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Revealed Comparative Advantage Measure: ASEAN-China Trade Flows

Ana Shohibul MA
Department of Economic Development, Faculty of Economics, University Sebelas Maret
Jl. Ir Sutami No. 36A Kentingan, Surakarta 57126, Central Java, Indonesia
*E-mail of the corresponding author: anasohibul@uns.ac.id

Abstract
This paper investigates the comparative advantage of ASEAN countries and China. We tested the comparative advantage by using Revealed Symmetric Comparative Advantage (RSCA) and Trade Balance Index (TBI) approach. Export products are analyzed based on Standard International Trade Classification (SITC) revision 3, which is divided into primary products and manufactured products. We found that the Chinese have more established patterns of trade, while ASEAN trade patterns are very dynamic. We also ferret out strong support, the comparative advantages to the trade balance, comparative advantage will toss up a profit (net export). This research cogent backlit the comparative advantage theorem.
Keyword: Patterns of Trade, Revealed Symmetric Comparative Advantage, Trade Balance.

1. Introduction

Comparative advantage is important concept in modern economic theory. Comparative advantage is a concept more than 200 years old that are immovable until today and is considered determinant of specialization in the concept of international trade. Liesner (1958) is the first person who introduced the measurement of reveal comparative advantage (RCA), and later developed by Balassa (1965). Balassa (1965; 1977; 1989) have published and analyzed of revealed comparative advantage measure in manufacturing and across industries. Comparative advantage measure is determinant of trade pattern which leads to the international trade specialization and to be determined by several supply and demand factors. Comparative advantage will increase the efficiency of scarce resources and welfare.

The performance popularity of the comparative advantage measure has not been disproved by various new models in international trade. Revealed comparative advantage measure is the most valid and comparable to determining comparative advantage such as patterns of trade specialization, trade patterns and international trade advantage [(Balassa, 1965; 1986); (Hilman, 1980); (Yeats, 1985); (Vollrath, 1991); (Laursen, 1998); (Dalum *et al*., 1998); (Bojnec, 2001); (Widodo, 2009)]. Base on Heckscher-Ohlin Theory stated that a country's comparative advantage depends on relative factor endowment across nation and trade affects relative factor prices within and across nations (Salvatore, 2007). Most economists have done the analysis that other factors as determinants of comparative advantage leads to trade specialization, demand bias and national preferences are determinant of net export and trade specialization (Lundback and Torstensson, 1998), specialization trade pattern to be determined by several supply and demand factor (Bojnec, 2001), trade liberalization to an increase specialization of larger economies in industries (Bastos and Cabral, 2007). Whereas, Helpman and Krugman (1985) argue that developed countries tend to export product that have not been standardized and scale-intensive industries, while developing countries will specialize in standardized product (e.g., Bojnec, 2001).

Association of Southeast Asian Nations (ASEAN) and China have agreed on cooperation in the form of free trade since 2004. The purpose of the agreement is to achieve free trade by eliminating or reducing trade barriers, both tariff and non tariffs, increase market access services, and investment in order to increase welfare. China as a new economic giant has many advantages, the first China has strong economic conditions and dynamic, is a cooperation partner of trade for countries in the world capable of increasing the flow of trade and investment for trading partners (purba, 2004), second highest economic growth in the world since 2000s, third China is very large factor endowment and human capital so that the resulting product will be more competitive (Liu and Ng, 2010) and finally behavior of people who are entrepreneurs and high motivation to innovate (Yue, 2004). While ASEAN is a trading bloc that has a relatively stable economic conditions with an average economic growth above five percent, is above the world economic growth. ASEAN GDP in 2010 reached US $ 1,800 billion or equivalent to 3.1 percent of total world GDP.

The aims of the paper to analysis of the properties of revealed comparative index and dynamics of comparative advantage, on the grounds an empirical point of view. This analysis includes ASEAN 5 and China. This paper is

consists of five section. The following section contains briefly describe literature review on theory of comparative advantage, starting from the standard theory of international trade, Heckscher-Ohlin theory to modern theory of international trade. Section 3, describes of estimation and empirical of comparative advantage measure. The empirical results are presented in section 4. Finally, several conclusions are presented in last section.

2. Literature Review

2.1 The Standard Theorem of International Trade

In the standard theorem of international trade, the production frontier with increasing costs is the theory's concept. Increasing of the opportunity cost result the in a production frontier that is concave from the origin. Differences in relative prices between the two countries illustrate the comparative advantages of each country. The relative prices that are lower than in other countries, reflecting the country has a comparative advantage (Salvatore, 2007). The differences of traded goods price are influenced by the level of efficiency of production inputs, so that a country will direct their work force from inefficient industries lead to a more efficient industry. a country will do the specialize of production for goods that have a comparative advantage and shift the production of which has a comparative disadvantage to other country.

Suppose there are two countries 1 and 2, which produce two commodities X and Y have possibility production function and indifference curve shown in figure 1. The initial equilibrium of production in country 1 at point A with the relative prices $(Px/Py)_1$ and at A' in country 2 with relative prices $(Px/Py)_2$ $[(Px/Py)_1 = (Px/Py)_2 = 1]$.

FIGURE 1 ABOUT HERE

In Figure 1, relative price in country 1 $(Px/Py)_1$ is lower than country 2 $(Px/Py)_2$, so country 1 will specialize in X, and country 2 will specialize in Y. the production of X in country 1 will move down from A to B, its production frontier this occurs as a result of increasing opportunity cost in the production of X. whereas country 2, the production possibility is move upward from A' to B', these to capture reduction in opportunity cost of X and growth on opportunity cost of Y. The trade values is equal to the triangle BCE for country 1 and triangle B'C'E' for country 2. The end consumption for each countries is equal to point E (indifference curve III) for country 1 and point E '(indifference curve III) for country 2. Thus, country 1 gains from trade are equal AEs area and A'E's area for country 2 (Salvatore, 2007).

2.2 The Heckscher-Ohlin Theorem

The principal of H–O theorem is a different productivity of production factors or endowment factors among countries, and affects to relative factor prices, as a determinant of comparative advantage and international trade. Basic assumption of H–O theorem are (i) there two countries (country 1 and 2), two commodities (X and Y), and two factors production (Labor and Capital); (ii) constant returns to scale and identical technologies; (iii) commodity X is labor intensive, and commodity Y is capital intensive (iv) there is incomplete specialization in production;(v) perfect competition in both commodity and factor markets in both nation (vi) factor production is completely immobile across international border but that can move costless among industry within the country; (vii) equal goods and factors, and taste both country (viii) there are no transportation cost, tariffs or other obstructions to the free flow of international trade; (ix) all resources are fully employed in both countries; and (x) international trade between the two countries is balanced (Salvatore, 2007).

FIGURE 2 ABOUT HERE

H–O theorem focus on predicts the pattern of trade and factor prize equalization. The differences in relative factors abundance will cause the difference of output price among countries, it is becoming the cause of international trade. To explain the comparative advantage of H–O theorem, by virtue of figure 2 indifferent curve I is tangent to be production frontier of country 1 at point A and at A of country 2. In panel 1 that mean there is no trade in both countries. Whereas panel 2 shows the existence of trade between countries (provided that the similarity of taste, which are indicated by indifferent curve II), as well as the price difference $P_A < P_{A'}$, so that country 1 has a comparative advantage for product X and country 2 in product Y.

2.3 The Modern Theory

Bojnec (2001) has examined of revealed comparative advantage and properties for agricultural product trade flows in Regional, Central and East European. He's argue that measuring of trade advantage based on exports RCA stronger relationship than on the basis of calculations using the import, because of the distortions in the form of import policy restrictions and import subsidies by developed to the developing world. European Union, Asia and NAFTA countries are three main players in world trade agricultural products. Revealed comparative advantage is the most valid measure of excellence in measuring trade advantage.

Bastos and Cabral (2007) has tested the dynamics of international trade patterns in 20 OECD countries over the 1980–2000 period. Bastos and Cabral argued that the observed changes in trade patterns were explained by initial endowment of human capital and industry specific changes in labor productivity and labor cost. Trade

liberalization induced an increase in the previous specialization of larger OECD economies in industries with increasing return to scale.

Widodo (2009) by using analytical tools "Product Mapping" and revealed symmetric comparative advantage (RSCA) noted that existence of a positive relationship between comparative advantage and trade balance. He also argues that the presence of a high comparative advantage, will create a net export. This discovery theory also strongly supports of the comparative advantages theory. The analytical tool called "Product Mapping" which he had developed based on the Flying Geese model.

FIGURE 3 ABOUT HERE

Figure 3 shows the Flying Geese model. The process of the Flying Geese model comprise with four phases are as [(Kojima, 2000) and (Widodo, 2009)], (i) developing and emerging countries to import consumer goods from developed countries; (ii) At the time t_2, begins production in the country and began to import capital goods from developed countries or the so-called import substitution; (iii) t_2t_3 is the stage of decline in imports of consumer goods and preparation for export. t* the condition is an equilibrium (export = import). So that domestic demand is influenced by domestic production, imports, and exports; (iv) Last step is the opposite of the first phase, developing countries began to export capital goods (t_5) over with the decline of consumer goods exports.

3. The Empirical Measures of Comparative Advantage

3.1 Revealed Comparative Advantage

Balassa (1965), have defined revealed comparative advantage as a ratio among certain export products of a country's overall exports to the world and a country's total exports to total world exports (e.g., Vollrath, 1991; Bojnec, 2001). Revealed comparative advantage index (RCA) can defined as:

$$\mathbf{RCA_{ij}} = \frac{[\mathbf{X_{ij}} / \mathbf{X_{id}}]}{[\mathbf{X_{ej}} / \mathbf{X_{ed}}]}$$

Where RCA_{ij} is revealed comparative advantage. The subscript *i* and *j* denote country and product of manufacturing export (SITC), X_{ij} refers to exports of country *i* in product of manufacturing export (SITC) *j*. Subscript *d* and *e* denote all traded products unless the *j*'s product and all countries except *i*'s country. The magnitude value of the RCA index ranges from zero to infinity ($0 \leq RCA_{ij} \leq \infty$). An RCA_{ij} greater than 1 indicated revealed comparative advantage in product *j* in country *i*. whereas RCA_{ij} less than 1 means country *i* has comparative disadvantage in product *j*.

Since the RCA turns out to produce an output which cannot be compared on both side of 1. Dalum *et. al*. (1998); laursen (1998); Widodo (2009) have obtained revealed symmetric comparative advantage (RSCA), this measure ranges from – 1 to 1, that is formulated as:

$$\mathbf{RSCA_{ij}} = \frac{[\mathbf{RCA_{ij}} - \mathbf{1}]}{[\mathbf{RCA_{ij}} + \mathbf{1}]}$$

The magnitude index of $RSCA_{ij}$ about zero up to one ($-1 \leq RCA_{ij} \leq 1$). When $RSCA_{ij}$ index of country *i* above zero is to be comparative advantage for product *j*. Conversely, $RSCA_{ij}$ index of country below zero is to be comparative disadvantage for product j.

3.2 Trade Balance Index

Widodo (2009) and Lafay (1992), Trade Balance Index (TBI) is defined as the ratio between export and total traded goods (exports coupled imports). Trade Balance Index explain whether a country made net exporter or net importer. The value of Trade Balance Index indicates a qualitative structure of product export and import trade flows. which is formulated as:

$$\mathbf{TBI_{ij}} = \frac{[\mathbf{X_{ij}} - \mathbf{M_{ij}}]}{[\mathbf{X_{ij}} + \mathbf{M_{ij}}]}$$

TBI_{ij} represents the balance of trade index of country *i* for product *j*. The value of TBI index ranges between -1 and 1. When TBI_{ij} equals 1 indicates that the qualitative structure of exports above structure of imports or a country as net exporter. Converse, TBI_{ij} equals –1 implies that a country as net importer. if the value of TBI index with to zero, represents that the value of exports same as the value of imports in the country i. For simplify interpretation of the index TBI, if index of TBI positive the mean as a net exporter and as a net importer when the index of TBI is negative.

4. The Empirical Results

4.1 Data

We use the data of export and import issued by United Nation Commodity Trade Statistic Database (UN COMTRADE). International trade of products used in this study are based on the Standard International Trade

Classification (SITC) Revision 3 and differentiated based on primary and manufacturing products. The primary products consist of Food and Live animals (SITC 0); Beverages and Tobacco (SITC 1); Crude Materials, Inedible, except Fuels (SITC 2); Mineral Fuels, Lubricants and related materials (SITC 3); Animal and Vegetable Oils, Fats and Waxes (SITC 4); and Non-Ferrous Metals (SITC 68). While manufactured products composed of Chemicals and Related products, n.e.s (SITC 5); Manufactured goods classified chiefly by material (SITC 6); Machinery and Transport equipment (SITC 7); and Miscellaneous manufactured articles (SITC 8). Whereas product groups of Commodities and transactions not classified elsewhere in the SITC (SITC 9) are exclude in this research.

4.2 The Analysis of Revealed Comparative Advantage

We present the results of measurements of revealed symmetric comparative advantage cross country over the period 2010 (table 1). The RSCA of Food and live animals (SITC 0) and, Beverages and tobacco (SITC 2) is negative for all countries, showing a relative revealed symmetric comparative disadvantage. Group product of Crude materials, inedible, and except fuels is negative for China, Malaysia, Philippines, and Singapore while Indonesia and Thailand is positive with values respectively 0.51 and 0.16. The RSCA of product group Crude materials, inedible, except fuels is indicates the existence of trade specialization advantage for Indonesia, Malaysia, and Singapore, while for China, the Philippines and Thailand are in condition of disadvantage. Indonesia and Malaysia have similar characteristics that have a comparative advantage for the product groups SITC 3 and SITC 4 that is equal respectively 0.38 and 0.09 (SITC2) and 0.90 and 0.88 for product groups of Mineral fuels, lubricants and related materials (SITC 3). This might be due to the two countries are geographically located in one area so having a product or material resources are almost the same. Comparative advantage also occurred in the Philippines (SITC 4) and Singapore (SITC 3) with the index value for each of 0.64 and 0.09, meanwhile for the China and Thailand has a comparative disadvantage for both groups of products. All countries have a comparative disadvantage for the group of products Non-ferrous metals (SITC 68) because the value of RSCA is negative besides Singapore with RSCA value equal to zero, this meant that exports the same as imports.

The RSCA results show that for manufacturing products in China is positive unless otherwise for the product group Chemicals and related products. This indicated that China has a comparative advantage for manufacturing products unless the product group Chemicals and related products. Indonesia has a comparative advantage for the product group Chemicals and related products with RSCA index value of 0.23 and for other manufactured products i.e. Manufactured goods classified chiefly by material (SITC 6), Machinery and transport equipment (SITC 7), and Miscellaneous manufactured articles (SITC 8) is negative. This represents that Indonesia is to have a comparative disadvantage for manufacturing products. RSCA calculation result is negative for the country of Malaysia, the Philippines, Singapore, and Thailand for the product group Chemicals and related products. It is probably because the availability of raw materials, human resources, and focus industries are relatively less when compared to developed countries. The product groups Machinery and transport equipment is positive for China, Malaysia, the Philippines, Singapore, and Thailand no but Indonesia. As for the RSCA index value of the five countries respectively are 0.17, 0.11, 0.33, 0.19, and 0.09. This was due to industrial machinery and transportation is a vital industry in a country. While for the product group Miscellaneous manufactured articles (SITC 8), RSCA is negative for all states unless otherwise China. This proves that the ASEAN countries have a comparative disadvantage for these product groups.

Singapore as the Asian newly industrialized economies, based on the RSCA index for manufactured products is negative unless for a group of products Machinery and transport equipment. This represents that Singapore has a comparative disadvantage for manufacturing products unless the products groups of Machinery and transport equipment. The reason, that Singapore is re-export country of the imported product, as a traffic lane of international trade in the world so that the transportation and machinery industry are more sophisticated. Tentative conclusion indicates that in general China has comparative advantage in manufacturing products over the primary product, whereas the ASEAN countries have a comparative advantage in primary products and some manufactured products.

TABLE 1 ABOUT HERE

Figure 4 indicates the pattern and consistency of revealed symmetric comparative advantage of ASEAN and China, are differentiated based on primary and manufacturing products for the period 1993 -2010. According technical analysis, China is one of the newly industrialized countries, with its marked shift toward specialization of the primary sector to the industrial /manufacturing sector. This is reflected in the pattern of RSCA, China's comparative advantage occur in manufactured products (except product group Chemicals and related products / SITC 5), regarding exports of primary products of China has a comparative disadvantage with a pattern that continued to decline since 1993 until 2010 (panel a). Similar condition also occurs in Thailand for manufacturing product. RSCA pattern manufactured products through leading zeros in the last few years (panel f), meaning

toward the pattern of specialization to achieve comparative advantage. For the primary product, product group Food and live animals (SITC 0) and Beverages and tobacco (SITC 2) has a comparative advantage and other primary products have a comparative disadvantage (SITC 1, SITC 3, SITC 4, SITC 68) but has a pattern leads to comparative advantage (panel f).

FIGURE 4 ABOUT HERE

Indonesia is not consistent for manufactured products, especially for product groups SITC 6 and SITC 8. Initially has a comparative advantage, but since 2007 a comparative disadvantage (panel b). Meanwhile for the primary product is consistent and has a comparative advantage, unless otherwise group product SITC 0 (pattern through zero). These results suggest that Indonesia specialize in exports of primary products. Malaysia and the Philippines have nearly the same features in terms of international trade patterns. They began manufacturing and product concentrations in leaves of primary products. The panel b and c show the flow of comparative advantage which was originally at the bottom toward the top right. Trade patterns in Singapore most perplexing compared to other ASEAN countries. Both primary and manufactured products have a comparative disadvantage unless otherwise product groups of SITC 2 and SITC 7 (panel e). In general, the results of this study support the Flying Geese theorem [(Kojima, 2000); and Widodo, 2009)].

4.3 Trade Balance Index

Table 2 exhibited the values of trade balance index for product group SITC revision 3, for each country. The TBIs are highest for Indonesia that is equal 0,98 for product group of Animal and vegetable oils, fats and waxes, and this shows that Indonesia is the country's largest net exports for these products. The TBIs are positive for China, Malaysia, Philippines, Singapore and Thailand which means that net export for product group of Machinery and transport equipment, but Indonesia is net import. Malaysia is a net export for the product group Mineral fuels, lubricants and related materials (SITC 3), Animal and vegetable oils, fats and waxes (SITC 4), Miscellaneous, manufactured articles (SITC 8) and SITC 7, regarding net import for product group SITC 0, SITC 2, SITC 68 and SITC 5. The product group Food and live animals are net import for Indonesia, Malaysia, Philippines, Singapore except Thailand is net export. Singapore is a net export for all manufacturing products besides product groups manufactured goods classified chiefly by material (SITC 6). China is most consistent for trade flow, net export for manufacturing products and net export for primary product (unless product group Food and live animals).

TABLE 2 ABOUT HERE

Determination of trade advantage by using trade balance index, supports RSCA. Consistency of the pattern of trade and specialization can be seen from the relationship between trade balance index and RSCA index. China is the most consistent for the pattern of trade and specialization. Based on tables 1 and 2, TBI is very supportive when RSCA is positive, TBI also is positive and vice versa. we suggest that the Chinese specialization for manufacturing products (SICT 6, SITC 7 and SITC 8). Meanwhile, trade patterns ASEAN countries less prosperous than the China, yet to be seen whether the pattern of specialization in manufacturing products or primary products. Based on the results of calculating the value of TBI, TBI supports in general the value of RSCA. But on average there are 4 groups of products that do not support (see table 1 and 2). We conclude that china is a country leading to industrialization, patterns of trade specialization in developing countries are relatively volatile and dynamic. These finding strongly supports Widodo (2009) and Bojnec (2001). We provide advice to the ASEAN countries to specialize for products that have comparative advantages are supported by the trade balance, leading to an established pattern of specialization and began to move toward the manufacturing products.

5. Conclusion

This paper is to analyzed on revealed comparative advantage to do with trade and specialization patterns of the ASEAN countries and China. We find that China has a more established trading patterns compared with other ASEAN countries, the pattern of trade specialization ASEAN countries is more complicated and dynamic. We also stumbled strong support, the comparative advantages to the trade balance, comparative advantage will bouncing a profit (net export). This research vigorous espousing the comparative advantage theorem.

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Appendix

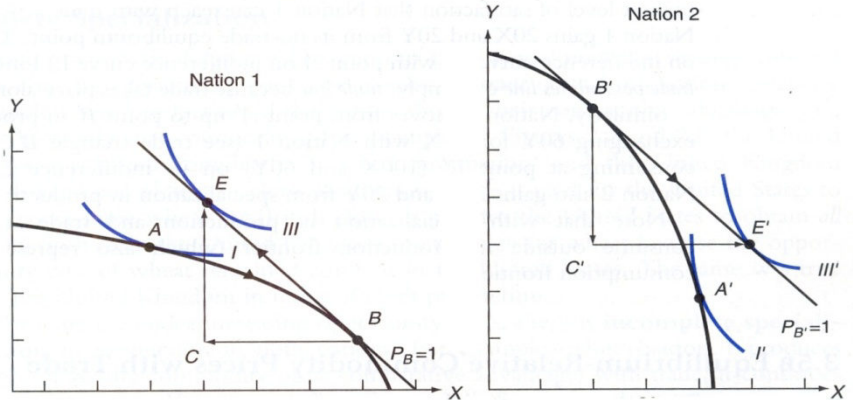


Figure 1 *The Standard Theorem of International Trade*

Source: Salvatore (2007)

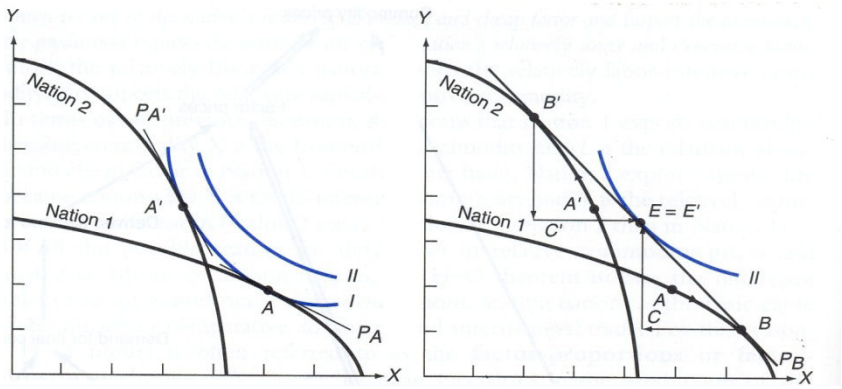


Figure 2 *The Heckscher-Ohlin Theorem*

Source: Salvatore (2007)

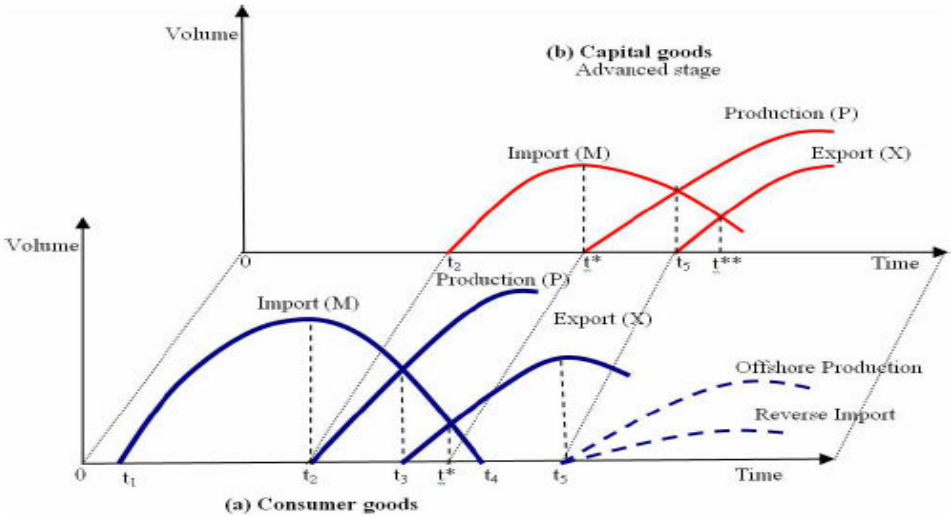
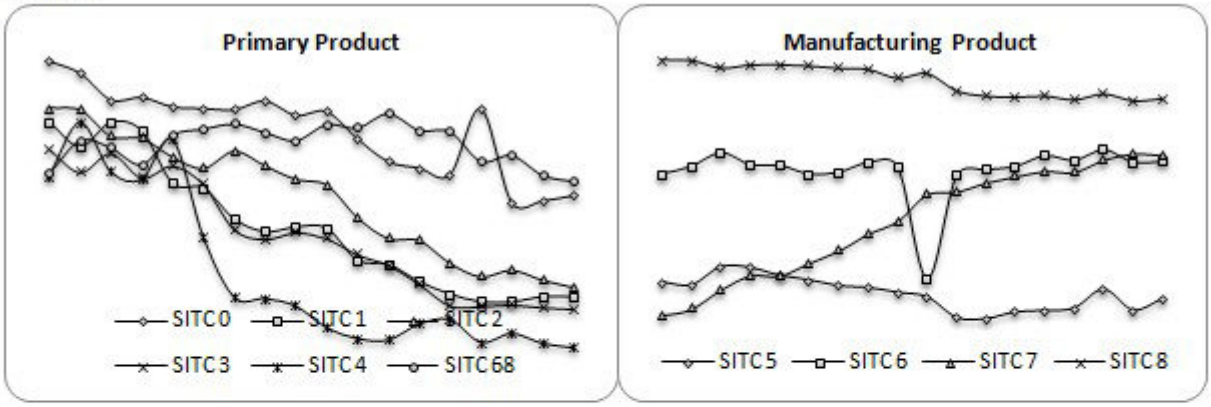


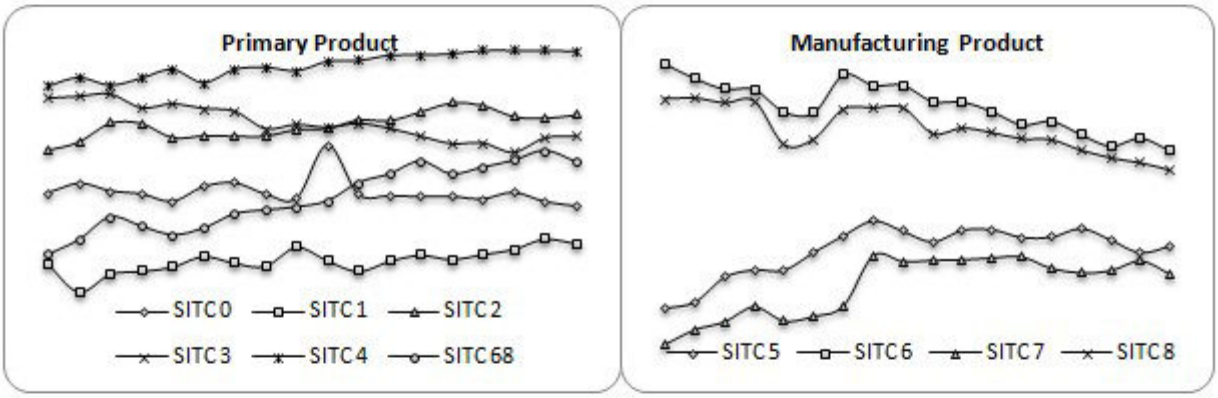
Figure 3 *Flying Geese Mechanism*

Source: Widodo (2009)

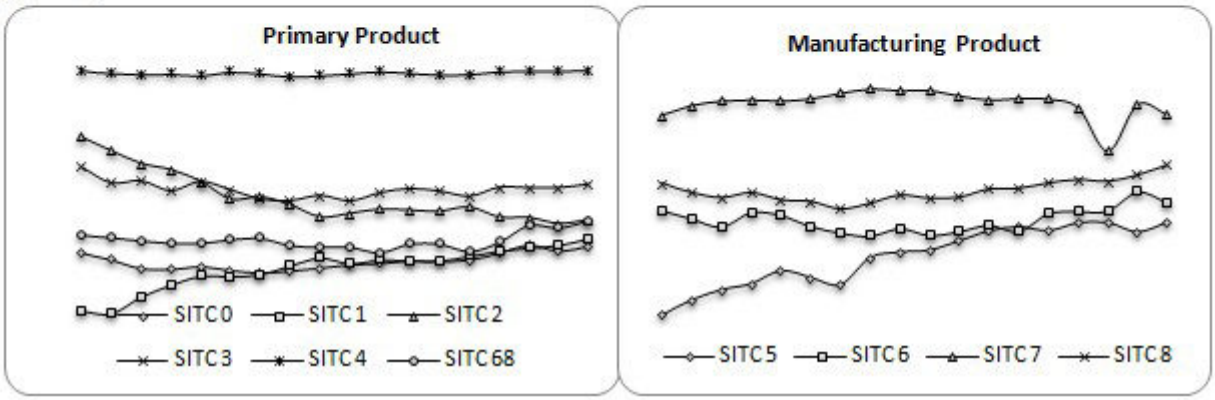
(a) China



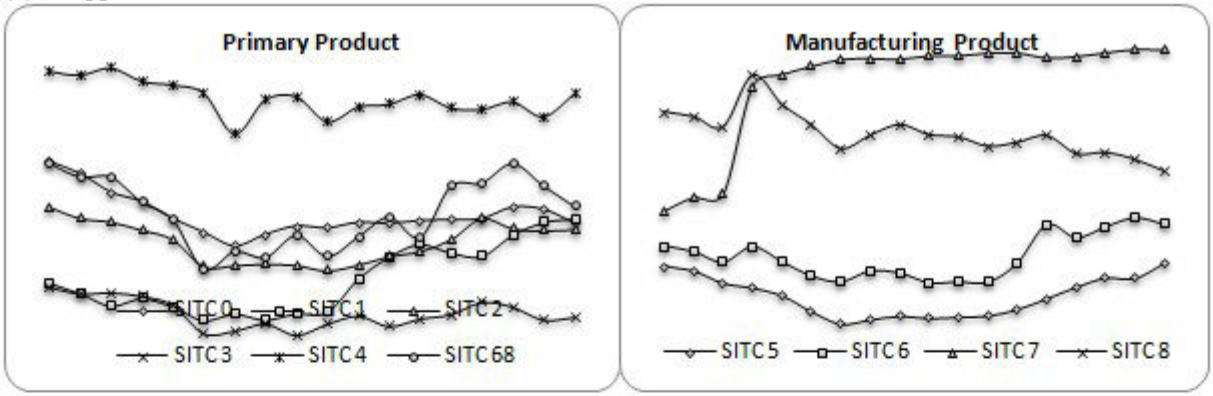
(b) Indonesia



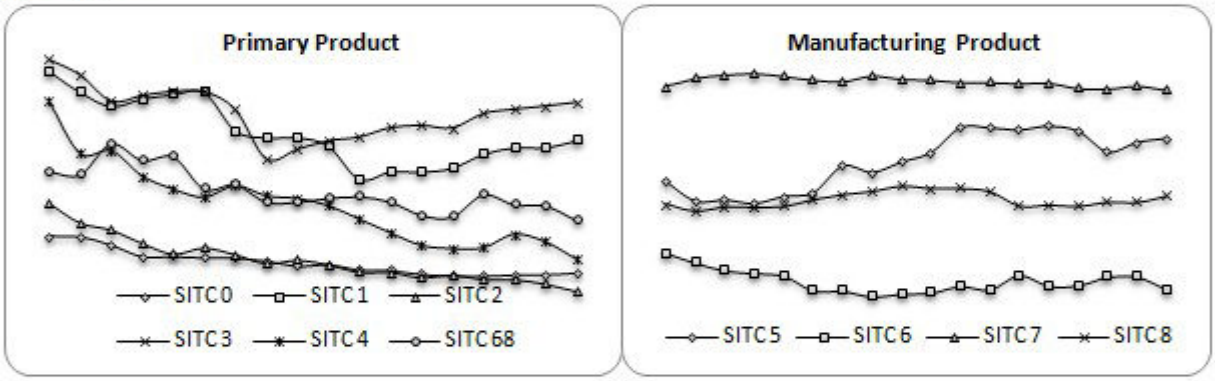
(c) Malaysia



(d) Philippines



(e) Singapore



(f) Thailand

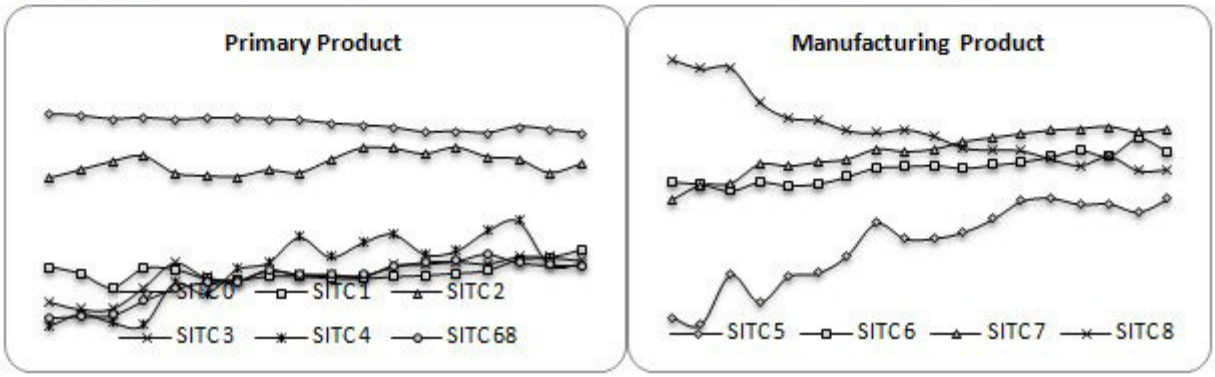


Figure 4 *The Pattern and Consistency of RSCA in each country for periode 1993-2010*

Table 1 Revealed Symmetric Comparative Advantage 2010

Countries / Product	China	Indonesia	Malaysia	Philipines	Singapore	Thailand
Food and live animals	-0,37	-0,04	-0,34	-0,15	-0,67	0,36
Beverages and tobacco	-0,73	-0,27	-0,28	-0,13	-0,07	-0,39
Crude materials, inedible, except fuels	-0,70	0,51	-0,16	-0,19	-0,75	0,16
Mineral fuels, lubricants and related materials	-0,77	0,38	0,09	-0,73	0,09	-0,46
Animal and vegetable oils, fats and waxes	-0,91	0,90	0,88	0,64	-0,61	-0,48
Non-ferrous metals (68)	-0,34	-0,37	-0,28	-0,58	0,00	-0,13
Chemicals and related products, n.e.s.	-0,32	0,23	-0,16	-0,05	-0,43	-0,49
Manufactured goods classified chiefly by material	0,15	-0,02	-0,20	-0,41	-0,58	0,02
Machinery and transport equipment	0,17	-0,48	0,11	0,33	0,19	0,09
Miscellaneous manufactured articles	0,37	-0,10	-0,07	-0,19	-0,22	-0,04

Table 2 Trade Balance Index for 2010

Countries	China	Indonesia	Malaysia	Philipines	Singapore	Thailand
Product						
Food and live animals	0,31	-0,08	-0,25	-0,47	-0,26	0,54
Beverages and tobacco	-0,12	0,14	0,09	0,25	0,03	0,29
Crude materials, inedible, except fuels	-0,90	0,47	-0,01	-0,17	-0,03	0,33
Mineral fuels, lubricants and related materials	-0,75	0,26	0,32	-0,80	-0,18	-0,53
Animal and vegetable oils, fats and waxes	-0,92	0,98	0,77	0,74	-0,19	0,20
Non-ferrous metals (68)	-0,47	0,34	-0,31	0,22	-0,08	-0,66
Chemicals and related products, n.e.s.	-0,26	-0,34	-0,08	-0,56	0,31	-0,08
Manufactured goods classified chiefly by material	0,48	-0,04	0,00	-0,27	-0,20	-0,08
Machinery and transport equipment	0,17	-0,42	0,03	0,13	0,11	0,12
Miscellaneous manufactured articles	0,54	0,51	0,31	0,33	0,06	0,24