The Dynamics of Comparative Advantage in the ASEAN Region

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The Dynamics of Comparative Advantage in the ASEAN Region

Abstract

The performance of a country's in international trade changes depending on its dynamic comparative advantage. The country with a rapid catching-up process has generally also shown a rapid structural transformation. This article addressed to answer two questions. How does the shift in comparative advantage or specialization in the ASEAN region? What is the exact position of countries in the Flying Geese model? We use data on exports and imports by commodities and by exporting countries taken from UN-COMTRADE. The classification of commodities follows 3-digit SITC Revision 2, consisting of 239 groups of products (SITC). The products mapping is constructed by using the RSCA (Revealed Symmetric Comparative Advantage) as the indicator of comparative advantage and TBI (Trade Balance Index) as the indicator of export import activities. The analytical tool, "products mapping" is used to examine the flying gees pattern. The results show that ASEAN featured product in 1990 was dominated by SITC 0 product (food and live animals), after twenty five years by 2015 SITC 7 (machinery and transportation) products are relatively more dominant in ASEAN export products. In 1990-2015 period, it is shown that the average magnitude of RSCA in ASEAN countries has decreased followed by an increase in the standard deviation value. It indicates that the occurance of product specialization that has a high comparative advantage and a decline in products that have low comparative advantages. Using a significance level 5%, it appears that ASEAN countries as a whole are experiencing significant dynamic changes in comparative advantage. From the pattern of Flying Gees, it can be said that the process of "catch up" in ASEAN member countries is not running as expected because the country that leads in the composition of flying gees only consists of certain countries only, namely Singapore, Malaysia, Indonesia, Thailand and Philippines.

Key words : Comparative Advantage, RSCA, TBI, Flying Geese, ASEAN

1. Introduction

ASEAN countries have liberalized intra-ASEAN trade over the last 20 years by establishing the ASEAN Free Trade Area (AFTA). It was launched in 1992 by the ASEAN itself. There are several motives behind the establishment of AFTA. First, ASEAN policy makers thought that an expansion of intra-ASEAN trade would promote economic development of the ASEAN countries as the expansion of exports would result in output growth and the expansion of imports would improve productive efficiency. Second, a rising trend of regional trade agreement (RTAs), which include FTAs and customs unions, in the world put pressure on ASEAN members to form an FTA. Third, the rise of China as an economic force was seen as a strong threat to the ASEAN members in terms of export competition and attracting foreign direct investment, which

would contribute to economic growth (Okabe and Urata, 2013). AFTA began with six ASEAN members, namely Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand, and then it was joined by Vietnam in 1995, Lao PDR and Myanmar in 1997, and Cambodia in 1999. Today, AFTA has 10 members.

The AFTA would be realized by applying the Common Effective Preferential Tariff (CEPT) Scheme to eliminate tariffs of intra-AFTA trade, which have been in effect since January 1993. Under the agreement, the AFTA members set the target years for tariff elimination to be completed. By 2010, more than 99% of the tariff lines in the CEPT inclusion list had been eliminated in the six original AFTA members, while around 95-99% of the tariff lines had been brought down to the 0-5 percentage tariff range for the new members. Moreover, it is agreed effective tariff, preferential to the ASEAN, to be applied to goods originating from the ASEAN member countries (at least 40% of its contents originates from members of the ASEAN).

ASEAN member countries are moving towards achieving the ASEAN Economic Community (AEC) with the time line set at 2015. The AEC Blueprint (2008) serves the road map of the AEC project's integrated ASEAN economic region, that was built on four pillars of integration: (i) a single market and production base, (ii) a competitive economic region, (iii) equitable economic development, and (iv) integration with the global economy. ASEAN Economic Integration, that signed with free mobility of five key elements, i.e., goods , services, investment, capital and skilled labour. The integration generates a hope that ASEAN would be a the third biggest market area in the world. This hope could achieve with determination of priority in 12 sectors, i.e.: (1) *Woodbased products*, (2) *Automotives*, (3) *Rubber based products*, (4) *Textile and apparels*, (5) *Agro based products*, (6) *Fisheries*, (7) *Electronics*, (8) *e-ASEAN*, (9) *Healthcare*, (10) *Air travel*, (11) *Tourism,* and (12) *Logistics Services*.

The economic integration among ASEAN members would make similarity on trading profile, especially on priority sectors. It would support a high interconnection among the 12 priority sectors and surely that it needs empowerment of competitiveness that generate in industrial specialization in every country. However, positive benefit in this integration could be realized with market expansion, increasing in production efficiency, decreasing in production cost, taking out investment from ASEAN members or outer ASEAN. It would stimulate economic activity, creating labour opportunities and increasing their yields, that be needed to stimulate economic growth. Without growth and investment, a country can't reduce poverty.

Competitiveness is one of important indicators to see how much benefits that ASEAN countries get. The most profitable country is the country with the highest competitiveness. Based on the Global Competitiveness Report 2016-2017 compiled by the World Economic Forum stated that the Indonesian economy is ranked 41st in the global economic competitiveness. The ranking is still below other ASEAN countries such as Singapore ranked 2nd, Malaysia ranked 25th, and Thailand ranked 34th. Indonesia's economic competitiveness in that period is still higher than the Philippines (57), Vietnam (60), Laos (93) and Cambodia (89). The following table shows the top 10 countries and ASEAN countries.

Table 1. about here

The table above shows that the majority of ASEAN countries are downgraded from 2015-2016 to 2016-2017, only Cambodia has increased (Myanmar is not surveyed). If this condition persist, the potential disadvantage with the presence of an MEA may occur. Thus a right effort is needed to accelerate competitiveness. One of the ways is by mapping product specialization that must be stimulated in order to improve competitiveness. The aim of this paper is to answer two questions. How does the shift in comparative advantage or specialization in the ASEAN region and what is the exact position of countries in the Flying Geese model?

2. Methodology

Data

This study uses data of ASEAN member countries such as Indonesia, Malaysia, Singapore, Thailand, Philippines, Brunei Darussalam, Cambodia, Laos, Myanmar and Vietnam. The data of internationally trade products are categorized according to the 3-digit Standard International Trade Classification (SITC) Revision 2. The data is taken from UN-Comtrade (United Nations Commodity Trade Statistics Database) and published by the World Bank. Products are classified to several international classification standards such as Standard International Trade Classification (SITC). In the SITC classification, products are grouped according to: (a) the materials used in production, (b) the processing stage, (c) market practice and product use, (d) the importance of the commodities in terms of the world trade, and (e) technological changes . The classification structure is: level 1 (one digit code) for section, level 2 (2-digit codes) for Divisions, level 3 (3-

digit codes) for Groups, level 4 (4 digit codes) for subgroups and level 5 (code 5 digits) for items (UN, 2004).

Based on the United Nations Conference on Trade and Development (UNCTAD) and the World Trade Organization (WTO) and the 3-digit SITC classification, a Dutch research organization Empirical Trade Statistics (ETA) grouped the 3-digit SITC into 6 groups:

A. Product group A: primary product (83 sectors).

B. Product group B: intensive products using natural resources (21 sectors)

C. Product group C: Intensive product using unskilled labor (26 sectors)

D. Product group D: technology-intensive products (62 sectors)

E. Product group E: intensive products using human capital (43 sectors)

F. Sectors not classified according to intensity (5 sectors)

Analysis of Comparative Advantage

To know the comparative advantage of export products, the Revealed Comparative Advantage (RCA) index is commonly applied in the empirical analysis. The RCA index has been introduced by Balassa (1965). This index measures the relative representation of a country's export in one product / industry compared to the average representation of that industry in total world trade. This research uses product definition based on 3-digit Standard International Trade Classification (SITC) product grouping system. The data used are export and import data of each country and world product, taken from UN-Comtrade. The RCA index is defined as:

$$RCA_{ij} = \left(x_{ij} / x_{in} \right) / \left(x_{rj} / x_{rn} \right)$$

where, RCA_{ij} shows the revealed comparative of country i for product group $(SITC)_j$; X_{ij} represents the total exports of country i in the product group $(SITC)_j$. Subscript r denotes all countries except country i, and subscript n refers to all product groups (SITC) except product group j. By excluding the countries and product groups under analysis, double counting can be avoided and the nature of trade, which is always a bilateral exchange of goods between two countries, can be well represented (Vollrath, 1991). RCA_{ij} index value ranges from 0 to infinity (0 ≤ RCA_{ij}∞∞). RCA_{ij} greater than 1 indicates that country i has a comparative advantage in group of products j. In contrast, RCA_{ij} less than 1 means that country i has no comparative advantage in product j, Vollrath (1991), notes that RCA distributions can not be derived theoretically. RCA_{ij}

can not be compared on both sides of 1, Therefore, the index is made to be symmetric index. This new index is called Revealed Symmetric Comparative Advantage (RSCA), formulated as (Laursen, 1998):

$$RSCA_{ij} = (RCA_{ij} - 1)/(RCA_{ij} + 1)$$

The $RSCA_{ij}$ index is between -1 and +1 ($-1 \leq RSCA_{ij} \leq 1$). RSCA below 0 means that country i has comparative disadvantage in product j, otherwise RSCA above 0 implies that country i has comparative advantage in good j.

The Dynamic of Comparative Advantage

To describe the dynamics of comparative advantage can be used descriptive statistical calculations as performed by Laursen (1998), Widodo (2010) by calculating the RCA distribution associated with the dynamics of comparative advantage. Some of these descriptive statistical calculations include calculation of arithmetic mean, standard deviation and skewness. The first calculation of arithmetic mean is shown by the following formula:

$$\overline{X}_{RSCA_{j,t}} = \frac{\sum_{i=1}^{n} RSCA_{ij,t}}{n}$$

Where:

$\overline{X}_{RSCA_{j,t}}$ is the average RSCA for country j in year t

i is the specification of exported products (STIC)

j is a country (ASEAN)

t is time of observation (2000,2005,2010 or 2015)

n is the number of product (in STIC 3 digits there are 237 products)

Second, the standard deviation calculation is a measure of statistical data dispersion. It measures how the value of data set spreading out from mean. The greater the standard deviation value indicates that the more data whose value is far from the average. If the data is close to the average magnitude, then the standard deviation value will move close to zero. The standard deviation value of the RSCA variable can be formulated as follows.

$$Stdev_{RSCA_{j,t}} = \sqrt{\frac{\sum_{i=1}^{n} \left(RSCA_{ij,t} - \overline{X}_{RSCA_{j,t}} \right)^2}{n}}$$

where

$Stdev_{RSCA_{j,t}}$ is the deviation standard of RSCA for country j (ASEAN) in year t

n is the number of observation (in STIC 3 digits there are 237 products)

Third, the shape of the RSCA distribution can be seen by calculating the size of its skewness. In a positive skewed distribution, the arithmetic mean is greater than the median value and mode. Conversely, in a negative skewed distribution, it indicates that the arithmetic mean is less than the median and mode. The formula for obtaining Skewness size is as follows.

$$Sk_{RSCA_{j,t}} = \frac{3\left(mean_{RSCA_{j,t}} - median_{RSCA_{j,t}}\right)}{stdev_{RSCA_{j,t}}}$$

where

$Sk_{RSCA_{j,t}}$ is the skewness coefficient of variable RSCA for state j in year t

$stdev$ is the standard deviation

j is ASEAN countries

t is time (2000, 2005, 2010, 2015)

To see the dynamics of comparative advantage between countries and between products can be used econometric model as used by Laursen (1998) and Widodo (2010).

$$RSCA_{ij,T} = \alpha + \beta RSCA_{ij,0} + \varepsilon_{ij}$$

Where $RSCA_{ij,T}$ and $RSCA_{ij,0}$ are Revealed Symmetric Comparative Advantage of state i with product j respectively for year T and 0. ε_{ij} is the error term (error term). The amount of β coefficient indicates whether there is a change in comparative advantage or specialization pattern during the observation period. If the value of β does not differ significantly with one (β = 1) then it can be said that there is no change at all levels of its speciality.

Rank Correlation

The general structural changes in comparative advantage can be seen the change in comparative advantage within the top twenty products. The Spearman's rank correlation on RSCA across periods can be used to examine separately the structural changes of comparative advantages in the ASEAN countries. The coefficient equal minus one (-1) if there is perfect

structural change in comparative advantage, in contrast, it equal plus one (+1) if there is no structural change in comparative advantages during the period of analysis. The degree of linear association between two series of RSCA can be calculated by the Spearman's rank correlation coefficient, which is given as follows (Gujarati, 2009; Widodo, 2010).

Across periods (year):

$$\rho_{s,Ct_a,Ct_b} = 1 - 6 \left[\frac{\sum_{i=1}^{n} d_{R_{it}}^2}{n(n^2 - 1)} \right]$$

Across countries:

$$\rho_{s,Ct_a,It_b} = 1 - 6 \left[\frac{\sum_{i=1}^{n} d_{R_{jt}}^2}{n(n^2 - 1)} \right]$$

where:

$\rho_{s,Cta,Ctb}$: The Spearman's rank correlation coefficient between country C's RSCA at time t_a (symbol Ct_a) and country C's RSCA at time t_b (symbol Ct_b)

$\rho_{s,Cta,Itb}$: The Spearman's rank correlation coefficient betweem country C's RSCA at time t_a (symbol Ct_a) and country I's RSCA at time t_b (symbol It_b)

$d_{R_{it}}^2 = \left(R_{RSCA_{jC,ta}} - R_{RSCA_{jC,tb}} \right)^2$ for across periods (years)

$d_{R_{jt}}^2 = \left(R_{RSCA_{jC,ta}} - R_{RSCA_{jI,tb}} \right)^2$ for across countries

$R_{RSCA_{jC,ta}}$: the rank of country C's RSCA of group of products j at time t_a

$R_{RSCA_{jC,tb}}$: the rank of country C's RSCA of group of products j at time t_b

$R_{RSCA_{jI,tb}}$: the rank of country I's RSCA of group of products j at time t_b

n is the number of observation groups of products (i.e. 237 STIC)

t_a and t_b are years

The Analysis of Catch Up process

To see the catch up process among ASEAN countries, this research use product mapping analysis. This analysis was developed to examine the Flying Geese pattern which tries to explain the phenomenon of industrial development in the pursuit of economic downturn (Widodo, 2010). There are two important variables in the Flying Geese (FG) pattern, namely comparative

advantage and export-import (trade balance). This analysis tool is developed by combining these two variables, namely RSCA (Revealed Symmetric Comparative Advantage) as an indicator of comparative advantage and Trade Balance Index (TBI) as an indicator of export and import activities. RSCA is calculated by the formula discussed in the previous section. TBI is used to analyze whether a country has specialized in its export (as a net exporter) or in import (as a net importer) for a particular product group (SITC). TBI can be calculated by the formula:

$$TBI_{ij} = (x_{ij} - m_{ij}) / (x_{ij} + m_{ij})$$

where TBI_{ij} shows the trade balance index of country i for product group (SITC) j; x_{ij} and m_{ij} denote the exports and imports of product group j by country i. Extremely, the TBI value equals -1 indicates that the country only imports, otherwise if the TBI value equals +1, it can be interpreted that the country only exports. If the value of TBI is between -1 and +1, it can be said that the country exports and imports. Negative values   show net importers and net exporters if the value of TBI is positive.

Revealed Symmetric Comparative Advantage Index (RSCA)	RSCA>0	Group B : Having comparative advantage but no export specialization (net-importer) (RSCA>0 and TBI<0)	Group A: Having comparative advantage and export specialization (net-exporter) (RSCA>0 and TBI>0)
	RSCA<0	Group D : No comparative advantage or export specialization (net-importer) (RSCA<0 and TBI<0)	Group C : Having an export specialization but does not have a comparative advantage (net-exporter) (RSCA<0 and TBI>0)
		TBI<0	TBI>0

Source : Widodo, 2010

Product mapping can be done by using the RSCA and TBI values. The product (SITC) can be categorized into four groups A, B, C and D. Group A consists of products having comparative advantages and export specialization, Group B represents a product that has a comparative advantage but no export specialization; Group C represents a product that has an export

specialization but does not have a comparative advantage; And group D consists of products that have no comparative advantage or export specialization.

3. Results and Discussion

In economics theory, there is an argument that there is a relationship between the factor intensities for specific products and the location for their optimal production. Product with labor intensive techniques in their productions should normally be produced in poorer, less development countries, where labor cost is relatively low. In the other hand, products with capital intensive techniques in their production should be produced in richer, development countries where the cost of capital is relatively low. Meanwhile, the less developed countries should have comparative advantage in labor-intensive products, and the more developed countries should have comparative advantage in capital-intensive products.

The Structure of Comparative Advantage

The following table shows the comparative advantages in ASEAN member countries in 1990 and 2015. The table also shows that a change in comparative advantage, however it can not be inferred the presence of structural change.

Table 2 about here

ASEAN's featured product in 1990 was dominated by SITC 0 product (food and live animals). After twenty five years of operation, by 2015 SITC 7 (machinery and transportation) products are relatively more dominant in ASEAN export products. In 1990, Brunei's exports were dominated by natural gas and crude oil products (SITC 341 and 333). By 2015 this product still dominates Brunei;s exports.

Indonesian's featured product in 1990 were vegetation oil, solid or refined crude oil (SITC 424), natural rubber latex (STIC 232), tin (STIC 687), coal (STIC 322) and products classified in STIC 0 (food and live animals), and by 2015 Indonesia can still maintain STIC 0 as the feature products and has a new featured products in STIC 2 (raw material except coal).

During 1990 to 2015, Malaysia still maintain vegetation oil products, solid or refined crude (STIC 424), natural rubber latex (STIC 232) and tin (STIC 687) as it's excellent products, as well as Indonesia. In 1990, Malaysia was also dominated by products from SITC 2 and SITC 7 (machinery and transport equipment). In 2015, it became to SITC 6 (manufactured products)

Philippine had the same superior products as well as Indonesia and Malaysia, that were vegetable oil, solid or refined crude (STIC 424), ore and precious metal concentrate (STIC 289), firewood and wood charcoal (STIC 425) and some products from STIC 0 (food and live animals). In 2015, there are other superior products from STIC 7 (machinery and transport equipment)

Between 1990 and 2015 Thailand remained consistent in maintaining STIC 0 (food and live animals) as it featured products. In 1990, Thailand also had another featured product named SITC 8 (miscellaneous manufactured), which in 2015 products from SITC 0 and SITC 2 still as superior products. Cambodia had a superior product in SITC 8 (miscellaneous manufactured), and in 2015, SITC 2 more dominates.

In 1990, Singapore had featured exports of natural rubber products. Petroleum products, tin and some SITC 7 products (machine and transport equipment). After twenty five years, this products still dominate. Myanmar has an excellent product as well as Brunei Darussalam, which has natural gas and crude oil as featured exports. Myanmar's data in 1990 was not yet available. From 1990 to 2015, Vietnam succeeded in maintaining its featured products in SITC 0 (food and live animals) and SITC 8 (miscellaneous manufactured).

The Dynamic of Comparative Advantage

To see the dynamics of comparative advantage can be used descriptive statistical calculations as performed by Laursen (1998), Widodo (2010) by calculating the RSCA distribution associated with the dynamics of comparative advantage. Some of these descriptive statistical calculations include calculation of mean, standard deviation and skewness. The first calculation of arithmetic mean is shown by the following formula.

$$\overline{X}_{RSCA_{j,t}} = \frac{\sum_{i=1}^{n} RSCA_{ij,t}}{n}$$

where : $\overline{X}_{RSCA_{j,t}}$ is the average RSCA for state j in year t

i is the specification of exported products (STIC)

j is a country (ASEAN)

t is the observation time (2000,2005,2010 or 2015)

n is the number of products (in STIC 3 digits there are 233 products)

Figure 1 about here

From figure 1, it is shown that the average magnitude of RSCA in ASEAN countries has decreased. This does not mean that the comparative advantage of the products of each country declines, but rather means that with decline   in the average value of RSCA is possible because the product diversification in each country is growing. Second, the standard deviation calculation is a measure of statistical data dissemination. The larger the standard deviation value indicates that the more data the value is far from the average. If the data is close to the average magnitude, then the standard deviation value will move close to zero. The standard deviation value of the RSCA variable can be formulated as a follows.

$$Stdev_{RSCA_{j,t}} = \sqrt{\frac{\sum_{i=1}^{n}\left(RSCA_{ij,t}-\overline{X}_{RSCA_{j,t}}\right)^2}{n}} \qquad , \text{where}$$

$Stdev_{RSCA_{j,t}}$ is the standard deviation of RSCA country j (ASEAN) at time t

n is the number of observations (233, 3 digits STIC)

Figure 2 about here

In international trade a country will retain their products that have a comparative advantage, by increasing their production capacity. Thus the comparative advantage of the product will be greater, and other products of comparative advantages increase relatively lower, constant, or decreased comparative advantage. Under these conditions, the difference in the value of comparative advantage becomes increasingly enlarged, so that the data can be shown with the increasing standard deviation value.

From figure 2 it is shown that the differences in comparative advantages between products in ASEAN countries fluctuated from 1990-2015. But it is generally seen that during this period the difference in comparative advantage in ASEAN member countries is growing, judging by the increasing trend of standard deviation values. This shows that there is specialization in ASEAN member countries.

The decline in average values followed by an increase in the standard deviation value indicates that the occurance of product specialization has a high comparative advantage and a decline in products that have low comparative advantages, in addition there is the possibility of the emergence of new products that in the previous period have not entered the foreign market.

Third, the shape of RSCA distribution can be seen by calculating the size of its skewness. If the positive skewness value means the arithmetic mean is greater than the median value and the

mode. Conversely, if the skewness value is negative, it indicates that the arithmetic mean is less than the median and mode. The formula for obtaining Skewness size is as follows.

$$Sk_{RSCA_{j,t}} = \frac{3\left(mean_{RSCA_{j,t}} - median_{RSCA_{j,t}}\right)}{stdev_{RSCA_{j,t}}}$$

where

$Sk_{RSCA_{j,t}}$ is the *skewness* coefficient of RSCA importer

$stdev$ is the standard deviation

j is a country (ASEAN)

t is time (2000, 2005, 2010, 2015)

The results of skewness calculation can be seen from the following table.

Table 3 about here

In general from 1990 to 2015, the magnitude of skewness each ASEAN country gradually declined and showed positive results. A positive value for skewness indicates that ASEAN countries are more concentrated (specialization) on products that have low comparative advantages. Conversely, if the value of skewness shows negative, then it can be said that in the country more concentrated on products that have high comparative advantage. This suggests that the average ASEAN country is more concentrated on products that have low comparative advantage and over time, with the smaller value of skewness indicated that ASEAN countries are beginning to move towards specialization.

To see dynamic of comparative advantage between countries and between products can be used also econometric model as used by Laurseen (1998) and Widodo (2010).

$$RSCA_{ij,T} = \alpha + \beta RSCA_{ij,0} + \varepsilon_{ij}$$

where $RSCA_{ij,T}$ and $RSCA_{ij,0}$ is *Revealed Symmetric Comparative Advantage* for country i with product j respectively for year T and 0. ε_{ij} is the error term. The amount of β coefficient indicates whether there is a change in comparative advantage or specialization pattern during the observation period. If the value of β does not differ significantly with one (β=1) then it can be said that there is no change at all the level of its specialty. In this study the above equations are modified by considering the differences of each country by adding dummy variables, as in the following equation.

$$RSCA_{ij,T} = \alpha + \beta\, RSCA_{ij,0} + \sum_{i=1}^{\gamma} \gamma_i\left(D_i^C RSCA_{ij,0}\right) + \omega_{ij}$$

The result of regression model above can be shown in the following equation.

Table 4 about here

From the above equation, it is known that in the period 1990-2015 ASEAN as a whole specializes, this is shown by the coefficient of specialization for ASEAN is positive and is in the range between zero and one. The coefficients for each country can be obtained by summing the coefficient of ASEAN specialization with the coefficient of each country's dummy, as shown in the following table.

Table 5 about here

From the estimation results it is shown that the average from 1990 to 2015 all countries experienced an increase in the index of comparative advantage. From eight countries, it can be seen that Singapore and Cambodia have a relatively higher coefficient of specialization, followed by Indonesia, Malaysia and the Philippine. This indicates a specialization in the country.

Shift in The Pattern of Comparative Advantage

International trade theory suggests that country will exploit their products, which have comparative advantages, and then they become specialized on those products. The comparative advantages of those products become higher and higher, so the other products will relatively have smaller increase, constant or decrease in comparative advantage.

To see whether there is a structural change between comparative advantage during 1990 to 2015, we try to calculate using Spearman's Rank Correlation to correlate between the magnitude of RSCA in two periods.

Spearman coefficient value, ranging from 0 to 1 (plus or minus). The coefficient value of +1 means that between periods there is no structural change, if the value is -1 it can be said that there is a perfect structural change during the period. Using a significance level of 5%, it appears that ASEAN countries as a whole are experiencing significant dynamic changes. Nevertheless, all countries on average have relatively low rates of change in the pattern of comparative advantage. For example, ASEAN has coefficient of 0.912 for 1990-1995, 0.913 for 1995-2000, 0.927 for 2000-2005, 0.930 in 2005-2010 and 0.774 in 2010-2015. This suggest that at some stage of economic development, structural changes in comparative advantage are less likely to occur.

When viewed from each member country, it can that Singapore, Malaysia and Thailand relatively have a more dynamic change than other ASEAN countries. For the countries of Vietnam, Cambodia and Brunei, it can be shown that the relative changes are not so great.

Table 6 about here

The magnitude of correlation coefficient between two countries can be positive or negative. The positive coefficient and greater value indicate that the pattern of comparative advantage is increasingly the same between the two countries. This can be interpreted as the competition between the two countries is getting stronger in the export market. Conversely, the negative and smaller coefficient values indicate that there are differences in pattern in comparative advantage. This shows that between the two countries have complementary in offering its products in export market. The figure below shows the Spearman correlation coefficient trend among ASEAN countries.

Figure 3 about here

The coefficient of comparative advantage between Cambodia and other ASEAN countries such as Vietnam, Indonesia, Philippines and Thailand show a positive value, indicating a relatively similar pattern in comparative advantage or competition in the export market. The coefficient of comparative advantage between Cambodia, Malaysia and Singapore shows a declining trend, so it can be said that competition in export markets has decreased, and in the long run leads to complementarity between the two countries.

The coefficient of comparative advantage between Indonesia and another ASEAN countries is indicated by a declining trend, however the value is positive. Indonesia's correlation coefficient relations with Malaysia and Vietnam, has a relatively large value. This indicates that in the export market, Indonesia tends to compete with Malaysia and Vietnam.

The relationship between Malaysia and other ASEAN countries shows a negative trend, except Malaysia's relations with Vietnam. However, as explained above, it can be said that between Malaysia and Indonesia has a relatively high level of competition in the export market. A positive trend between Malaysia and Vietnam, it can be said that Malaysia's competition with Vietnam in export market is also getting bigger.

The coefficient of comparative advantage between the Philippines, Singapore, Thailand and other ASEAN countries shows a positive value, but has a downward trend, so it can be said that competition in export markets has decreased, and in the long run leads to complementarity

between the two countries. Nevertheless, the correlation coefficient between Thailand-Cambodia, Thailand-Indonesia and Thailand-Malaysia products is still relatively high. This indicates that there are certain products from the three pair of countries are still competing in the export market.

For the correlation coefficient between Thailand and Vietnam, even the value is relatively low but in 2010 to 2015 increased. This shows that Vietnamese products are starting to compete with Thai products in export markets. As explained earlier, Thailand and Vietnam share the comparative advantage of SITC 0 products (food and living animals). Of all couples only relations between Singapore and Vietnam have negative values, meaning that Singapore and Vietnam have very different products, and both countries have complementarity in offering their products in export markets.

Products Mapping

To see the catch up process among ASEAN countries, in this research will use mapping product analysis. This product mapping was developed to examine the Flying Geese pattern in which this paradigm tries to explain the phenomenon of industrial development in the pursuit of economic underdevelopment (Widodo, 2010). Trade are two important things in the Flying Geese (FG) pattern, namely comparative advantage and export-import (trade balance). thus the analysis tool is developed by combining two things, namely RSCA (Revealed Symmetric Comparative Advantage) as an indicator of comparative advantage and Trade Balance Index (TBI) as an indicator of export and import activities. RSCA is calculated by the formula discussed in the previous section. TBI is used to analysis whether a country has specialized in its export (as a net exporter) or in import (as a net importer) for a particular product group (STIC). TBI can be calculated by the formula :

$TBI_{ij} = (x_{ij} - m_{ij}) / (x_{ij} + m_{ij})$

Where TBI_{ij} shows the country trade balance index i for product group (SITC) j; x_{ij} and m_{ij} denote the export and import of product group j by country i. The extreme value of TBI of -1 indicates that the country only imports, otherwise if the TBI value is +1, it can be interpreted that the country is only exporting. If the value of TBI is between -1 and +1, it can be said that the

country exports and imports. Negative values indicate net importer and net exporter if the value of TBI is positive. The following is the development of TBI in ASEAN countries.

Figure 4 about here

From the picture above shows that the average value of TBI ASEAN countries ranged between -1 and +1. It can be said that ASEAN countries on average act as exporters and importers. Negative value can be interpreted that the countries are in net importer position.

Using the RSCA and TBI values, product mapping can be done. The product (STIC) can be categorized into four groups namely A, B, C and D. Group A consists of products having comparative advantages and export specialization, Group B represents a product that has comparative advantage but no export specialization; Group C represents a product that has an export specialization but does not have a comparative advantage; and group D which consist of products that have no comparative advantage nor export specialization.

Here is a product mapping in ASEAN countries. Table 7 shows the product mapping based on the comparative advantage and trade balances described above. The first column shows the image of the product mapping, and the second column shows the top ten product in group A. This product can be regarded as the best product produced in the country based on its comparative advantage and its trade balance index.

Table 7 about here

The Pattern of "Flying Geese"

The following will be discussed on the position of ASEAN countries in the Flying Geese pattern in ASEAN. In this case will be known what industry is the first, second and third rounds in the formation of Flying Geese. Where are each country's position within the Flying Geese pattern and what industries can be moved in the future based on the Flying Geese pattern. In this analysis the industry is categorized according to Empirical Trade Statistics (ETA) into 6 groups by grouping 3-digit SITC, namely:

    a. Product group A: primary product (83 sectors)

    b. Product group B: intensive product using natural resources (21 sectors)

    c. Product group C: intensive product using unskilled labor (26 sectors)

    d. Product group D: technology-intensive products (62 sectors)

    e. Product group E: intensive products using human capital (43 sectors)

f. Sectors not classified according to their intencity (5 sectors)

From the calculation results can be described "Product Mapping" for the industry. The image are through several stages (Widodo, 2010) namely, (1) calculate the RSCA and TBI index, (2) calculate the medias of RSCA and TBI for each classification, and (3) each industry classification, median RSCA and TBI plotted into "product mapping" for two observation periods.

The following figure is an ASEAN Flying Gees pattern for the primary product industry. In 1990 Indonesia was a country with comparative advantage for industries producing primary products, followed by Thailand and Singapore. Indonesia products that have high comparative advantages such as natural gas and its preparations (SITC 341), latex and rubber (SITC 232)

By 2015 the condition change as this year, Thailand can replace Indonesia as the strongest producer of primary products in ASEAN. This year Malaysia can also surpass Indonesia as a lending country in the primary product industry. Malaysia managed to occupy second place after Thailand. Thai products for primary products include rubber products, rice, agricultural products such as fruit, fish and so on.

Figure 5 about here

The following figure is an ASEAN Flying Gees pattern for the intensive product industry using unskilled labor. In 1990 Thailand was a country with comparative advantage for industries that products using unskilled labor, followed by the Philippines and Malaysia. Thai products that have high comparative advantages such as apparel and textiles. In 2015 Indonesia succeeded Thailand as a producer of intensive products using the strongest unskilled labor force in ASEAN. Thailand was ranked second followed by the Philippines.

Figure 6 about here

The following figure is an ASEAN Flying Gees pattern for technology-intensive product industry. In 1990 Singapore took the lead in the excellence of producing technology-intensive products. Malaysia ranks second after Singapore. Some Singaporean products have high comparative advantages such as data processing machines and medical equipment. By 2015 the conditions remain unchanged as this year Singapore and Malaysia remain in the same position. Followed by Thailand as the third rank in producing technology-intensive products.

Figure 7 about here

Other ASEAN countries such as Brunei, Cambodia, Vietnam and Myanmar are relatively far behind compared to the five ASEAN countries. Thus it can be said that the process of "catch

up" in ASEAN member countries is not running as expected because the country that leads in the composition of flying gees only consists of certain countries only.

4. Conclusion

ASEAN featured product in 1990 was dominated by SITC 0 product (food and live animals), after twenty years of operation, by 2015 SITC 7 (machinery and transportation) products are relatively more dominant in ASEAN export products. In 1990-2015 period, it is shown that the average magnitude of RSCA in ASEAN countries has decreased. It does not mean that the comparative advantage of the products of each country declines, but rather means that with decline in the average value of RSCA is possible because the product diversification in each country is growing. The decline in average values followed by an increase in the standard deviation value indicates that the occurance of product specialization has a high comparative advantage and a decline in products that have low comparative advantages, in addition there is the possibility of the emergence of new products that in the previous period have not entered the foreign market. Using a significance level 5%, it appears that ASEAN countries as a whole are experiencing significant dynamic changes in comparative advantage. Nevertheless, all countries on average have relatively low rates of change in the pattern of comparative advantage. In several member countries, it can be shown that Singapore, Malaysia and Thailand relatively have a more dynamic change than other ASEAN countries. From the pattern of Flying Gees, it can be said that the process of "catch up" in ASEAN member countries is not running as expected because the country that leads in the composition of flying gees only consists of certain countries only, namely Singapore, Malaysia, Indonesia, Thailand and Philippines.

References

Appleyard, D. R., Alfred J. Field, J., & Cobb, S. L. (2008). *International Economics.* Singapore: McGraw Hill Irwin.

Aron, Janine. (2000). Growth and Institutions : A Review of the Evidence. The World Bank Research Observer, Vol. 15 No. 1 (February 2000), pp. 99-135.

Arguello, R. C. (2000). Economic Integration. An Overview of Basic Economic Theory and other Related Issues. *Economia No.3 Marzo de 2000 .*

ASEAN Development Bank, (2014). *ASEAN 2030 Toward of Borderless Economic Community.* Tokyo: Asian Development Bank Institute.

Balassa, B. (1961). *The Theory of Economic Integration*. Richard D Irwin, Illinois

Bank Indonesia. (2008). *Masyarakat Ekonomi ASEAN (MEA) 2015 : memperkuat Sinergi ASEAN di Tengah Kompetisi Global*. Jakarta: PT Alex Media Komputindo.

Bowen, H., Hollander, A., & Marie Viaene, J. (2001). *Applied International Trade Analysis*. Michigan: The University of Michigan Press.

Cipto, B. (2010). *Hubungan Internasional di Asia Tenggara, Teropong terhadap Dinamika, Realitas, and Masa Depan*. Yogyakarta: Pustaka Pelajar.

Crowley, P. M. (2006). Is There a logical Integration Sequence after EMU? *Journal of Economic Integration 21(1) March 2006* , 1-20.

Green, W. H. (2000). *Econometric Analysis*. New Jersey: Prentice Hall.

Gujarati, D., & Porter, D. (2009). *Basic Econometrics* (5 ed.). Singapore: McGraw-Hill International Edition.

Hill, C. W., Wee, C.-H., & Udayasankar, K. (2012). *International Business : An Asian Perspective*. Singaphore: McGraw Hill.

Kimura, F. (2013, October). Reconstructing the Concept of Single Market and Production Base for ASEAN Beyond 2015. *ERIA Discussion Series* .

Krugman, P. R. (1987). Is Free Trade Passe? *Journal of Economic Perspectives* , 131-44.

Laursen, K. (1998). Revealed Comparative Advantage and the Alternative as Measures of International Specification. *DRUID Working Paper No 98-30* .

Lululima, C. (2011). *Dinamika Asia Tenggara Menuju 2015*. Yogyakarta: Pustaka Pelajar.

Lululima, C., Anwar, D. F., Bhakti, I. N., Siregar, Y., & Inayati, R. S. (2008). *Masyarakat Asia Tenggara Menuju Komunitas ASEAN 2015*. Yogyakarta: Pustaka Pelajar.

Madani, D. (2001). *Regional Integration and Industrial Growth Among Developing Countries : The Case of Three ASEAN Members*. New York: World Bank.

Mc Carthy C. (2002). SADC Macroeconomic Convergence Workshop Convergence in SADC. Away Forward *Report to The SADC Committee of Ministers of Finance and Investment*, July 2002.

Mete, F. O. (2011). Analyzing The Impact of Globalization on Economic Development in Developing Economies : An Application of Error Correction Modelling (ECM) to Nigeria. *Journal of Economic Integration* .

Naya, S. a. (1991). ASEAN Economic Cooperation in the New International Economic Environment. *ASEAN Economic Bulletin* , 261-276.

Okabe, Misa & Shojiro Urata. (2013). The Impact of AFTA on Intra AFTA Trade. *ERIA Discussion Paper*, DP 2013-05

Okabe, Misa. (2015). Impact of free Trade Agreements on Trade in East Asia. *ERIA Discussion Paper Series*. ERIA-DP-2015-01

Verbeck, M. (2012). *A Guide to Modern Econometrics* (4 ed.). West Sussex, United Kingdom: John Wiley & Sons Ltd.

Vollrath, T. L. (1991). A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage. *Weltwirtschaftliches Archiv* , 265-280.

Weatherbee, D. E. (2010). *International Relations in Southeast Asia* (2 ed.). Singapore: ISEAS Publishing.

Widgeon, A. (2013). *Trigonometric, Pantagruel and Alkalinity*. Yogyakarta: UPP STIM YKPN.

Widodo, T. (2009). Dynamic Comparative Advantage in ASEAN +3. *Journal of Economic Integration , 24(3)*, 505-529.

Widodo, T. (2010). *International Trade, Regionalism and Dynamic Market*. Yogyakarta: BPFE.

Widodo, T. (2010). Market Dynamics in The EU, NAFTA, North East Asia and ASEAN : The method of Constant Market Shares (CMS) Analysis. *Journal of Economic Integration , 25* (3).

Williamson, O. (1985). *The Economic Institutions of Capitalism : Firm, Markets, Relational Contracting* (New York: The Free Press)

World Bank, (2015). *World Development Indicators.* World Bank.

World Economic Forum (2016). *The Global Competitiveness Report 2015-1016.* World Bank.

World Economic Forum (2016). *The Global Competitiveness Report 2015-2016.* World Bank.

Table 1. Competitiveness from 140 countries in the world 2016-2017

Top 10 Ranking Countries		ASEAN Countries	
Country	**Ratings**	**Country**	**Ratings**
Switzerland	1	Malaysia	25 (previous rankings 18)
Singapore	2	Brunei Darussalam	58 (during 2013-2014 rankings 26)
United State	3	Thailand	34 (previous rankings 32)
Netherlands	4	Indonesia	41 (previous rankings 37)
German	5	Philippines	57 (previous rankings 47)
Sweden	6	Vietnam	60 (previous rankings 56)
United Kingdom	7	Lao PDR	93 (previous rankings 83)
Japan	8	Cambodia	89 (previous rankings 90)
Hong Kong	9	Myanmar	131 (data from 2015-2016)
Finland	10		

Source : *World Economic Forum, The Global Competitiveness report* 2016-2017
Myanmar is not included in the report (data 2015-2016)

Table 2.
The Comparative Advantages in ASEAN member countries in 1990 and 2015

Country	Year	Top twenty SITC Products
ASEAN	1990	232, 424, 687, 431, 42,245, 75, 341, 247, 37, 36, 72, 762, 334, 776, 47, 761, 248, 763
	2015	232, 424, 687, 431, 776, 42, 37, 848, 683, 881, 762, 335, 898, 14, 759, 512, 752, 751, 621, 334
Brunei	1990	341, 333, 334
	2015	341, 333, 512, 513, 883
Cambodia	1990	845, 892, 846, 233, 634, 232, 842, 843, 269, 851, 844, 223, 848, 971, 847, 658, 655, 248, 22, 692
	2015	110, 211, 212, 14, 43, 215, 200, 210, 106, 209, 208, 213, 220, 207, 126, 58, 191, 25, 109, 214
Indonesia	1990	634, 232, 341, 75, 687, 245, 424, 36, 656, 74, 333, 71, 72, 287, 431, 635, 653, 842, 844, 851
	2015	424, 232, 687, 322, 431, 245, 91, 634, 75, 267, 72, 289, 36, 287, 651, 71, 341, 251, 37, 844
Lao PDR	1990	-
	2015	-
Malaysia	1990	424, 232, 247, 687, 431, 72, 762, 248, 776, 341, 634, 223, 75, 848, 761, 333, 621, 897, 763, 771
	2015	424, 431, 678, 848, 232, 335, 683, 776, 72, 634, 91, 762,341, 247, 685, 512, 898, 621, 761, 513
Myanmar	1990	-
	2015	77, 74, 84,85, 222, 203, 153, 65, 154, 180, 219, 177, 156, 141, 168, 179, 137, 35, 234, 164
Philippines	1990	424, 289, 245, 931, 265, 223, 36, 37, 58, 287, 899, 57, 61, 628, 635, 773, 846, 883, 845, 634
	2015	635, 245, 776, 881, 424, 265, 287, 773, 58, 771, 752, 37, 793, 759, 726, 884, 121, 57, 778, 682
Singapore	1990	232, 334, 687, 762, 752, 75, 431, 761, 763, 776, 72, 245, 335, 91, 515, 759, 764, 111, 424, 122
	2015	776, 687, 898, 334, 683, 514, 881, 759, 512, 723, 714, 277, 511, 551, 122, 728, 583, 233, 515, 553
Thailand	1990	42, 232, 37, 47, 36, 61, 54, 687, 58, 897, 62, 842, 846, 667, 56, 843, 844, 831, 851, 759
	2015	232, 42, 37, 14, 47, 61, 762, 592, 266, 782, 621, 751, 58, 741, 267, 111, 625, 763, 246, 98
Vietnam	1990	42, 36, 75, 245, 71, 232, 851, 74, 844, 842, 35, 57, 333, 843, 831, 687, 261, 34, 424, 663
	2015	881, 246, 75, 42, 851, 232, 71, 842, 37, 844, 36, 764, 613, 845, 843, 751, 651, 34, 846, 831

Source : UN-COMTRADE Author's calculation

Table 3. The Skewness of ASEAN Member Countries' RSCA 1990-2015

Country	1990	1995	2000	2005	2010	2015
Brunei	6,169	-	-	-	-	4,781
Cambodia	-	-	2,872	3,042	2,663	2,258
Indonesia	1,144	0,885	0,527	0,573	0,717	0,575
Lao PDR	-	-	-	-	-	-
Malaysia	1,079	1,072	1,051	0,883	0,706	0,484
Myanmar	-	-	-	-	-	4,781
Philippines	1,165	1,458	1,325	1,118	1,128	0,911
Singaphore	0,751	0,721	0,756	0,748	0,808	0,767
Thailand	0,686	0,510	0,288	0,267	0,263	0,231
Vietnam	-	-	1,155	0,950	0,663	0,682
ASEAN	0,576	0,463	0,413	0,272	0,193	0,169

Source : UN-Comtrade, author's calculation

Table 4. The Estimation of Regression Equation

Dependent Variable: $RSCA_{ij,T}$				
Independent Variable	**Coefficient**	**standard error**	**t-statistic**	**Prob**
Constant	-0,300	0,013	-23,248	0,000
$RSCA_{ij,0}$	0,078	0,012	6,498	0,000
$D_{Ina}RSCA_{ij,0}$	0,309	0,043	7,143	0,000
$D_{Mal}RSCA_{ij,0}$	0,248	0,046	5,372	0,000
$D_{Fil}RSCA_{ij,0}$	0,302	0,042	7,158	0,000
$D_{Sing}RSCA_{ij,0}$	0,406	0,055	7,443	0,000
$D_{Thai}RSCA_{ij,0}$	0,209	0,046	4,562	0,000
$D_{Bru}RSCA_{ij,0}$	-0,063	0,013	-4,876	0,000
$D_{Kam}RSCA_{ij,0}$	0,487	0,037	13,168	0,000
$D_{Viet}RSCA_{ij,0}$	0,315	0,043	7,384	0,000
F_{stat} : 66,838* R^2 : 0,470				

Source : Author,s calculation

Table 5 The Specialization Coefficient

Country	Specialization Coefficient	Specialization Coefficient
ASEAN	β	0,078
Indonesia	$\beta + \gamma_1$	0,387
Malaysia	$\beta + \gamma_2$	0,326
Philippines	$\beta + \gamma_3$	0,380
Singaphore	$\beta + \gamma_4$	0,484
Thailand	$\beta + \gamma_5$	0,287
Brunei	$\beta + \gamma_6$	0,015
Cambodia	$\beta + \gamma_7$	0,565
Vietnam	$\beta + \gamma_8$	0,393

Source : Author,s calculation

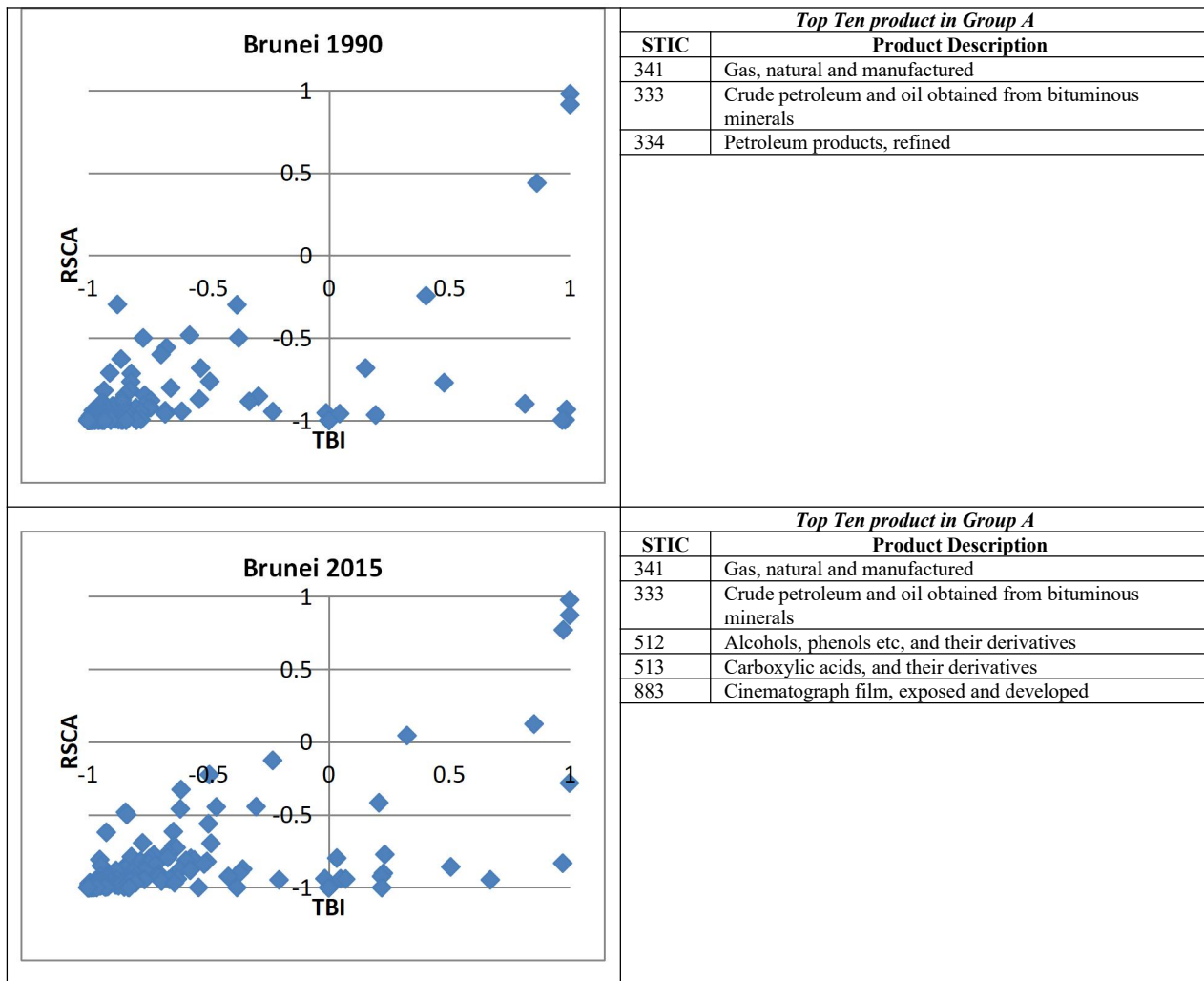## Table 6 Spearman's Rank Correlation Coefficients Across Period

		Philippines Comparative Advantage					
		1990	1995	2000	2005	2010	2015
	1990	1	0,827	0,711	0,615	0,598	0,438
	1995	0,827	1	0,800	0,680	0,672	0,490
Comparative Advantage	2000	0,711	0,800	1	0,869	0,752	0,661
	2005	0,615	0,680	0,869	1	0,792	0,719
	2010	0,598	0,672	0,752	0,792	1	0,727
	2015	0,438	0,490	0,661	0,719	0,727	1
		Singaphore Comparative Advantage					
		1990	1995	2000	2005	2010	2015
	1990	1	0,874	0,851	0,744	0,655	0,557
	1995	0,874	1	0,921	0,843	0,758	0,684
Comparative Advantage	2000	0,851	0,921	1	0,909	0,825	0,747
	2005	0,744	0,843	0,909	1	0,928	0,849
	2010	0,655	0,758	0,825	0,928	1	0,909
	2015	0,557	0,684	0,747	0,849	0,909	1
		Indonesia Comparative Advantage					
		1990	1995	2000	2005	2010	2015
	1990	1	0,858	0,749	0,796	0,753	0,713
	1995	0,858	1	0,828	0,901	0,844	0,776
Comparative Advantage	2000	0,749	0,828	1	0,880	0,927	0,918
	2005	0,796	0,901	0,880	1	0,900	0,800
	2010	0,753	0,844	0,927	0,900	1	0,865
	2015	0,713	0,776	0,918	0,800	0,865	1
		Malaysia Comparative Advantage					
		1990	1995	2000	2005	2010	2015
	1990	1	0,880	0,801	0,711	0,660	0,569
	1995	0,880	1	0,900	0,822	0,781	0,695
Comparative Advantage	2000	0,801	0,900	1	0,916	0,878	0,769
	2005	0,711	0,822	0,916	1	0,933	0,787
	2010	0,660	0,781	0,878	0,933	1	0,854
	2015	0,569	0,695	0,769	0,787	0,854	1
		Thailand Comparative Advantage					
		1990	1995	2000	2005	2010	2015
	1990	1	0,898	0,863	0,694	0,600	0,551
	1995	0,898	1	0,863	0,778	0,695	0,626
Comparative Advantage	2000	0,800	0,863	1	0,898	0,779	0,724
	2005	0,694	0,778	0,898	1	0,888	0,817
	2010	0,600	0,695	0,779	0,888	1	0,925
	2015	0,551	0,626	0,724	0,817	0,925	1
		ASEAN Comparative Advantage					
		1990	1995	2000	2005	2010	2015
	1990	1	0,912	0,833	0,751	0,701	0,521
	1995	0,912	1	0,913	0,843	0,794	0,597
Comparative	2000	0,833	0,913	1	0,927	0,867	0,659

Advantage	2005	0,751	0,843	0,927	1	0,930	0,730
	2010	0,701	0,794	0,867	0,930	1	0,774
	2015	0,521	0,597	0,659	0,730	0,774	1

		Vietnam Comparative Advantage					
		1990	1995	2000	2005	2010	2015
Comparative Advantage	1990	1	-	-	-	-	-
	1995	-	1	-	-	-	-
	2000	-	-	1	0,802	0,682	0,640
	2005	-	-	0,802	1	0,819	0,752
	2010	-	-	0,682	0,819	1	0,867
	2015	-	-	0,640	0,752	0,867	1

		Cambodia Comparative Advantage					
		1990	1995	2000	2005	2010	2015
Comparative Advantage	1990	1	-	-	-	-	-
	1995	-	1	-	-	-	-
	2000	-	-	1	0,835	0,645	0,585
	2005	-	-	0,835	1	0,712	0,602
	2010	-	-	0,645	0,712	1	0,634
	2015	-	-	0,585	0,602	0,634	1

		Brunei Comparative Advantage					
		1990	1995	2000	2005	2010	2015
Comparative Advantage	1990	1	-	-	-	-	0,558
	1995	-	1	-	-	-	-
	2000	-	-	1	-	-	-
	2005	-	-	-	1	-	-
	2010	-	-	-	-	1	
	2015	0,558	-	-	-	-	1

Source : Author's calculation
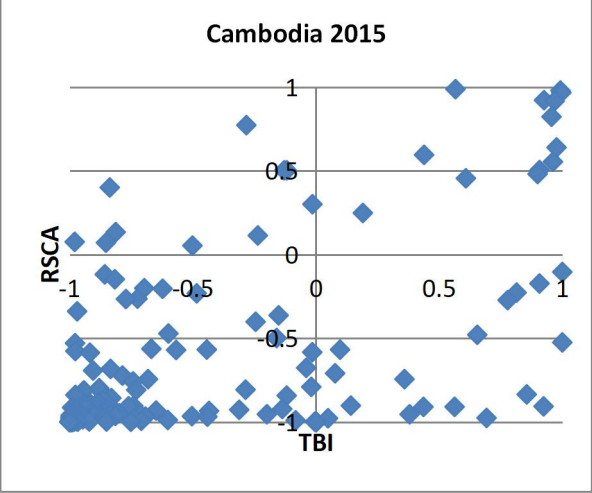
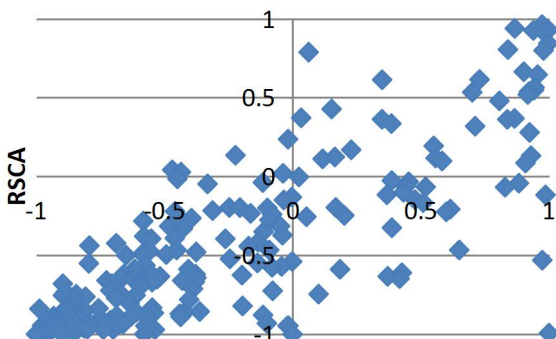## Table 7. "*Product Mapping*": Top ten Product in Group A 1990-2015

Brunei

Top Ten product in Group A	
STIC	Product Description
341	Gas, natural and manufactured
333	Crude petroleum and oil obtained from bituminous minerals
334	Petroleum products, refined

Top Ten product in Group A	
STIC	Product Description
341	Gas, natural and manufactured
333	Crude petroleum and oil obtained from bituminous minerals
512	Alcohols, phenols etc, and their derivatives
513	Carboxylic acids, and their derivatives
883	Cinematograph film, exposed and developed

Cambodia

Top Ten product in Group A	
STIC	Product Description
845	Outerwear knitted or crocheted, not elastic nor rubberized
892	Printed matter
846	Under-garments, knitted or crocheted
233	Synthetic rubber, latex, etc; waste, scrap of unhardened rubber
634	Veneers, plywood, improved" wood and other wood worked nes"
232	Natural rubber latex; rubber and gums
842	Men's and boys' outerwear, textile fabrics not knitted or

	crocheted
843	Women, girls, infants outerwear, textile, not knitted or crocheted
269	Old clothing and other old textile articles; rags
851	Footwear

Cambodia 2015

Top Ten product in Group A	
STIC	**Product Description**
110	Furskins, tanned or dressed; pieces of furskin, tanned or dressed
211	Outerwear knitted or crocheted, not elastic nor rubberized
212	Under-garments, knitted or crocheted
14	Rice
43	Natural rubber latex; rubber and gums
215	Footwear
200	Cycles, scooters, motorized or not; invalid carriages
210	Under garments of textile fabrics, not knitted or crocheted
106	Starches, insulin and wheat gluten; albuminoidal substances; glues
209	Women, girls, infants outerwear, textile, not knitted or crocheted
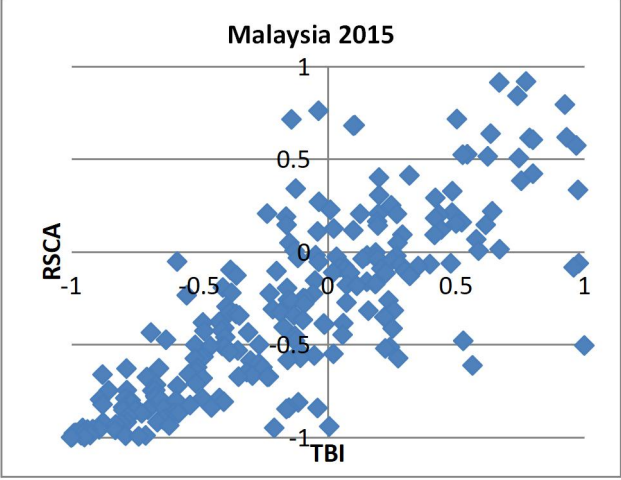
Indonesia

Indonesia 1990

Top Ten product in Group A	
STIC	**Product Description**
634	Veneers, plywood, improved" wood and other wood worked nes"
232	Natural rubber latex; rubber and gums
341	Gas, natural and manufactured
75	Spices
687	Tin
245	Fuel wood and wood charcoal
424	Other fixed vegetable oils, fluid or solid, crude, refined
36	Crustaceans and molluscs, fresh, chilled, frozen, salted,
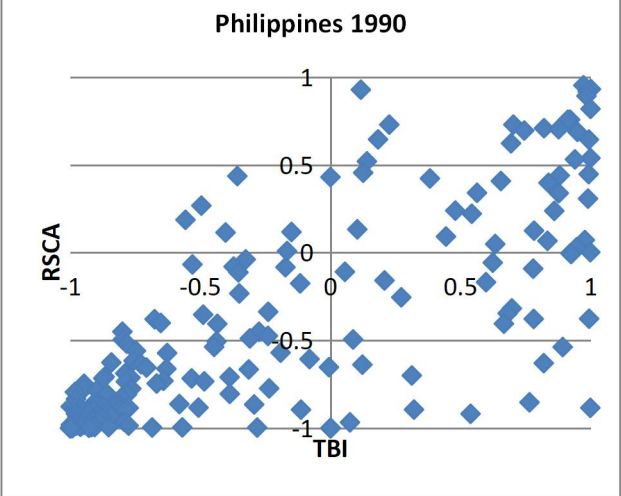
		etc
	656	Tulle, lace, embroidery, ribbons, trimmings and other small wares
	74	Tea and mate

Indonesia 2015

	Top Ten product in Group A	
STIC	**Product Description**	
424	Other fixed vegetable oils, fluid or solid, crude, refined	
232	Natural rubber latex; rubber and gums	
687	Tin	
322	Coal, lignite and peat	
431	Animal and vegetable oils and fats, processed, and waxes	
245	Fuel wood and wood charcoal	
91	Margarine and shortening	
634	Veneers, plywood, improved" wood and other wood worked nes"	
75	Spices	
267	Other man-made fibres suitable for spinning, and waste	
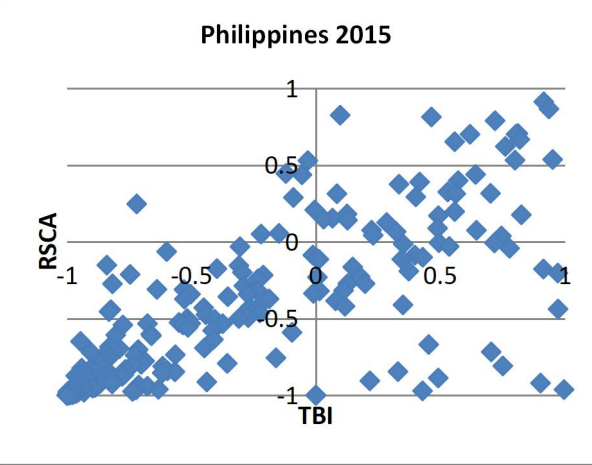
Malaysia

Malaysia 1990

	Top Ten product in Group A	
STIC	**Product Description**	
424	Other fixed vegetable oils, fluid or solid, crude, refined	
232	Natural rubber latex; rubber and gums	
247	Other wood in the rough or roughly squared	
687	Tin	
431	Animal and vegetable oils and fats, processed, and waxes	
72	Cocoa	
762	Radio-broadcast receivers	
248	Wood, simply worked, and railway sleepers of wood	
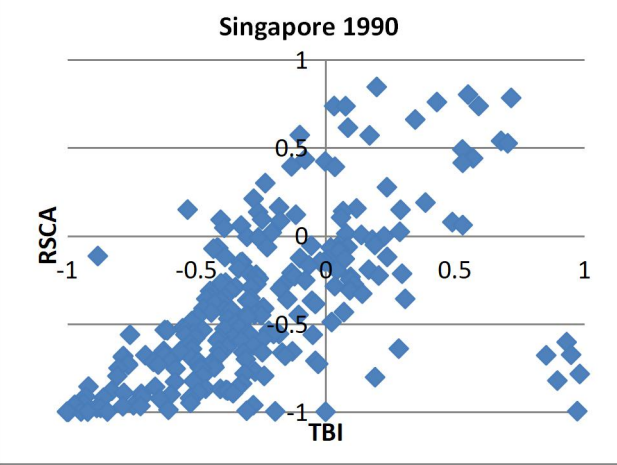
776	Thermionic, microcircuits, transistors, valves, etc
341	Gas, natural and manufactured

	Top Ten product in Group A	
STIC	**Product Description**	
424	Other fixed vegetable oils, fluid or solid, crude, refined	
431	Animal and vegetable oils and fats, processed, and waxes	
687	Tin	
848	Articles of apparel, clothing accessories, non-textile, headgear	
232	Natural rubber latex; rubber and gums	
335	Residual petroleum products, nes and related materials	
683	Nickel	
776	Thermionic, microcircuits, transistors, valves, etc	
72	Cocoa	
634	Veneers, plywood, improved" wood and other wood worked nes"	
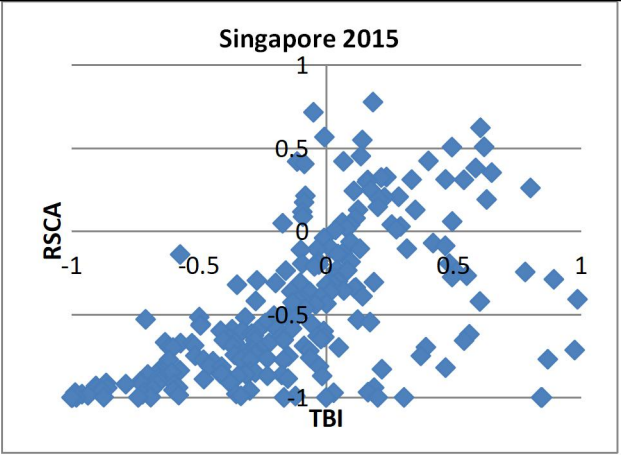
Malaysia 2015 scatter plot (RSCA vs TBI)

Philippines

Philippines 1990 scatter plot (RSCA vs TBI)

	Top Ten product in Group A	
STIC	**Product Description**	
424	Other fixed vegetable oils, fluid or solid, crude, refined	
289	Ores and concentrates of precious metals, waste, scrap	
245	Fuel wood and wood charcoal	
931	Special transactions, commodity not classified according to class	
265	Vegetable textile fibres, excluding cotton, jute, and waste	
223	Seeds and oleaginous fruit, whole or broken, for other fixed oils	
36	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc	
37	Fish, crustaceans and molluscs, prepared or preserved,	
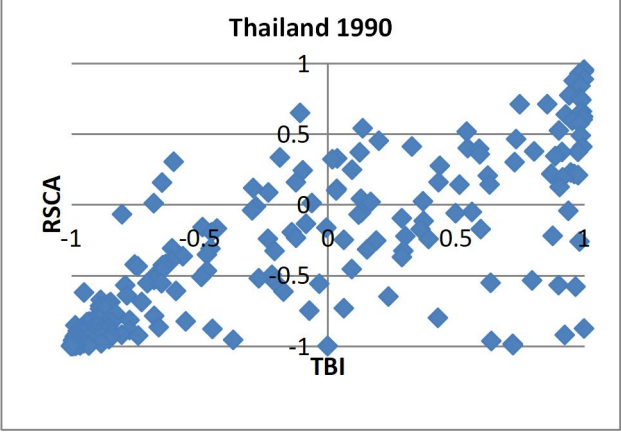
	nes
58	Fruit, preserved, and fruits preparations
287	Ores and concentrates of base metals, nes

Philippines 2015

Top Ten product in Group A	
STIC	**Product Description**
635	Wood manufactures, nes
245	Fuel wood and wood charcoal
776	Thermionic, microcircuits, transistors, valves, etc
881	Photographic apparatus and equipment, nes
424	Other fixed vegetable oils, fluid or solid, crude, refined
265	Vegetable textile fibres, excluding cotton, jute, and waste
287	Ores and concentrates of base metals, nes
773	Equipment for distribution of electricity
58	Fruit, preserved, and fruits preparations
189	Electric power machinery, and parts thereof, nes
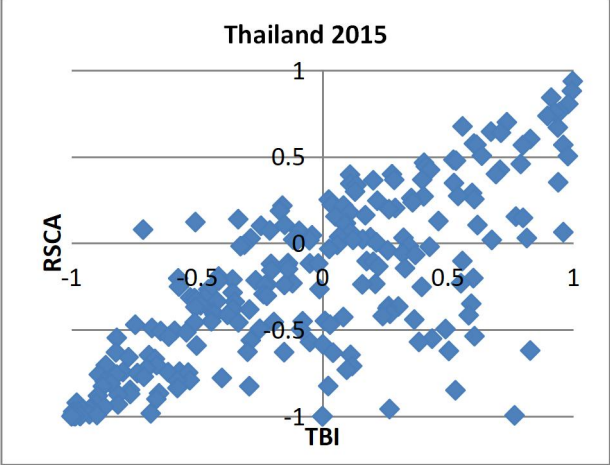
Singapore

Singapore 1990

Top Ten product in Group A	
STIC	**Product Description**
232	Natural rubber latex; rubber and gums
334	Petroleum products, refined
687	Tin
762	Radio-broadcast receivers
752	Automatic data processing machines and units thereof
75	Spices
431	Animal and vegetable oils and fats, processed, and waxes
761	Television receivers
763	Gramophones, dictating machines and other sound recorders

Singapore 2015
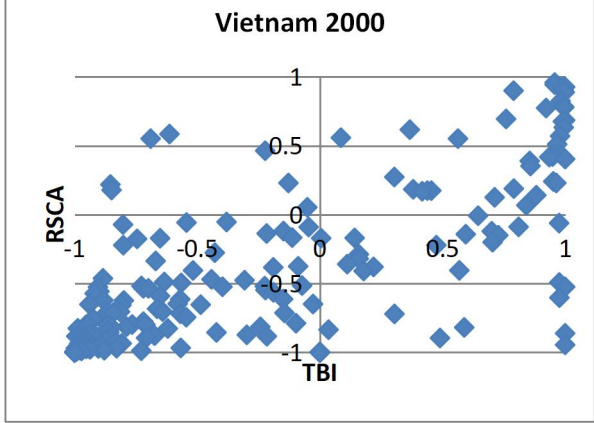
	Top Ten Products
STIC	**Product Description**
776	Thermionic, microcircuits, transistors, valves, etc
687	Tin
898	Musical instruments, parts and accessories thereof
334	Petroleum products, refined
683	Nickel
514	Nitrogen-function compounds
881	Photographic apparatus and equipment, nes
759	Parts, nes of and accessories for machines of headings 751 or 752
512	Alcohols, phenols etc, and their derivatives

Thailand

Thailand 1990

	Top Ten product in Group A
STIC	**Product Description**
42	Rice
232	Natural rubber latex; rubber and gums
37	Fish, crustaceans and molluscs, prepared or preserved, nes
47	Other cereal meals and flour
36	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc
61	Sugar and honey
54	Vegetables, fresh or simply preserved; roots and tubers, nes
687	Tin
58	Fruit, preserved, and fruits preparations
897	Gold, silver ware, jewelry and articles of precious

	materials, nes

Thailand 2015

Top Ten product in Group A	
STIC	**Product Description**
232	Natural rubber latex; rubber and gums
42	Rice
37	Fish, crustaceans and molluscs, prepared or preserved, nes
14	Meat and edible meat offal, prepared, preserved, nes; fish extracts
47	Other cereal meals and flour
61	Sugar and honey
762	Radio-broadcast receivers
592	Starches, insulin and wheat gluten; albuminoidal substances; glues
266	Synthetic fibres suitable for spinning
782	Lorries and special purposes motor vehicles

Vietnam

Vietnam 2000

Top Ten product in Group A	
STIC	**Product Description**
42	Rice
36	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc
75	Spices
245	Fuel wood and wood charcoal
71	Coffee and coffee substitutes
232	Natural rubber latex; rubber and gums
851	Footwear
74	Tea and mate
844	Under garments of textile fabrics, not knitted or crocheted
842	Men's and boys' outerwear, textile fabrics not knitted or crocheted

Vietnam 2015
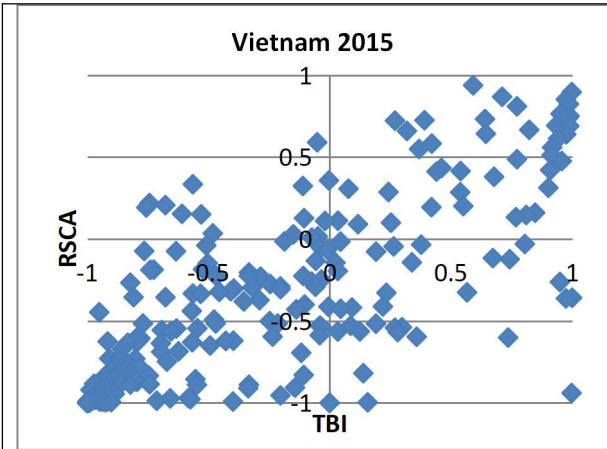
Top Ten product in Group A	
STIC	**Product Description**
220	Photographic apparatus and equipment, nes
47	Pulpwood (including chips and wood waste)
31	Spices
14	Rice
215	Footwear
43	Natural rubber latex; rubber and gums
27	Coffee and coffee substitutes
208	Men's and boys' outerwear, textile fabrics not knitted or crocheted
12	Fish, crustaceans and molluscs, prepared or preserved, nes
210	Under garments of textile fabrics, not knitted or crocheted
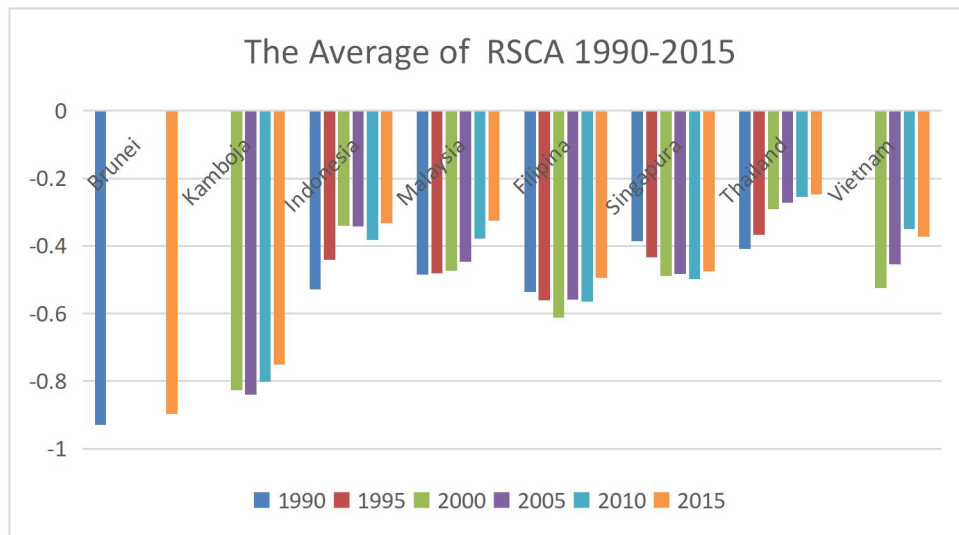
Figure 1. The RSCA Arithmetic Mean in ASEAN Member Countries 1990-2015
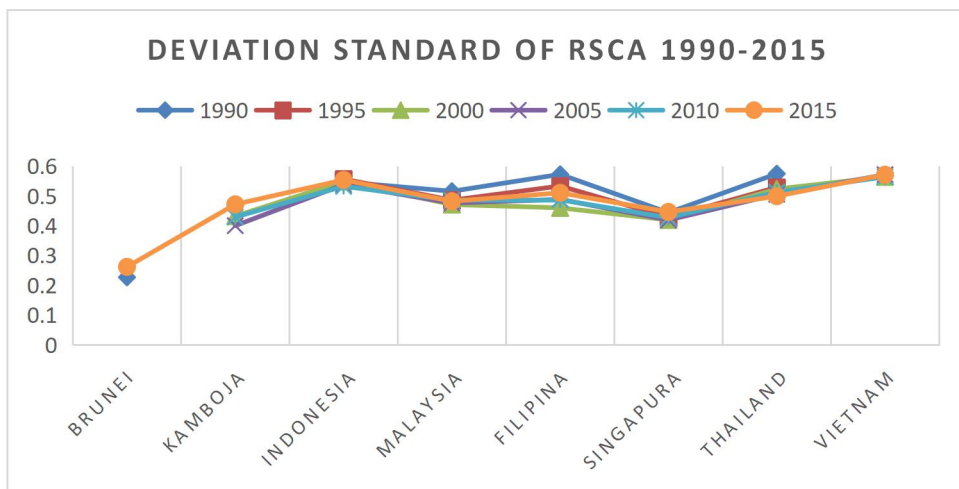
Figure 2. The Change of Deviation Standard of RSCA 1990-2015

The Relation of The Patterns of Comparative Advantage : Cambodia and Other ASEAN Member Countries
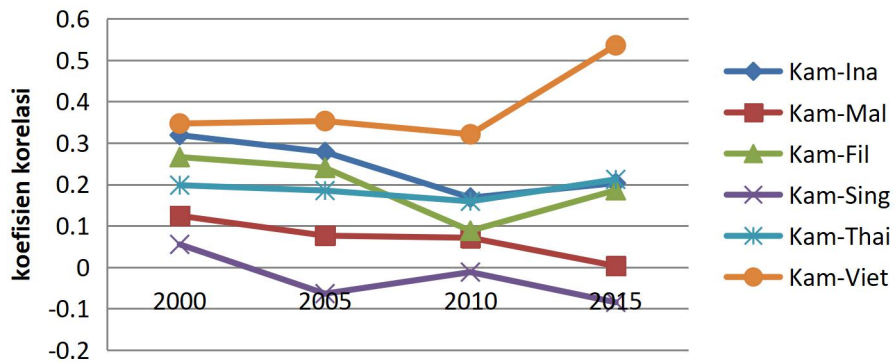
The Relation of The Patterns of Comparative Advantage: Indonesia and Other ASEAN Member Countries
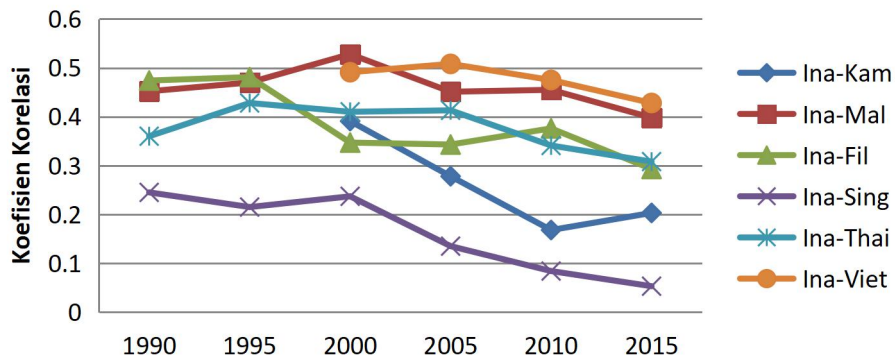
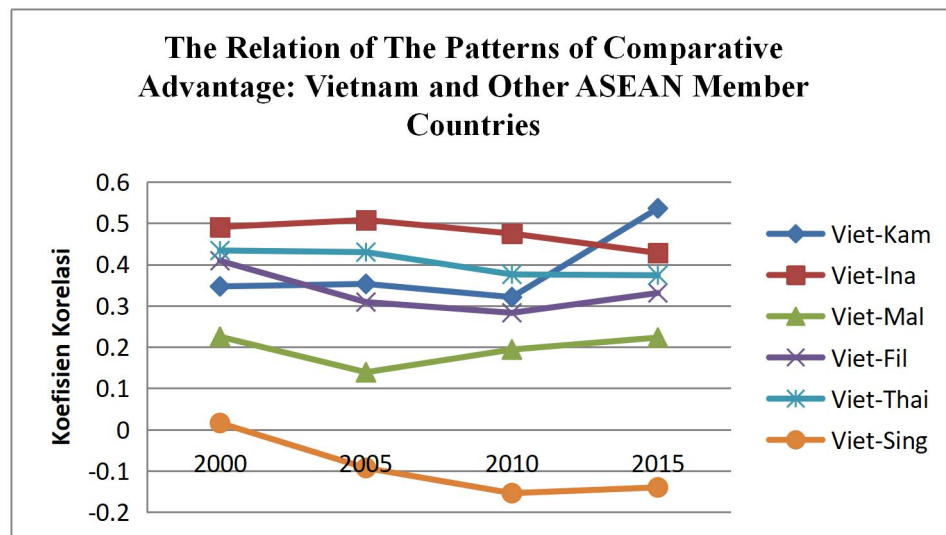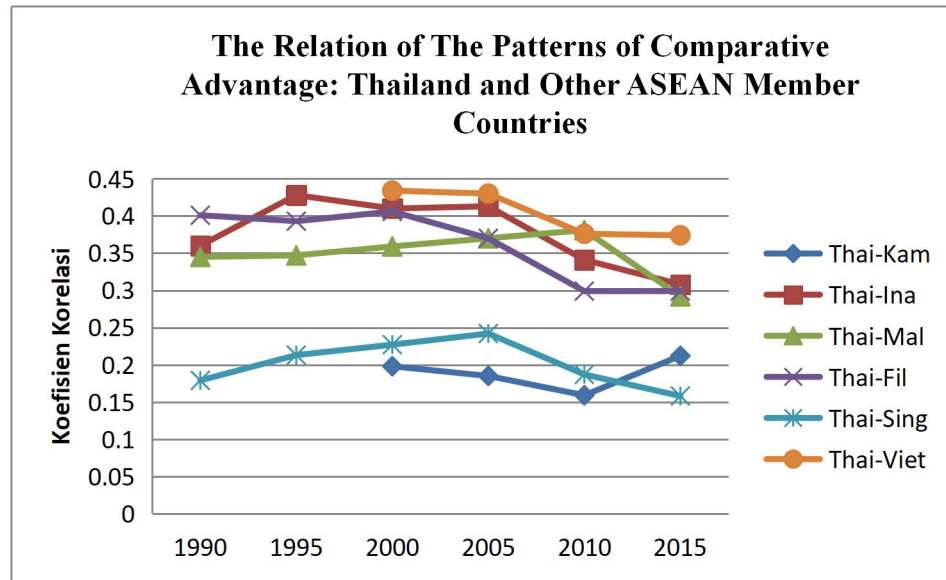The Relation of The Patterns of Comparative Advantage: Malaysia and Other ASEAN Member Countries
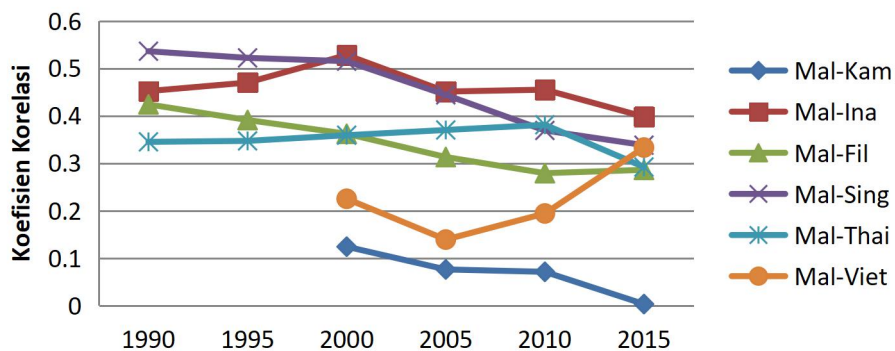
The Relation of The Patterns of Comparative Advantage: Philippines and Other ASEAN Member Countries
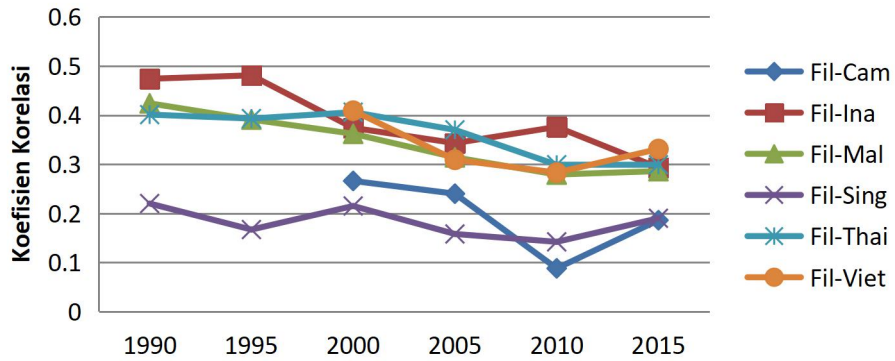
The Relation of The Patterns of Comparative Advantage: Singapore and Other ASEAN Member Countries

The Relation of The Patterns of Comparative Advantage: Thailand and Other ASEAN Member Countries

The Relation of The Patterns of Comparative Advantage: Vietnam and Other ASEAN Member Countries
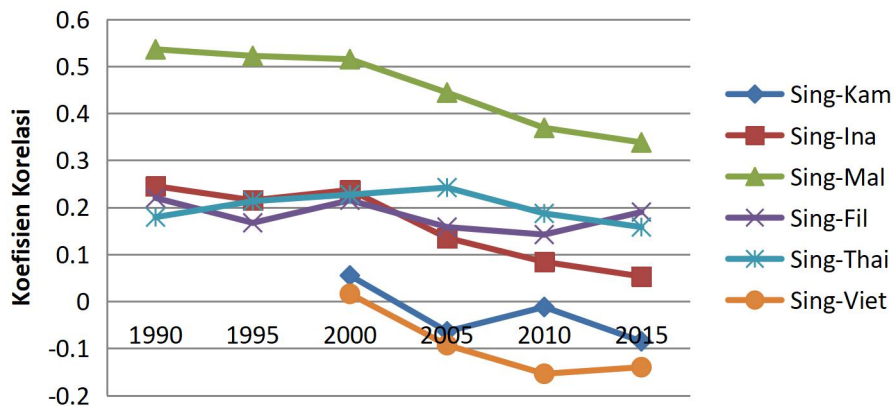
Figure 3. The Relation of The Patterns of Comparative Advantage within ASEAN Member Countries
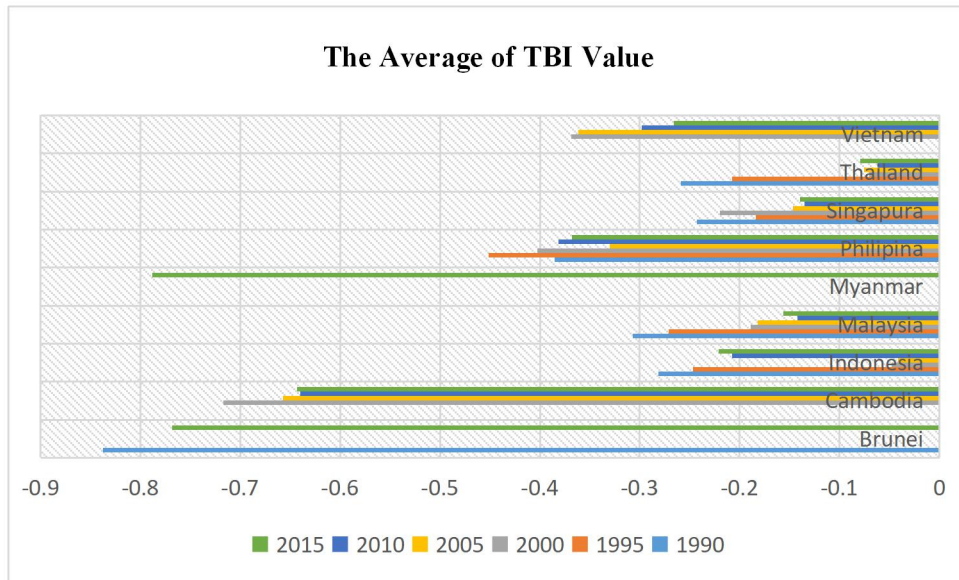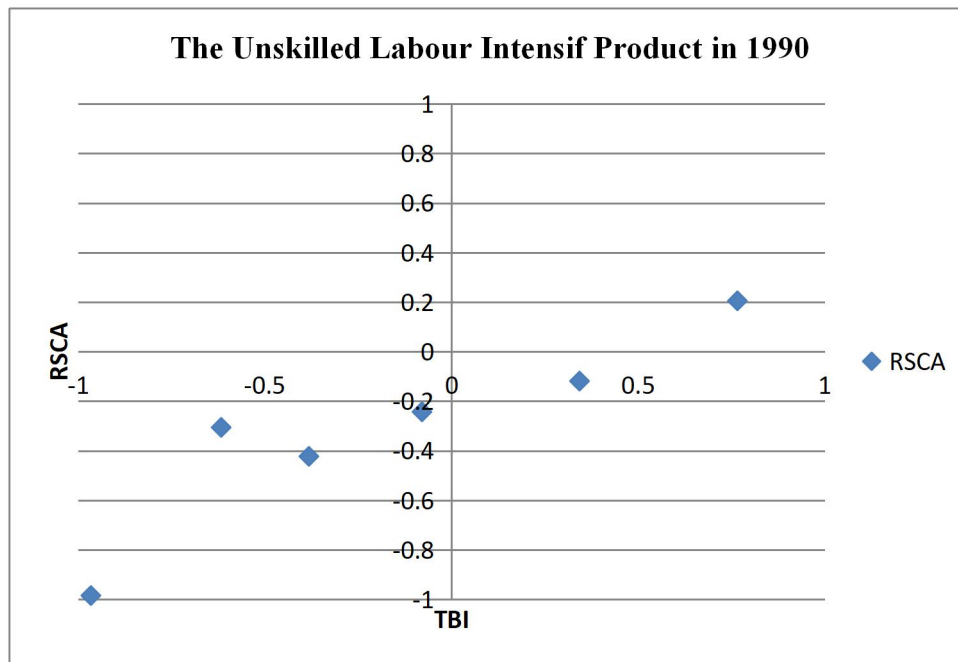
Figure 4. The Average Value of TBI

The Primary Product in 2015
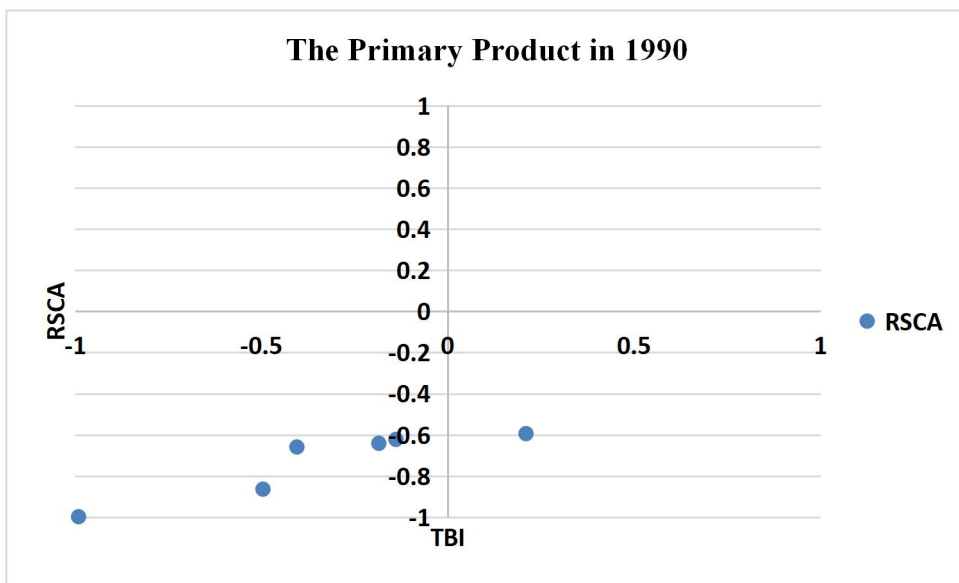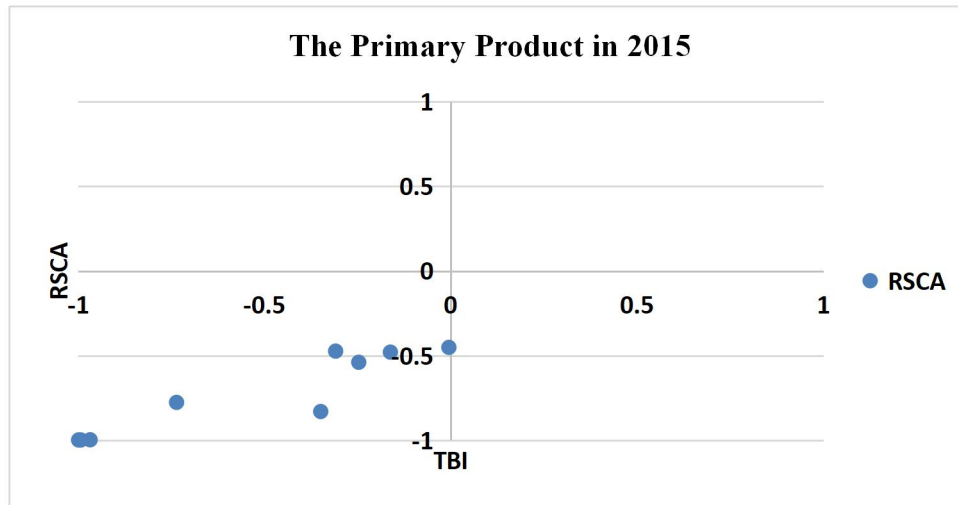
Figure 5. The Pattern of Flying Gees : Primary Product

The Unskilled Labour Intensif Product in 1990

The Unskilled Labour Intensif Product in 2015
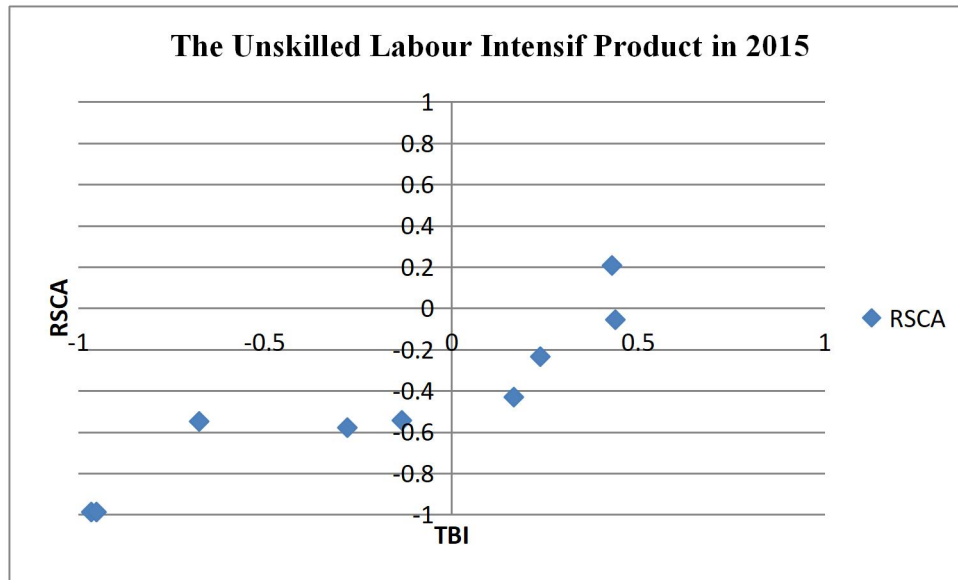
Figure 6. The Pattern of Flying Gees : Unskilled Labour Intensive Product
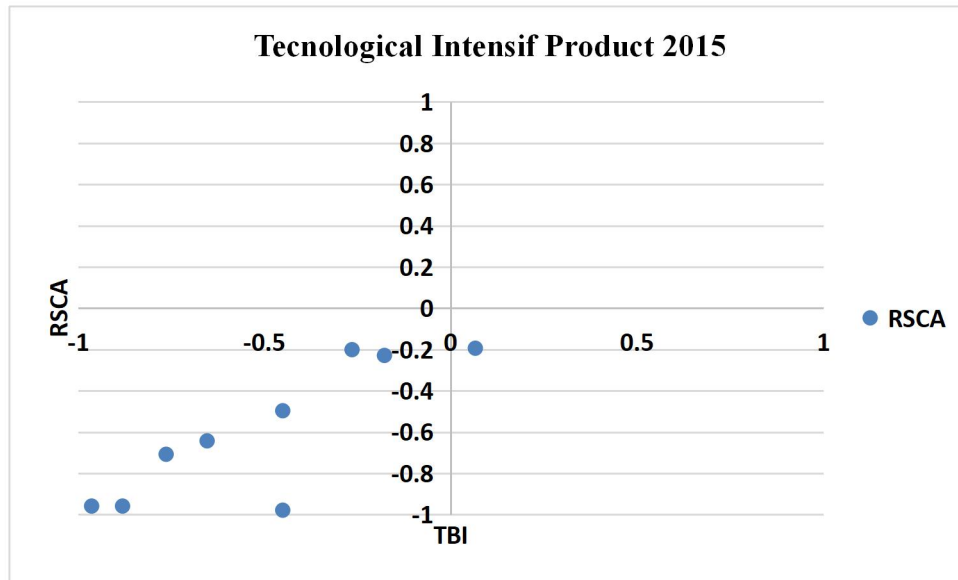

Technological Intensif Product 1990
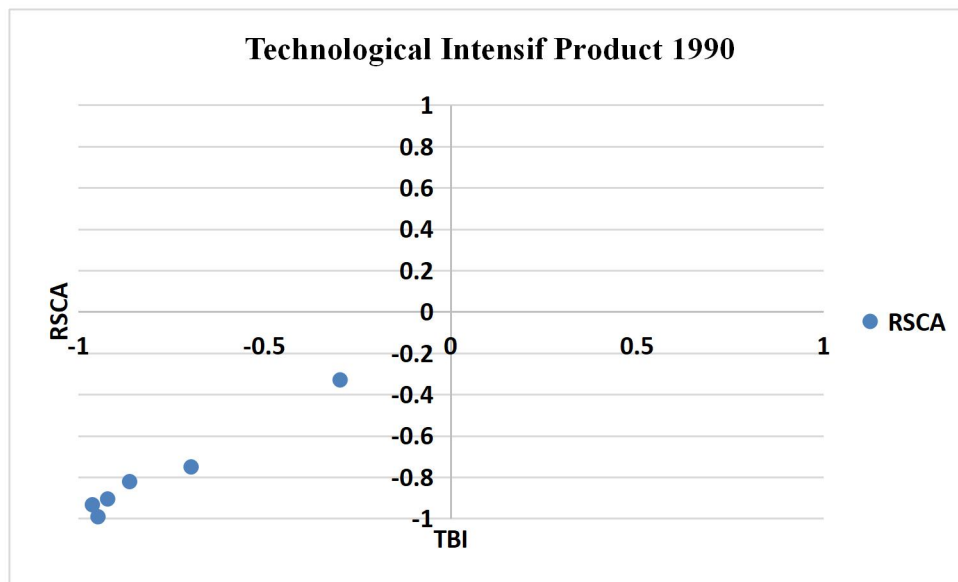
Figure 7. The Pattern of Flying Gees : Technological Intensive Product