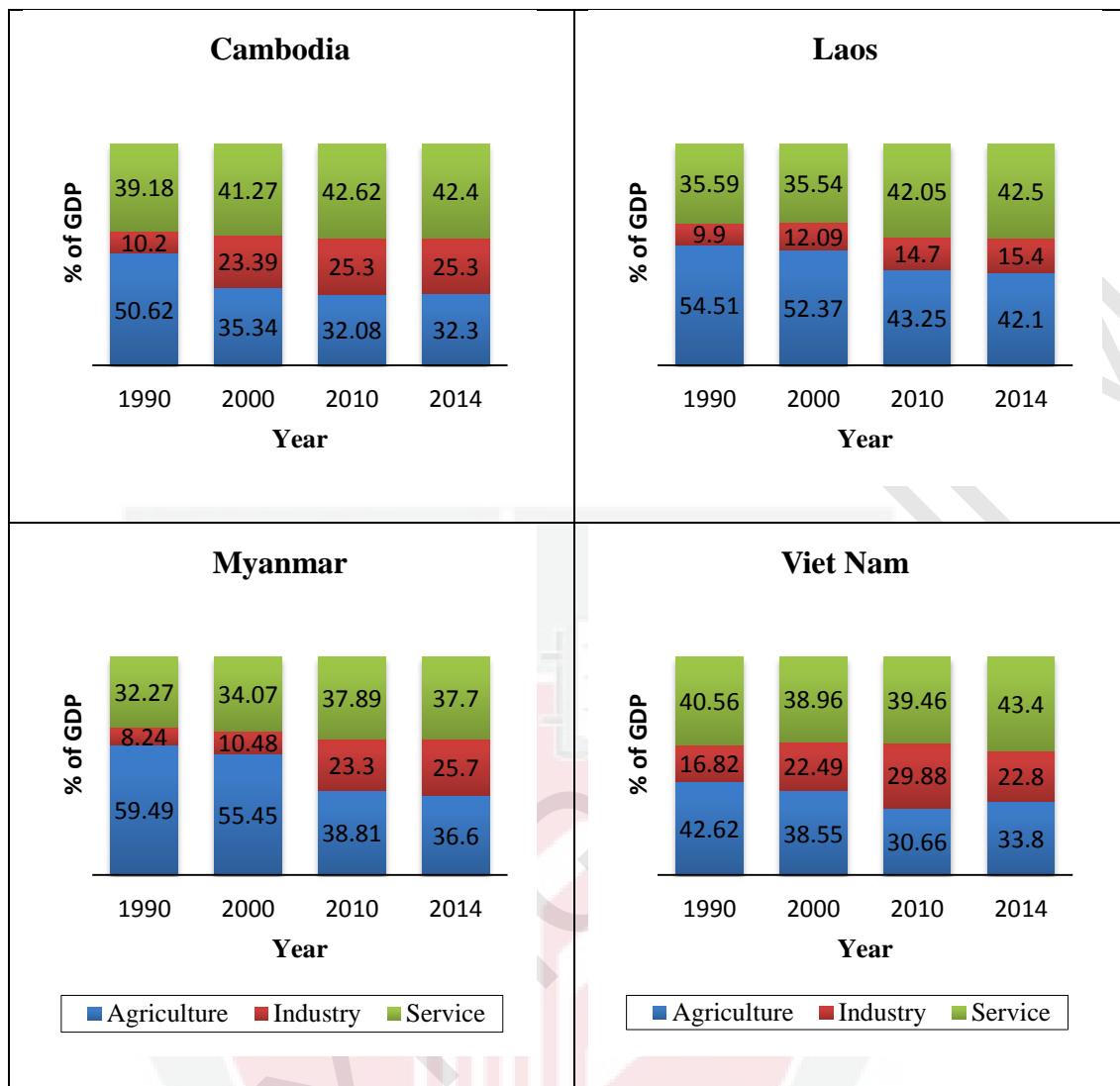
In general, development gap can be reflected in the disparities in both income and production structure (as measured by sectoral shares in benchmarking the stages of economic development). Therefore, trends of aggregate income, sectoral income and sectoral shares explained earlier ascertain the huge development gaps between ASEAN-6 members and the CLMV countries.



Source: United Nations Statistics Division (UNSD)

Note: Agriculture sector includes the mining and utilities sector while industry sector comprises with manufacturing and construction sector.

**Figure 1.4 (a): Sectoral Shares of ASEAN-6 Member States**



Source: United Nations Statistics Division (UNSD)

Note: Agriculture sector includes the mining and utilities sector while industry sector comprises with manufacturing and construction sector.

**Figure 1.4 (b): Sectoral Shares of CLMV Countries**

## 1.2 Problem Statement

Full membership of ASEAN was formed since 1999 with the goal to be a highly competitive with equitable development region. Yet, the gap within ASEAN-6 and CLMV countries in terms of income and production structure remained vast as shown in the previous section. Besides, numerous studies have reported huge development gap within ASEAN (Park, 2000; Park and Rahman, 2001; Bunyaratavej & Hahn, 2003; Xu, Ward and Gan, 2007; Bacha, 2008; Engwerda, Boldea, Michalak, Plasmans & Salmah, 2012).

Income convergence is the key to allow further economic integration among ASEAN member states. Besides, Reyes (2012) stressed that income inequalities must be narrowed if not removed in ASEAN, as a necessary condition for one community of ten nations to function as a single market and as a production base. Otherwise, it

would be impossible for ten countries with different development level to move forward in a unified manner (Bayoumi & Mauro, 1999; Bunyaratavej & Hahn, 2003). The complementary relationship among the ASEAN members develops ASEAN as a competitive region in the global market. An economically strong ASEAN will not only benefit ASEAN members but also strengthen the economic integration with respective partner countries as well.

Study of convergence club is also important because there might be multiple steady-states rather than a common one due to heterogeneity among economies (Azariadis, 1996; Chatterji, 1992; Galor, 1996). Considering the heterogeneity between ASEAN-6 and the CLMV countries, it will be worthwhile to examine whether this would be the possible explanation on the non-convergence as mentioned in the studies of ASEAN.

On the other hand, it has been discussed in the previous section that a successful economic integration within ASEAN should stimulate sectoral convergence and structural convergence. Furthermore, literature of income convergence have stressed the importance to include the study on sectoral productivities and the production structure (Bernard & Jones, 1996b; Cuadrado-Roura et al., 1999; Cunado & Sanchez-Robles, 2000; Wong, 2006). Such examination in ASEAN can provide more comprehensive analysis on the performance of the CLMV countries in catching-up with the ASEAN-6 members in terms of their sectoral income and stages of development (as measured by structural convergence).

Meanwhile, it is crucial to identify the source of income growth and source of income convergence. This will enable policy makers to tailor country- and sector-specific policies in order to facilitate income convergence among the ASEAN members. However, past studies only focused on the aggregate income convergence on the ASEAN-5 or the ASEAN region while convergence clubs were analysed within the ASEAN-5 countries only. There are limited studies on the sectoral convergence and structural convergence, especially among ASEAN members, despite their role in development theories, which contribute to overall income convergence. Therefore, this study would fill in the research gaps as discussed above.

### **1.3 Objectives of the Study**

The empirical evidences in supporting income convergence within the ASEAN members lack comprehensiveness. Hence, the general objective of this study is to explain the overall income convergence by analysing the sectoral income and the production structures within ASEAN.

Therefore, the specific objectives of this study are as follows:-

1. To examine the overall income convergence and sectoral convergence in ASEAN.
2. To examine the possibility for the emergence of convergence clubs in ASEAN in both aggregate income and sectoral income.

3. To examine whether the production structures of ASEAN member states are similar over time i.e. structural convergence.
4. To identify the source of income growth and income convergence within ASEAN.

#### **1.4 Significance of the Study**

The present study hopes to contribute to the literature by revisiting the income convergence within ASEAN as no studies were conducted in this area since year 2003 with regard to this region. Furthermore, the analysis of sectoral convergence in this study shall provide information whether the trend in aggregate income was reflected in sectoral income as well. The results will allow to identify the non-converging sector which might be the possible reason leading to the non-convergence in ASEAN's aggregate income. Then, necessary assistance can be provided to non-converging sector and country in order to stimulate their economic growth and facilitate the convergence process.

The study on the convergence club will allow understanding whether there are actually two different steady-states between ASEAN-6 and CLMV and it may be the reason behind the non-convergence as mentioned in many studies. Such information can also help to assist members outside any of the converging club in order to improve their conditions to converge to these clubs.

On the other hand, the examination on structural convergence will uncover whether ASEAN economies are experiencing similar development after years of integration. The breakdown of specialization index helps to identify the sector from each country contributing to the slowdown of structural convergence.

Finally, the identified source of income growth and income convergence within ASEAN allows policy makers to formulate the country- and sector-specific policies to facilitate the income convergence process.

#### **1.5 Organization of the Thesis**

This thesis is divided into 8 chapters. Following this chapter, Chapter 2 begins with an introduction on the background of ASEAN member states along with some development over 43 years of integration. Chapter 3 discusses the theories of income convergence followed by sectoral convergence and structural convergence. Next, the empirical evidences are presented after the theories. Chapter 4 reports the methodology, and findings for income convergence and sectoral convergence within ASEAN. Chapter 5 discusses the methodology along with the results of possible convergence clubs. Chapter 6 outlines the methodology and findings regarding the structural convergence within ASEAN. Chapter 7 documents the methodology and findings of the source of income convergence. Finally, Chapter 8 summarises the main results and conclusions, proposes policy implications, and outlines the limitations and recommendations for future research.



## REFERENCES

- Abegaz, B. (2002). Structural convergence in manufacturing industries between leaders and latecomers. *Journal of Development Studies*, 38(4), 69–99. doi:10.1080/00220380412331322421.
- Alavi, R., & Ramadan, A. A. (2008). Narrowing development gaps in ASEAN. *Journal of Economic Cooperation*, 29(1), 29–60. Retrieved from [http://www.sesric.org/jecd/jecd\\_articles/ART07100102-2.pdf](http://www.sesric.org/jecd/jecd_articles/ART07100102-2.pdf).
- Alexiadis, S., Hasanagas, N., & Ladas, C. A. (2013). Regional “Clubs” in Agriculture: Empirical Evidence. *Procedia Technology*, 8, 512–515. doi:10.1016/j.protcy.2013.11.069.
- Andrews, D. W. K. (1991). Heteroskedasticity and autocorrelation consistent covariance matrix estimation. *Econometrica*, 59(3), 817–858. doi: 10.2307/2938229.
- Angeloni, I., Flad, M., & Mongelli, F. P. (2005). *Economic and monetary integration of the new member states: helping to chart the route* (No. 36). *ECB Occasional paper*. Retrieved from <https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp36.pdf?4bd7824d8a5e0ced11ca4ac914499a63>.
- Apergis, N., & Cooray, A. (2014). Tax revenues convergence across ASEAN, Pacific and Oceania countries: evidence from club convergence. *Journal of Multinational Financial Management*, 27, 11–21. doi:10.1016/j.mulfin.2014.06.007.
- Apergis, N., Panopoulou, E., & Tsoumas, C. (2010). Old wine in a new bottle: growth convergence dynamics in the EU. *Atlantic Economic Journal*, 38(2), 169–181. doi:10.1007/s11293-010-9219-1.
- Artelaris, P., Kallioras, D., & Petrakos, G. (2010). Regional inequalities and convergence clubs in the European Union new member-states. *Journal of European Studies*, 1(1), 113–133. Retrieved from [http://ejes.uaic.ro/articles/EJES2010\\_0101\\_ART.pdf](http://ejes.uaic.ro/articles/EJES2010_0101_ART.pdf).
- ASEAN Statistics. (2016). Retrieved from <http://aseanstats.asean.org/>.
- Asian Development Bank (ADB). (2016). Retrieved from <https://aric.adb.org/integrationindicators>.
- Azariadis, C. (1996). The economics of poverty traps part one: complete markets. *Journal of Economic Growth*, 1(4), 449–486. doi:10.1007/BF00150197.
- Azariadis, C., & Drazen, A. (1990). Threshold externalities in economic development. *The Quarterly Journal of Economics*, 105(2), 501–526. doi:10.2307/2937797.
- Bacha, O. I. (2008). A common currency area for ASEAN? Issues and Feasibility. *Applied Economics*, 40(4), 515–529. doi:10.1080/00036840600675653.

- Bandyopadhyay, S. (2012). Convergence clubs in incomes across Indian states: is there evidence of a neighbours' effect? *Economics Letters*, 116(3), 565–570. doi:10.1016/j.econlet.2012.05.050.
- Barrios, E. B. (2007). *Convergence in agriculture of some Asian countries* (ADB Discussion Paper No. 71). Retrieved from <http://www.econstor.eu/handle/10419/53529>.
- Barro, R. J., & Sala-i-Martin, X. (1992). Convergence. *Journal of Political Economy*, 100(2), 223–251. doi:10.1086/261816.
- Bartkowska, M., & Riedl, A. (2012). Regional convergence clubs in Europe: identification and conditioning factors. *Economic Modelling*, 29(1), 22–31. doi:10.1016/j.econmod.2011.01.013.
- Baumol, W. J. (1994). Multivariate growth patterns: contagion and common forces as possible sources of convergence. In W. J. Baumol, R. R. Nelson, & E. N. Wolff (Eds.), *Convergence of Productivity: Cross-national Studies and Historical Evidence* (pp. 62–85). New York: Oxford University Press.
- Baumol, W. J., Nelson, R. R., & Wolff, E. N. (1994). Introduction: the convergence to productivity, its significance, and its varied connotations. In W. J. Baumol, R. R. Nelson, & E. N. Wolff (Eds.), *Convergence of Productivity: Cross-national Studies and Historical Evidence*. New York: Oxford University Press.
- Bayoumi, T., & Mauro, P. (2001). The suitability of ASEAN for a regional currency arrangement. *World Economy*, 24(7), 933–954. doi: 10.1111/1467-9701.00390.
- Bernard, A. B., & Durlauf, S. N. (1995). Convergence in international output. *Journal of Applied Econometrics*, 10(2), 97–108. doi:10.1002/jae.3950100202.
- Bernard, A. B., & Durlauf, S. N. (1996). Interpreting tests of the convergence hypothesis. *Journal of Econometrics*, 71(1-2), 161–173. doi:10.1016/0304-4076(94)01699-2.
- Bernard, A. B., & Jones, C. I. (1996a). Comparing apples to oranges: productivity convergence and measurement across industries and countries. *The American Economic Review*, 86(5), 1216–1238. doi: 10.1257/aer.91.4.1168.
- Bernard, A. B., & Jones, C. I. (1996b). Productivity across industries and countries: Time series theory and evidence. *The Review of Economics and Statistics*, 78(1), 135–146. doi:10.2307/2109853.
- Bernard, A. B., & Jones, C. I. (1996c). Productivity and convergence across U.S. states and industries. *Empirical Economics*, 21(1), 113–135. doi:0.1007/BF01205496.
- Borsi, M. T., & Metiu, N. (2015). The evolution of economic convergence in the European Union. *Empirical Economics*, 48(2), 657–681. doi:10.1007/s00181-014-0801-2.



- Bouvet, F. (2010). EMU and the dynamics of regional per capita income inequality in Europe. *Journal of Economic Inequality*, 8(3), 323–344. doi: 10.1007/s10888-010-9129-0.
- Bunyaratavej, K., & Hahn, E. D. (2003). Convergence and its implications for a common currency in ASEAN. *ASEAN Economic Bulletin*, 20(1), 49–59. doi:10.1355/AE20-1D.
- Canova, F. (2004). Testing for convergence clubs in income per capita: a predictive density approach. *International Economic Review*, 45(1), 49–77. doi:10.2307/3663602.
- Carlino, G. A., & Mills, L. O. (1993). Are U. S. regional incomes converging? A time series analysis. *Journal of Monetary Economics*, 32(2), 335–346. doi:10.1016/0304-3932(93)90009-5.
- Carmignani, F. (2007). A note on income converge effects in regional integration agreements. *Economics Letters*, 94(3), 361–366. doi:10.1016/j.econlet.2006.08.020.
- Carvalho, V. M., & Harvey, A. C. (2005). Convergence in the trends and cycles of euro-zone income. *Journal of Applied Econometrics*, 20(2), 275–289. doi:10.1002/jae.820.
- Chatterji, M. (1992). Convergence clubs and endogenous growth. *Oxford Review of Economic Policy*, 8(4), 57–69. doi:10.1093/oxrep/8.4.57.
- Chenery, H. B. (1960). Patterns of industrial growth. *The American Economic Review*, 50(4), 624–654.
- Chowdhary, R., Jore, S., Thakur, R., Agrawal, K., & Geete, V. (2010). Convergence of GDP per capita in Asean countries. *Prestige International Journal of Management and Research*, 3(2/1), 1–9. Retrieved from [http://www.pimrindore.ac.in/PIJMR-Vol3\(2\)-Vol4\(1\).pdf](http://www.pimrindore.ac.in/PIJMR-Vol3(2)-Vol4(1).pdf).
- Chowdhury, K. (2005). What's happening to per capita GDP in the ASEAN countries? An analysis of convergence, 1960-2001. *Applied Econometrics and International Development*, 5(3), 49–68. Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1238161](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1238161).
- Corrado, L., Martin, R., & Weeks, M. (2005). Identifying and interpreting regional convergence clusters across Europe. *Economic Journal*, 115(502), 133–160. doi:10.1111/j.0013-0133.2005.00984.x.
- Crespo, N., & Fontoura, M. P. (2007). Integration of CEECs into EU market: structural change and convergence. *Journal of Common Market Studies*, 45(3), 611–632. doi:10.1111/j.1468-5965.2007.00726.x.
- Crespo, N., & Simões, N. (2012). On the measurement of a multidimensional concept of structural similarity. *Economics Letters*, 116(1), 115–117. doi:10.1016/j.econlet.2012.01.024.

- Cuadrado-Roura, J. R., García-Greciano, B., & Raymond, J. L. (1999). Regional convergence in productivity and productive structure: the Spanish case. *International Regional Science Review*, 22(1), 35–53. doi:10.1177/016001799761012190.
- Cunado, J., & Sanchez-Robles, B. (2000). Sectoral structure and real convergence among Spanish regions. *International Advances in Economic Research*, 6(2), 259–270. doi:10.1007/BF02296107.
- Cyrus, T. (2004). Does convergence cause trade, or does trade cause convergence? *Journal of International Trade & Economic Development*, 13(4), 397–418. doi:10.1080/0963819042000300573.
- Dayang-Affizzah, A. M., & Norimah, R. (2010). Testing for structural convergence in Asia: an application of Phillips-Sul log-t test. *Journal of International Economic Review*, 3(2), 69–88.
- Dayang-Affizzah, A. M., Rossazana, A. R., Dayang-Hummida, A. A. R., & Habibullah, M. S. (2012). ASEAN5 + 3 economies: convergence or divergence? *Journal of International Economic Review*, 5(1), 63–68.
- Dollar, D., & Wolff, E. N. (1993). *Competitiveness, convergence, and international specialization*. London: MIT Press.
- Doyle, E., & O’Leary, E. (1999). The role of structural change in labour productivity convergence among European Union countries: 1970-1990. *Journal of Economic Studies*, 26(2), 106–122. doi:10.1108/01443589910258452.
- Drennan, M. P., Lobo, J., & Strumsky, D. (2004). Unit root tests of sigma income convergence across US metropolitan areas. *Journal of Economic Geography*, 4(5), 583–595. doi:10.1093/jnlecg/lbh035.
- Durlauf, S. N., & Johnson, P. A. (1995). Multiple regimes and cross-country growth behaviour. *Journal of Applied Econometrics*, 10(4), 365–384. doi:10.1002/jae.3950100404.
- Elliott, G., Rothenberg, T. J., & Stock, J. H. (1996). Efficient tests for an autoregressive unit root. *Econometrica*, 64(4), 813–836. doi:10.2307/2171846.
- Engwerda, J., Boldea, O., Michalak, T., Plasmans, J., & Salmah. (2012). A simulation study of an ASEAN monetary union. *Economic Modelling*, 29(5), 1870–1890. doi:10.1016/j.econmod.2012.05.032.
- Evans, P., & Karras, G. (1996). Convergence revisited. *Journal of Monetary Economics*, 37(2), 249–265. doi:10.1016/S0304-3932(96)90036-7.
- Fiaschi, D., & Lavezzi, A. M. (2007). Productivity polarization and sectoral dynamics in European regions. *Journal of Macroeconomics*, 29(3), 612–637. doi:10.1016/j.jmacro.2007.03.003.

- Filiztekin, A. (1999). *Convergence across Turkish provinces and sectoral dynamics*. Retrieved from <http://myweb.sabanciuniv.edu/alpayf/files/2010/04/provconv.pdf>.
- Fisher, A. G. B. (1939). Production, primary, secondary and tertiary. *Economic Record*, 15(1), 24–38. doi:10.1111/j.1475-4932.1939.tb01015.x.
- Fisher, A. G. B. (1952). A note on tertiary production. *The Economic Journal*, 62(248), 820–834. doi:10.2307/2227773.
- Fritsche, U., & Kuzin, V. (2011). Analysing convergence in Europe using the non-linear single factor model. *Empirical Economics*, 41(2), 343–369. doi: 10.1007/s00181-010-0385-4.
- Galor, O. (1996). Convergence? Inferences from theoretical models. *The Economic Journal*, 106(437), 1056–1069. doi:10.2307/2235378.
- Galor, O., & Zeira, J. (1993). Income distribution and macroeconomics. *The Review of Economics Studies*, 60(1), 35–52.
- Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective*. Harvard University Press, Cambridge, MA.
- Ghosh, M. (2006). Regional convergence in Indian agriculture. *Indian Journal of Agricultural Economics*, 61(4), 610–629. Retrieved from <http://search.proquest.com/docview/201557701?accountid=28110>.
- Ghosh, M., Ghoshray, A., & Malki, I. (2013). Regional divergence and club convergence in India. *Economic Modelling*, 30, 733–742. doi: 10.1016/j.econmod.2012.10.008.
- Gollin, D., Parente, S., & Rogerson, R. (2002). The role of agriculture in development. *The American Economic Review*, 92(2), 160–164. doi:10.1126/science.151.3712.867-a.
- Gomez, M., & Ventosa-Santaul, D. (2007). *Trade liberalization and regional income convergence in Mexico: a time-series analysis*. (MPRA Working Paper No. 58777). Retrieved from [https://mpra.ub.uni-muenchen.de/58777/1/MPRA\\_paper\\_58777.pdf](https://mpra.ub.uni-muenchen.de/58777/1/MPRA_paper_58777.pdf).
- Gomez-Zaldivar, M., & Ventosa-Santaularia, D. (2010). Per capita output convergence: the Dickey-Fuller test under the simultaneous presence of stochastic and deterministic trends. *Annales D'économie et de Statistique*, 99-100, 429–445. Retrieved from [https://www.researchgate.net/profile/Manuel\\_GomezZaldivar/publication/227362885\\_Per\\_Capita\\_Output\\_Convergence\\_The\\_Dickey-Fuller\\_Test\\_Under\\_the\\_Simultaneous\\_Presence\\_of\\_Stochastic\\_and\\_Deterministic\\_Trends/links/00b7d52545a0f536d7000000.pdf](https://www.researchgate.net/profile/Manuel_GomezZaldivar/publication/227362885_Per_Capita_Output_Convergence_The_Dickey-Fuller_Test_Under_the_Simultaneous_Presence_of_Stochastic_and_Deterministic_Trends/links/00b7d52545a0f536d7000000.pdf).
- Greasley, D., & Oxley, L. (1997). Time-series based tests of the convergence hypothesis: some positive results. *Economics Letters*, 56(2), 143–147. doi:10.1016/S0165-1765(97)81892-7.

- Gutierrez, L. (2000). Convergence in US and EU agriculture. *European Review of Agricultural Economics*, 27(2), 187–206. doi:10.1093/erae/27.2.187.
- Haraguchi, N., & Rezonja, G. (2010). *Structural change and sectoral growth in selected East Asian countries* (UNIDO Working Paper No. 18). United Nations Industrial Development Organization (UNIDO). Retrieved from [http://www.unido.org/fileadmin/user\\_media/Publications/Research\\_and\\_statistics/Branch\\_publications/Research\\_and\\_Policy/Files/Working\\_Papers/2009/Wp\\_18\\_Structural\\_Change\\_and\\_Sectoral\\_Growth\\_in\\_Selected\\_East\\_Asian\\_Countries.pdf](http://www.unido.org/fileadmin/user_media/Publications/Research_and_statistics/Branch_publications/Research_and_Policy/Files/Working_Papers/2009/Wp_18_Structural_Change_and_Sectoral_Growth_in_Selected_East_Asian_Countries.pdf).
- Hew, D. (2008). Towards an ASEAN economic community by 2015. In *The ASEAN Community: Unblocking the Roadblocks* (pp. 15–29). Singapore: Institute of Southeast Asian Studies (ISEAS).
- Ho, T. W. (2015). Income inequality may not converge after all: testing panel unit roots in the presence of cross-section cointegration. *The Quarterly Review of Economics and Finance*, 56, 68–79. doi:10.1016/j.qref.2014.10.005.
- Hohenberger, N., & Schmiedeberg, C. (2008). *Structural convergence of European countries* (No. 75). *Structural Change and Economic Dynamics*. (Cege Working Paper No. 75) Retrieved from <http://wwwuser.gwdg.de/~cege/Diskussionspapiere/75.pdf>.
- Hsiao, C. (2007). Panel data analysis - advantages and challenges. *Test*, 16(1), 1–22. doi:10.1007/s11749-007-0046-x.
- Hwa, E. C. (1986). The contribution of agriculture to economic growth: some empirical evidence. *World Development*, 16(11), 1329–1339. doi:10.1016/0305-750X(88)90208-2.
- IESR. (2014). *The framework for extractive industries governance in ASEAN*. Retrieved from [http://www.resourcegovernance.org/sites/default/files/FrameworkExtractiveIndustriesGov\\_20141202.pdf](http://www.resourcegovernance.org/sites/default/files/FrameworkExtractiveIndustriesGov_20141202.pdf).
- Imbs, J. (2001). *Sectors and the OECD business cycle*. Retrieved from <http://www.hec.unil.ch/jimbs/Research/OECDDBC2001.pdf>.
- Islam, N. (2003). What have we learnt from the convergence debate? *Journal of Economic Surveys*, 17(3), 309–362. doi:10.1111/1467-6419.00197.
- Ismail, N. W. (2008). Growth and convergence in ASEAN: a dynamic panel approach. *International Journal of Economics and Management*, 2(1), 127–140. Retrieved from <http://psasir.upm.edu.my/684/1/bab06.pdf>.
- Jayanthakumaran, K., & Lee, S. W. (2013). Evidence on the convergence of per capita income: a comparison of founder members of the Association of South East Asian Nations and the South Asian Association of Regional Cooperation. *Pacific Economic Review*, 18(1), 108–121. doi:10.1111/1468-0106.12013.



- Jayanthakumaran, K., & Verma, R. (2008). International trade and regional income convergence: the ASEAN-5 evidence. *ASEAN Economic Bulletin*, 25(2), 179–194. doi:10.1355/ae25-2d.
- King, A., & Ramlogan-Dobson, C. (2015). International income convergence: is Latin America actually different? *Economic Modelling*, 49, 212–222. doi:10.1016/j.econmod.2015.04.008.
- Krüger, J. J. (2008). Productivity and structural change: a review of the literature. *Journal of Economic Surveys*, 22(2), 330–363. doi:10.1111/j.1467-6419.2007.00539.x.
- Kuznets, S. (1971). *Economic growth of nations: total output and production structure*. Cambridge, Mass.
- Lee, H.-A., Lim, K.-P., & Azali, M. (2005). Income disparity between Japan and ASEAN-5 economies: converge, catching up or diverge? *Economics Bulletin*, 6(13), 1–20. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.597.4552&rep=rep1&type=pdf>.
- Li, Q., & Papell, D. (1999). Convergence of international output. Time series evidence for 16 OECD countries. *International Review of Economics & Finance*, 8(3), 267–280. doi:10.1016/S1059-0560(99)00020-9.
- Lim, L. K., & McAleer, M. (2004). Convergence and catching up in ASEAN: a comparative analysis. *Applied Economics*, 36(2), 137–153. doi:10.1080/0003684042000174038.
- Lloyd, P. J. (2005). What is a single market? an application to the case of ASEAN. *ASEAN Economic Bulletin*, 22(3), 251–265. doi:10.1355/AE22-3A.
- Loewy, M. B., & Papell, D. H. (1996). Are U.S. regional incomes converging? some further evidence. *Journal of Monetary Economics*, 38(3), 587–598. doi:10.1016/S0304-3932(96)01292-5.
- Loke, W.-H. (2009). East Asia and Southeast Asia: similarity in trade structures. In *The Singapore Economic Review Conference (SERC) 2009* (pp. 1–16). Retrieved from [https://editorialexpress.com/cgi-bin/conference/download.cgi?db\\_name=serc2009&paper\\_id=184](https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=serc2009&paper_id=184).
- Longhi, C., & Musolesi, A. (2007). European cities in the process of economic integration: towards structural convergence. *Annals of Regional Science*, 41(2), 333–351. doi:10.1007/s00168-006-0104-4.
- Lopez-Bazo, E., Vaya, E., Mora, A. J., & Suriñach, J. (1999). Regional economic dynamics and convergence in the European Union. *The Annals of Regional Science*, 33(3), 343–370. doi:10.1007/s001680050109.
- Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3–42. doi:10.1016/0304-3932(88)90168-7.

- Marelli, E. (2007). Specialisation and convergence of European regions. *The European Journal of Comparative Economics*, 4(2), 149–178. Retrieved from <http://eaces.liuc.it/18242979200702/182429792007040203.pdf>.
- Martin, C., & Sanz, I. (2003). Real convergence and European integration: the experience of the less developed EU members. *Empirica*, 30(3), 205–236. doi:10.1023/A:1026014600454.
- Masron, T. A., & Yusop, Z. (2008). AFTA, income growth, and income convergence in ASEAN. *The International Trade Journal*, 22(3), 290–314. doi:10.1080/08853900802191363.
- Mathur, A. (1983). Regional development and income disparities in India: a sectoral analysis. *Economic Development and Cultural Change*, 31(3), 475–505. doi:10.1086/451338.
- Molle, W., & Boeckhout, S. (1995). Economic disparity under conditions of integration - a long term view of the European case. *Papers in Regional Science*, 74(2), 105–123. doi:10.1111/j.1435-5597.1995.tb00631.x.
- Monfort, M., Cuestas, J. C., & Ordóñez, J. (2013). Real convergence in Europe: a cluster analysis. *Economic Modelling*, 33, 689–694. doi:10.1016/j.econmod.2013.05.015.
- Mora, T., Vaya, E., & Suriñach, J. (2005). Specialisation and growth: the detection of European regional convergence clubs. *Economics Letters*, 86(2), 181–185. doi:10.1016/j.econlet.2004.07.010.
- Ng, S., & Perron, P. (2001). Lag length selection and the construction of unit root tests with good size and power. *Econometrica*, 69(6), 1519–1554. doi:10.1111/1468-0262.00256.
- O’Leary, E. (2003). Aggregate and sectoral convergence among Irish regions: the role of structural change, 1960-96. *International Regional Science Review*, 26(4), 483–501. doi:10.1177/0160017603259179.
- Olczyk, M., & Lechman, E. (2011). *Structural convergence among selected European countries. multidimensional analysis* (MPRA Working Paper No. 33656). Retrieved from [https://mpra.ub.uni-muenchen.de/33656/2/MPRA\\_paper\\_33656.pdf](https://mpra.ub.uni-muenchen.de/33656/2/MPRA_paper_33656.pdf).
- Ong, H.-B., & Habibullah, M. S. (2007). The ASEAN-5 economic alliance: a time varying convergence analysis. *International Research Journal of Finance and Economics*, 8, 97–106.
- Ong, H.-B., & Habibullah, M. S. (2008). Evidence of ongoing convergence within ASEAN. *Journal of Applied Sciences*, 8(14), 2592–2598. doi:10.3923/jas.2008.2592.2598.

- Onwuka, K. O., Baharumshah, A. Z., & Habibullah, M. S. (2006). Trading systems and convergence hypothesis: evidence from ASEAN-5 countries. *International Research Journal of Finance and Economics*, (5), 52–63. Retrieved from [http://www.cpiasia.net/v3/images/policy\\_papers/Trading Systems and Convergence Hypothesis Evidence from ASEAN-5 Countries.pdf](http://www.cpiasia.net/v3/images/policy_papers/Trading_Systems_and_Convergence_Hypothesis_Evidence_from_ASEAN-5_Countries.pdf).
- Oxley, L., & Greasley, D. (1995). A time series perspective on convergence: Australia, UK and USA since 1870. *The Economic Record*, 71(214), 259–270. doi:10.1111/j.1475-4932.1995.tb01893.x.
- Paci, R., & Pigliaru, F. (1997). *European regional growth: do sectors matter?* Retrieved from <http://crenos.unica.it/crenos/sites/default/files/wp/97-3.pdf>.
- Palan, N., & Schmiedeberg, C. (2010). Structural convergence of European countries. *Structural Change and Economic Dynamics*, 21(2), 85–100. doi:10.1016/j.strueco.2010.01.001.
- Panopoulou, E., & Pantelidis, T. (2009). Club convergence in carbon dioxide emissions. *Environmental and Resource Economics*, 44(1), 47–70. doi:10.1007/s10640-008-9260-6.
- Panopoulou, E., & Pantelidis, T. (2012). Convergence in per capita health expenditures and health outcomes in the OECD countries. *Applied Economics*, 44(30), 3909–3920. doi:10.1080/00036846.2011.583222.
- Park, D. (2000). Intra-Southeast Asian income convergence. *ASEAN Economic Bulletin*, 17(3), 285–292. Retrieved from <http://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?sid=7ab801e6-43dd-444c-878f-98ddcf7f3319@sessionmgr4007&vid=0&hid=4203>.
- Park, D. (2003). An empirical examination of income convergence in the Asia-Pacific region. *Journal of Asian Economics*, 14(3), 497–502. doi:10.1016/S1049-0078(03)00039-3.
- Park, D., & Rahman, S. (2001). Inter-country income convergence within ASEAN, 1960-2000. *International Area Studies Review*, 4(2), 89–95.
- Phillips, P. C. B., & Sul, D. (2007). Transition modeling and econometric convergence tests. *Econometrica*, 75(6), 1771–1855. doi:10.1111/j.1468-0262.2007.00811.x.
- Phillips, P. C. B., & Sul, D. (2009). Economic transition and growth. *Journal of Applied Econometrics*, 24(7), 1153–1185. doi:10.1002/jae.1080.
- Pittau, M. G., & Zelli, R. (2006). Empirical evidence of income dynamics across EU regions. *Journal of Applied Econometrics*, 21(5), 605–628. doi:10.1002/jae.855.
- Quah, D. (1993). Galton's fallacy and tests of the convergence hypothesis. *Scandinavian Journal of Economics*, 95(4), 427–443. doi:10.2307/3440905.

- Quah, D. T. (1996a). Convergence empirics across economies with (some) capital mobility. *Journal of Economic Growth*, 1(1), 95–124. doi:10.1007/BF00163344.
- Quah, D. T. (1996b). Empirics for economic growth and convergence. *European Economic Review*, 40(6), 1353–1375. doi:10.1016/0014-2921(95)00051-8.
- Quah, D. T. (1996c). Regional convergence clusters across Europe. *European Economic Review*, 40(3-5), 951–958. doi:10.1016/0014-2921(95)00105-0.
- Quah, D. T. (1996d). Twin peaks: growth and convergence in models of distribution dynamics. *The Economic Journal*, 106(437), 1045–1055. doi:10.2307/2235377.
- Ramajo, J., Márquez, M. A., Hewings, G. J. D., & Salinas, M. M. (2008). Spatial heterogeneity and interregional spillovers in the European Union: do cohesion policies encourage convergence across regions? *European Economic Review*, 52(3), 551–567. doi:10.1016/j.eurocorev.2007.05.006.
- Reyes, R. A. (2012, July 24). Will ASEAN economic integration help the poor? *Asean Secretariat*. Retrieved from <http://www.aseansec.org/16508.htm>.
- Reza, R., & Zahra, K. T. (2008). Evaluation of the income convergence hypothesis in ten new members of the European union: a panel unit root approach. *Panoeconomicus*, 55(2), 157–166. <http://doi.org/10.2298/PAN0802157R>.
- Rodríguez-Benavides, D., López-Herrera, F., & Venegas-Martínez, F. (2014). Are there economic convergence clubs in Latin America? *Journal of Economics and Development Studies*, 2(3), 113–123. doi:10.15640/jeds.v2n3a8.
- Romer, P. M. (1986). Increasing returns and long-run growth. *The Journal of Political Economy*, 94(5), 1002–1037. doi:10.1086/261420.
- Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, 98(5), S71–S102. doi:10.1086/261725.
- Roncolato, L., & Kucera, D. (2014). Structural drivers of productivity and employment growth: a decomposition analysis for 81 countries. *Cambridge Journal of Economics*, 38(2), 399–424. doi:10.1093/cje/bet044.
- Rowthorn, R. E. (1992). Productivity and American Leadership. *Review of Income and Wealth*, 38(4), 475–496. doi:10.1093/qje/qjt032.
- Sala-i-Martin, X. X. (1996a). Regional cohesion: evidence and theories of regional growth and convergence. *European Economic Review*, 40(6), 1325–1352. doi:10.1016/0014-2921(95)00029-1.
- Sala-i-Martin, X. X. (1996b). The classical approach to convergence analysis. *The Economic Journal*, 106(437), 1019–1036. doi:10.2307/2235375.
- Sassi, M. (2011). Convergence across the EU regions: economic composition and structural transformation. *International Advances in Economic Research*, 17(1), 101–115. doi:10.1007/s11294-010-9286-8.



- Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65–94. doi:10.2307/1884513.
- Strazicich, M. C., Lee, J., & Day, E. (2004). Are incomes converging among OECD countries? Time series evidence with two structural breaks. *Journal of Macroeconomics*, 26(1), 131–145. doi:10.1016/j.jmacro.2002.11.001.
- Suhariyanto, K., & Thirtle, C. (2001). Asian agricultural productivity and convergence. *Journal of Agricultural Economics*, 52(3), 96–110. doi:10.1111/j.1477-9552.2001.tb00941.x.
- Tan, Y. L., Nor, A. H. S. M., Saud, N. A., & Ahmad, Z. (2013). Testing for unit roots and structural breaks: evidence from selected ASEAN macroeconomic time series. *International Journal of Trade, Economics and Finance*, 4(4), 230–237. doi:10.7763/IJTEF.2013.V4.292.
- Tatomir, C. F. (2012). *Structural convergence of the central and eastern European countries: achievements in the last decade* (MPRA Working Paper No. 35701). Retrieved from [https://mpra.ub.uni-muenchen.de/35701/1/Structural\\_Convergence\\_of\\_the\\_CEECs\\_Achivements\\_in\\_the\\_last\\_decade.pdf](https://mpra.ub.uni-muenchen.de/35701/1/Structural_Convergence_of_the_CEECs_Achivements_in_the_last_decade.pdf).
- Tochkov, K., & Yu, W. (2013). Sectoral productivity and regional disparities in China, 1978–2006. *Comparative Economic Studies*, 55(4), 582–605. doi:10.1057/ces.2013.19.
- Tomljanovich, M., & Vogelsang, T. J. (2002). Are U.S. regions converging? using new econometric methods to examine old issues. *Empirical Economics*, 27(1), 49–62. doi:10.1007/s181-002-8358-3.
- United Nations Conference on Trade and Development (UNCTAD). (2016). Retrieved from [http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?IF\\_ActivePath=P,15912&sCS\\_ChosenLang=en](http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?IF_ActivePath=P,15912&sCS_ChosenLang=en).
- United Nations Statistics Division (UNSD). (2014). Retrieved from <http://unstats.un.org/unsd/snaama/dnlList.asp>.
- Van Riet, A. et al. (2004). *Sectoral specialisation in the EU: a macroeconomic perspective* (ECB Working Paper No. 19). Retrieved from <http://www.ecb.europa.eu/pub/pdf/scpops/ecbocp19.pdf>.
- Villaverde, J., & Maza, A. (2008). Productivity convergence in the European regions, 1980–2003: a sectoral and spatial approach. *Applied Economics*, 40(10), 1299–1313. doi:10.1080/00036840600771361.
- Wacziarg, R. (2001). *Structural convergence*. Retrieved from [http://www.anderson.ucla.edu/faculty\\_pages/romain.wacziarg/downloads/structconv.pdf](http://www.anderson.ucla.edu/faculty_pages/romain.wacziarg/downloads/structconv.pdf).
- Wang, M. S. (2012). Income convergence within ASEAN, ASEAN+3: a panel unit root approach. *Applied Economics Letters*, 19(5), 417–423. doi:10.1080/13504851.2011.581203.

- Wong, W. K. (2006). OECD convergence: a sectoral decomposition exercise. *Economics Letters*, 93(2), 210–214. doi:10.1016/j.econlet.2006.05.004.
- Woosik, M. (2006). Income convergence across nations and regions in East Asia. *Journal of International and Area Studies*, 13(2), 1–16. Retrieved from [http://publication.gsis.snu.ac.kr/?download\\_doc\\_id=5693](http://publication.gsis.snu.ac.kr/?download_doc_id=5693).
- Xu, Z. L., Ward, B. D., & Gan, C. (2007). A single currency for ASEAN-5: an empirical study of economic convergence and symmetry. *International Finance Review*, 8, 117–139. doi:10.1016/S1569-3767(07)00006-4.
- Zhang, Z. (2003). Can the rest of East Asia catch up with Japan: some empirical evidence. *Japan and the World Economy*, 15(1), 91–110. doi:10.1016/S0922-1425(01)00078-0.
- Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the Great Crash, the Oil-Price Shock, and the unit-root hypothesis. *Journal of Business & Economic Statistics*, 10(3), 251–270. doi:10.1198/073500102753410372.