

**Shift in Comparative Advantage, Dynamic Market
and Purchasing Power Parity in the East Asia**

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Summary

Background

Since the beginning of multilateral trade system, many regional trade agreements (RTAs) and regional economic integrations have been achieved, for examples the European Union (EU), the North American Free Trade Agreement (NAFTA), the *Mercado Común del Sur* (MERCOSUR, Southern Common Market), the Association of South East Asian Nations (ASEAN) - Free Trade Area (AFTA), etc. The achievements of RTAs and regional economic integrations, to some extent, have brought positive as well as negative implications that might appear in the forms of trade creation and trade diversion for the non-member countries (Viner, 1950; McCarthy, 2006). The East Asian region was noticeably late in proceeding to the *de jure* (legal) regional economic integration, even though the *de facto* (factual) economic integration is sometimes claimed (Fouquin *et al.*, 2006). Remarkable trade and investment activities, especially between Japan and China, as well as Japan and the individual ASEAN countries have increased significantly. RTAs in the East Asia did not exist until the ASEAN (only among the founding members: Indonesia, Malaysia, the Philippines, Singapore, and Thailand) reached the Preferential Trade Agreements (PTAs) in 1977.

The RTAs, regional economic integrations, bilateral trade agreements (BTAs), and other international strategic alliances have affected countries' dynamic comparative advantages and specialization. Whether there are systematic changes in the comparative advantage and specialization of trade in the East Asian countries has been a crucial issue for the future development of the East Asian economic integration. Following a

formation of ‘flying geese’ (FG)¹, it might be commonly believed that the systematic shifts in comparative advantage exist. The shifts have been in the most standardized, labor-intensive manufactures from Japan to the Newly Industrialized Economies (NIEs) and then to the ASEAN4 (Malaysia, Indonesia, Thailand and the Philippines) and so on (Kojima, 2000; Ozawa, 2001, 2006; Kasahara, 2004; Kwan, 2002).

One of the most important issues in the international trade is exchange rate. Indeed, the nominal exchange rate determines the competitiveness of a country. The law of one price states that in competitive markets, free of transportation costs and no official barriers to trade (such as tariffs and non-tariff barriers), an identical commodity in different countries will have the same price when it is valued in the same currency. Purchasing Power Parity (PPP) is a simple empirical preposition that once converted to a common currency; national price levels should be equal. The theory of PPP explains the movements in the exchange rates between two countries and their changes in price levels (Krugman and Obstfeld, 2000:394). In spite of the relatively large body of literature examining the PPP theory for developed countries, relatively few researches have studied the proposition for developing countries, which have various distinctive international policies and degrees of liberalization such as the East Asian countries.

¹ The ‘flying geese’ paradigm was introduced by Kaname Akamatsu in the 1930s in the several articles available only in Japanese. Kaname Akamatsu showed himself in the world academia after the World War II in the two articles (1961, 1962) in English. ‘Flying geese’ model intends to explain the catching-up process of industrialization of latecomer economies from intra-industry, inter-industry and international aspects. It might be argued that the structural transformation of industrialization in East Asia follows this ‘flying geese’ formation. Garment, Steel, Popular TV, Video and HDTV are frequently used to illustrate the formation. Those products have been transferred from Japan to Newly Industrialized Economies (NIEs: Hong Kong, Taiwan, Singapore and Korea); from NIEs to the ASEAN4 (Malaysia, Indonesia, Thailand and the Philippines); from the ASEAN4 to latecomer economies.

Research Questions

The main aim of this thesis is to answer several critical questions relating to the economic integration, comparative advantages and Purchasing Power Parity (PPP) of the East Asian economies:

1. The first established economic integration in the East Asia is the ASEAN. How has the *de jure* economic integration changed? Has the focus of the ASEAN changed, parallel with the development of international regionalism?
2. In fact, the ASEAN member countries' factors endowments are relatively similar. Theoretically, they will also have similarities in comparative advantage. There have been skeptical views on the development of the ASEAN because the substitute relationship among the members exists. How are the major trade trends in the ASEAN region? Has the intra-regional trade in the ASEAN region increased significantly?
3. Foreign direct investment (FDI) can change the relative factors endowment. Accordingly, the country's comparative advantage can be dynamic. How have the patterns of comparative advantage of the East Asian countries shifted?
4. The Heckscher-Ohlin (HO) theory suggests that a country will have comparative advantage on commodities produced with the country's abundant factors of production. How have the endowment factors determined the countries' comparative advantage?
5. To what directions have the trade specialization and trade patterns of the East Asian countries been going on? In other words, have they de-specialized in their trade and converged in their patterns of comparative advantage?

6. One very famous theory in the “catching-up” process of economies is the flying geese (FG) pattern (in Japanese: *ganko keitai*): imports-domestic production-exports-reverse imports (“M-P-E-M”). Does the FG pattern exist in the East Asia?
7. Regionalism and economic integration affect countries’ export performance. What are the dynamic markets for the East Asian countries’ exports?
8. How are the intra-industry trade and the intra-regional trade in the East Asia going on? Has the intra-industry trade in the intra-regional trade become significant compared with the inter-industry trade in the region?
9. Does purchasing power parity (PPP) not hold in the strong sense in the case of East-Asian countries?
10. Finally, this thesis takes Indonesia as a case study. How is the structure of protection in Indonesian manufacturing sector?

Theoretical Framework

Figure 1 and Table 1 show the theoretical framework, analytical tools and case studies for each chapter of this thesis. To make clear analysis, the all ten research questions are broken down into some more specific questions that are presented and answered systematically in the ten chapters (Chapters 2-11). All ten research-questions can be categorized into three groups i.e. comparative advantage, dynamic market and exchange rate as depicted in Figure 1. Chapters 4-7 and 11 deal with questions about comparative advantage. Chapter 3, 8 and 9 are related to the dynamic market of East

Asian countries' exports. Meanwhile, Chapter 10 is about hypothesis testing on PPP in the cases of the East Asian countries.

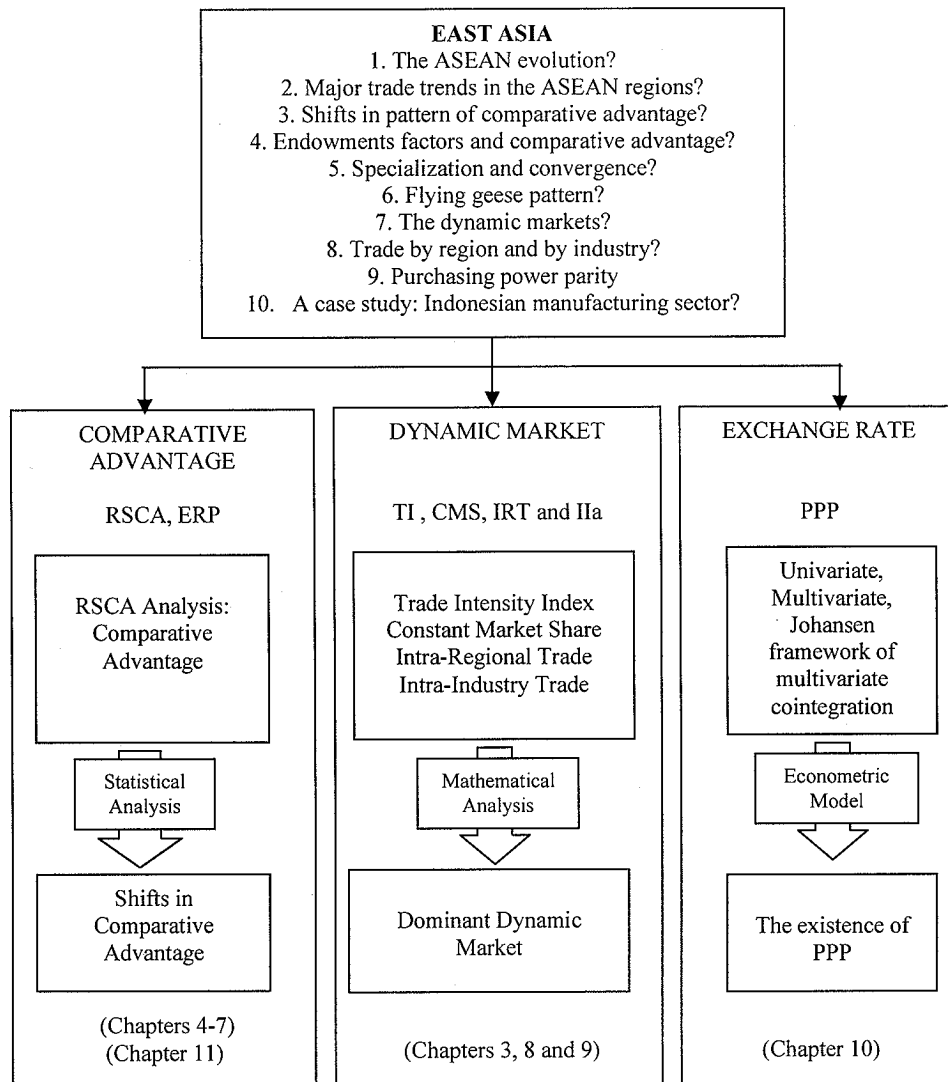


Figure 1. The Research Framework

Some common analytical tools are applied, such as Trade Intensity (TI) index, Revealed Symmetric Comparative Advantage (RSCA), Spearman's rank correlation, Trade Balance Index (TBI), Econometric model, Constant Market Shares (CMS), Intra-regional trade (IRT) and Intra-industry trade (IIa) and Effective Rate of Protection (ERP). However, this thesis contributes to the analytical tools. *First*, this thesis proposes a new

method in analyzing convergence of comparative advantage between two countries, i.e. by conducting the stationary test on Spearman's rank correlation coefficients between the two countries' RSCA (Chapter 4). *Second*, this thesis introduces dummy variables (across countries and across industries) in the econometric model that is commonly applied to examine countries' dynamic specialization (Laursen, 1998; Wörz, 2005) (Chapter 6).

Table 1. Analytical Tools and Case Studies

Analytical Tools and Case Studies	Chapters											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Analytical Tools												
- Descriptive statistic		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
- TI			⊙									
- RSCA				⊙	⊙	⊙	⊙				⊙	
- Spearman's rank corr.				⊙		⊙						
- TBI							⊙					
- Econometric Model				⊙			⊙			⊙		
- CMS								⊙				
- IRT and Iia			⊙						⊙			
- Mathematical approach					⊙			⊙				
- ERP											⊙	
2. Case Studies												
a. ASEAN		⊙	⊙	⊙								
- Singapore		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Indonesia		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
- Malaysia		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Thailand		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- the Philippines		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Brunei D.		⊙	⊙									
- Vietnam		⊙	⊙									
- Lao		⊙	⊙									
- Myanmar		⊙	⊙									
- Cambodia		⊙	⊙									
b. North East Asia												
- Japan				⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Korea				⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- China				⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Hong Kong								⊙	⊙	⊙		

Notes: TI = Trade Intensity Index, RSCA = Revealed Symmetric Comparative Advantage, TBI = Trade Balance Index, CMS = Constant Market Share, IRT = Intra-Regional Trade, Iia = Intra-Industry Trade, ERP = Effective Rate of Protection, ⊙ is applied.

Third, by combining RSCA and TBI, this thesis makes a new analytical tool, namely, 'products mapping', which is appropriate for analyzing the FG pattern (Chapter 7). *Fourth*, this thesis refines the CMS method by Leamer and Stern (1970) (Chapter 8). *Fifth*, this thesis modifies the formula of inter- and intra-industry trade by Grubel and

Lloyd (1975) to deal with the phenomena of inter- and intra-regional trade (Chapter 9). This modification formula will be referred to as Regional Intra-Industry Trade index.

Chapter 2 – The evolution of ASEAN

Chapter 2 shows the evolution of ASEAN. It might be argued that the ASEAN's interest has shifted from international-political issues to economic issues, especially on trade and investment. Institutional approach is mainly employed in this chapter to show the evolution. Historically, the ASEAN was established concerning the regional stability and political issues. However, parallel with the proliferation of economic regionalism in the world and the period of active trade liberalization in the 1980s and 1990s, the ASEAN has pushed economic cooperation forward.

The first effort on it was the establishment of the ASEAN Preferential Trading Arrangements (ASEAN-PTA). However, this initiative of forming the ASEAN-PTA was disappointing due to some factors such as the limited coverage of the PTA, the nature of intra-regional structure, which was competitive rather than complementary, and the diminishing urgency of pursuing the task because of the continued growth and development in the region. The further concrete effort toward regionalism was the ASEAN Free Trade Area (AFTA) launched in 1992 by the ASEAN. The AFTA will be created through the Common Effective Preferential Tariff (CEPT) Scheme. The schedule is flexible managed depending on the preferences of different countries over range of sectors.

The relative similarities in natures of the ASEAN's members, to some extent, give positive and negative implications. Brunei Darussalam and Singapore are the richest members in terms of GDP per capita but they do not have many labors, natural resources,

etc. In contrast, Indonesia is the biggest member in term of population but she does not have much capital, good services and so on. As result, there is no dominant member, which may be the ‘core’ member steering dominantly the institution. The ASEAN has frequently been criticized as an indulgent institution directed by weak peer pressure. However, it has proved to be a very successful model of economic cooperation and economic integration for developing countries.

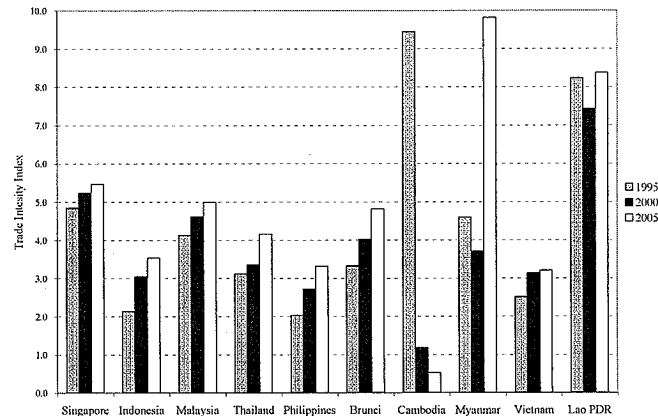
Chapter 3 – Major trade trends in the ASEAN region

The major trade trends in the ASEAN region are represented in **Chapter 3**. The establishment of the ASEAN Free Trade Area (AFTA) is proposed to increase the intra-regional trade. This chapter is addressed to answer some more detailed critical questions: What are the geographic destinations of the ASEAN exports? Does the country size matter in the intra-ASEAN trade? Which countries are more dependent upon the intra-ASEAN trade? How far have the geographic patterns of regional trade dependence changed? How intense is the intra-ASEAN trade? Statistic descriptive and static comparative methods such as share analysis, Pearson correlation and trade intensity (TI) index are used to examine the intra-regional trade and geographical export destinations. The standard TI index by Drysdale and Garnout (1982) is formulated as follows:

$$TI_{jk} = \frac{\left[\frac{x_{jk}}{X_j} \right]}{\left[\frac{x_{wk}}{X_w} \right]_t} \quad (1)$$

where TI_{jk} is trade intensity index of country j for export destination k ; x_{jk} and x_{wk} country j 's and world's exports to k , respectively. An index of more (less) than unity is

interpreted as indicating a bilateral trade flow is larger (smaller) than expected given the partner country's importance in world trade. Figure 2 shows the trade intensity index of the ASEAN countries.



Source: DOTS-IMF (1998, 2006), *author's calculation*.

Figure 2. Trade Intensity Index of the ASEAN

This chapter concludes that the geographic destination of the ASEAN countries' exports has slightly changed. Although Japan, the EU and the NAFTA are still dominant trade partners, the share of the ASEAN countries' exports to those trade partners decreased for 1995-2005. China, Hong Kong and Taiwan have significantly become a more important geographic destination of the ASEAN countries' exports. The ASEAN5 countries (Singapore, Malaysia, Thailand, Indonesia and the Philippines) have dominated the intra-regional trade in ASEAN region. There is a positive relationship between the size of country and the share of intra-regional trade in the ASEAN region. The intra-regional trade in the ASEAN region has been larger (intense) than expected given the ASEAN's importance in world trade, except Cambodia, which was currently very much engaged with the US market.

Chapter 4 – Shifts in comparative advantage

Chapter 4 analyzes the shifts in pattern of comparative advantage of the ASEAN5² (Singapore, Indonesia, Malaysia, Thailand and the Philippines), Japan, Korea and China (abbreviated as the ASEAN+3, from now on) by applying statistical method. This chapter is addressed to answer some particular questions: what sorts of exported products do the ASEAN+3 have comparative advantages? How far have comparative advantages of the ASEAN+3 shifted dynamically? Does the ASEAN's pattern of comparative advantages follow a sequential change similar to that of Japan, China, and Korea?

An indicator of comparative advantage, namely Revealed Symmetric Comparative Advantage (RSCA) by Laursen (1998) is applied in this chapter as well as the next three chapters. The RSCA index is a simple transformation of Revealed Comparative Advantage (RCA) or Balassa index (Balassa, 1965). The RCA and RSCA indices are formulated as follow:

$$RCA_{ij} = (x_{ij} / x_{in}) / (x_{rj} / x_{rn}) \quad (2)$$

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (3)$$

where RCA_{ij} denotes revealed comparative advantage of country i for group of products (Standard International Trade Classification, SITC) j . x_{ij} stands for total exports of country i in group of products (SITC) j . Subscript r denotes all countries without country i , and subscript n refers to all groups of products (SITC) excepting group of product j .

² The other ASEAN countries are excluded from the analysis due to unavailability of the data.

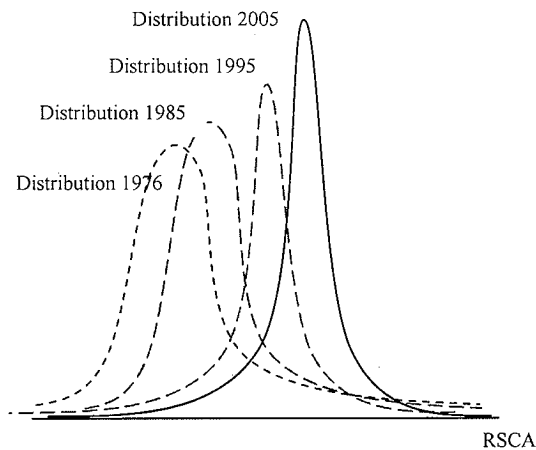
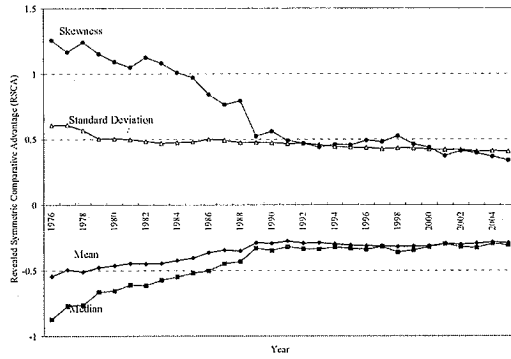


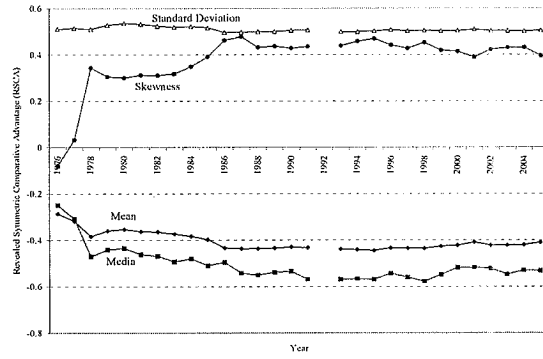
Figure 3. Shifting Comparative Advantage

Descriptive statistics (mean, median, standard deviation and correlation) are applied to summarize the RSCA across commodities (Standard International Trade Classification, SITC). Then, we might make a hypothesis that the ASEAN, Japan, Korea or China have more specialized or more concentrated on higher comparative advantage products over periods of observation (shown by higher value of means; smaller standard deviation and smaller value of skewness over time) as presented by Figure 3.

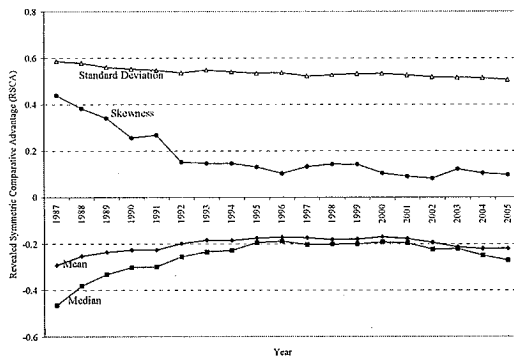
Figure 4 shows the empirical results. The increase in overall comparative advantage together with the decrease in the standard deviation implies that the increase in overall comparative advantage is encouraged by the higher increase in comparative advantage of products, which had no or lower comparative advantage in the past. The ASEAN, China and Korea may have a trade-off between specialization based on the existing comparative advantage (in low technological groups of products) and shifting to the other products in which they currently lack a comparative advantage, but may acquire such an advantage in the future as a result of the potential for productivity growth (in high technology groups of products which Japan has specialized in).



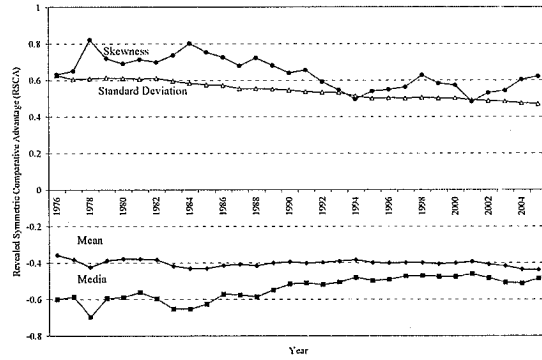
(a) the ASEAN



(b) Japan



(a) China



(b) Korea

Source: UN-COMTRADE, author's calculation.

Figure 4. Trend in Mean, Median, Standard Deviation and Skewness of Comparative advantages

This chapter also applies statistical hypothesis test procedure of correlation on the RSCA index to examine the shifts in the patterns of comparative advantage. The degree of linear association between the two series of RSCA can be compared by the Spearman's rank correlation coefficient, which is given as follows (Leu, 1998; James and Movshuk, 2003; Gujarati, 2000):

- Across periods (years):

$$\rho_{s, Ct_a, Ct_b} = 1 - 6 \left[\frac{\sum_{i=1}^n d_{R_{it}}^2}{n(n^2 - 1)} \right] \quad (4)$$

- Across countries:

$$\rho_{s,Ct_a,It_b} = 1 - 6 \left[\frac{\sum_{i=1}^n d_{R_{ji}}^2}{n(n^2 - 1)} \right] \quad (5)$$

Where:

ρ_{s,Ct_a,Ct_b} = 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).

ρ_{s,Ct_a,It_b} = the Spearman's rank correlation coefficient between country C's RSCA at time t_a (symbol: Ct_a) and country I's RSCA at time t_b (symbol: It_b).

$d_{R_j}^2 = \left(R_{RSCA_{jC,t_a}} - R_{RSCA_{jC,t_b}} \right)^2$ for across periods (years).

$d_{R_j}^2 = \left(R_{RSCA_{jC,t_a}} - R_{RSCA_{jI,t_b}} \right)^2$ for across countries.

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

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

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

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

t_a and t_b is time

The values of Spearman's rank correlation coefficients range from -1 (a perfect negative relationship) to $+1$ (a perfect positive relationship). Within a specific country, it is applied across periods to analyze the dynamic shift in comparative advantage. If the correlation is closer to one ($+1$), the shift in comparative advantage is less dynamic. In contrast, if it is closer to minus one (-1), the shift in comparative advantage is more dynamic. Table 2 shows the empirical results. All countries exhibit slower rate of change in the pattern of comparative advantage.

The rank correlation is also applied across countries i.e. the ASEAN, Japan, Korea and China to see the association of the pattern of comparative advantage. Higher positive value of Spearman's correlation coefficient indicates stronger competition

between two countries in the export market (more similar pattern of comparative advantage), *vice versa*.

Table 2. Spearman's Rank Correlation Coefficient across Periods

		ASEAN			
		Comparative Advantage			
		1976	1985	1995	2005
ASEAN Comparative Advantage	1976	1.00	0.54*	0.40*	0.24*
	1985	0.54*	1.00	0.76*	0.61*
	1995	0.40*	0.76*	1.00	0.83*
	2005	0.24*	0.61*	0.83*	1.00

(a)

		Japan			
		Comparative Advantage			
		1976	1985	1995	2005
Japan Comparative Advantage	1976	1.00	0.92*	0.86*	0.82*
	1985	0.92*	1.00	0.92*	0.84*
	1995	0.86*	0.92*	1.00	0.95*
	2005	0.82*	0.84*	0.95*	1.00

(b)

		Korea			
		Comparative Advantage			
		1976	1985	1995	2005
Korea Comparative Advantage	1976	1.00	0.78*	0.56*	0.34*
	1985	0.78*	1.00	0.78*	0.57*
	1995	0.56*	0.78*	1.00	0.82*
	2005	0.34*	0.57*	0.82*	1.00

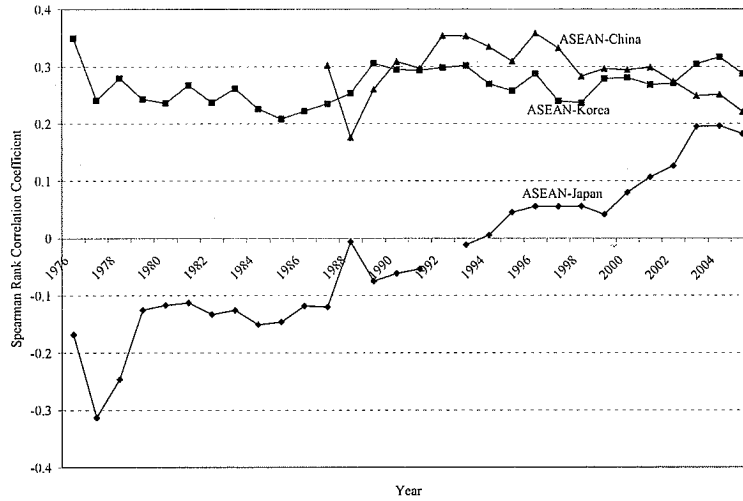
(c)

		China			
		Comparative Advantage			
		1987	1995	2005	
China Comparative Advantage	1987	1.00	0.68*	0.48*	
	1995	0.68*	1.00	0.81*	
	2005	0.48*	0.81*	1.00	

(d)

Note: * significant at 1 percent level of significance
Source: UN-COMTRADE, *author's calculation*.

Figure 5 shows trends of the Spearman's rank correlation coefficient between the ASEAN's comparative advantage and that of Japan, Korea as well as China. The coefficients of the ASEAN-China and the ASEAN-Korea were positive during the periods of observation. In the case of the ASEAN-Japan, up to 1994 there had been negative values in the coefficients correlation, which implied complementary relationship in the patterns of comparative advantage. However, since 1995 the correlation coefficients have become positive and approached 0.2 (statistically significant) in 2003.



Source: UN-COMTRADE, author's calculation.

Figure 5. Spearman's Rank Correlation Coefficient the ASEAN+3

An interesting issue regarding the relationship of comparative advantage pattern between the ASEAN and Japan; the ASEAN and China; or the ASEAN and Korea is whether a long term equilibrium relationship exists or not. In other words, do they have a certain level of similarity in their patterns of comparative advantage in the long run? This chapter applies a stationary test on the correlation series, namely Augmented Dickey-Fuller (ADF) test. The ADF test constructs a parametric correction of the typical Dickey-Fuller test for highest-order correlation by assuming that the series (in this research the Spearman's rank correlation coefficients, ρ) follows autoregressive model with order p - denoted as AR(p)- process and adding lagged difference terms of the dependent variable ρ_t to the right hand side of original test regression (Enders, 1995; Gujarati, 2000), as described as follows:

$$\Delta\rho_t = \beta_0 + \beta_1\rho_{t-1} + \sum_{i=1}^p \alpha_i \Delta\rho_{t-i} + \delta t + \varepsilon_t \quad (6)$$

where t and ε_t are time and the error term, respectively. The ρ_t is non-stationary if we accept the hypothesis (H_0) saying that $\beta_1=0$. In contrast, the ρ_t is stationary if we reject

the hypothesis (H_0) saying that $\beta_1=0$. For testing the hypothesis, it follows conventional

Student's t-distribution $t_{\beta_1} = \frac{\beta_1}{se(\beta_1)}$ and it is compared with the MacKinnon (1991, 1996)

critical value.

Table 3 represents the results of the ADF stationary tests on correlation of comparative advantage between the ASEAN and Japan; the ASEAN and Korea; as well as the ASEAN and China. Since the ADF test statistics more than the chosen critical values (1 percent, 5 percent, and 10 percent), we accept the hypothesis (H_0) saying that the correlation coefficient series (ASEAN-Japan; ASEAN-Korea and ASEAN-China) are non stationary series. This research, therefore, indicates that the comparative advantage pattern should be seen in dynamic sense.

Table 3. Stationary Test on Pattern of Comparative Advantage

Pattern of Comparative Advantage	ADF Test Statistic	Level of Significance	Critical Value	Conclusions
ASEAN-Japan	-3.11	1%	-4.37	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		5%	-3.60	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		10%	-3.24	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
ASEAN-Korea	-2.36	1%	-4.36	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		5%	-3.59	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		10%	-3.23	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
ASEAN-China	-2.80	1%	-4.73	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		5%	-3.76	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		10%	-3.32	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)

Source: UN-COMTRADE, *author's calculation.*

Chapter 5 – Factor endowments and comparative advantage

Chapter 5 discusses a more theoretical issue on the relation between a country's factor endowments and its comparative advantage. Factor endowments play important roles in international trade. This chapter describes the Heckscher-Ohlin theory in the general equilibrium (GE) framework. In the H-O model, there are nine strict assumptions (Appleyard and Field, 2001): (1) there are two countries, (2) technology is identical in both countries; that is, production functions are the same in both countries, (3) production function is characterized by constant return to scale (CRS) for both commodities in both countries, (4) the two commodities have different factor intensities, and the respective commodity factor intensities are the same for all factor price ratios, (5) tastes and preferences (utility functions) are the same in both countries. In addition, there are homothetic tastes and preferences, (6) markets are in perfect competition in both countries, (7) factors of production are perfectly mobile within each country and immobile between two countries, (8) transportation costs are zero, (9) there are no trade barriers or any policy restrictions on the movements of goods between two countries or interfering with the market determination of prices and output. By using numerical examples, this chapter shows that the H-O theorem does not necessarily hold when assumptions on production and consumption are violated.

Countries in the East Asian region have large discrepancies in the factor endowments. By applying Revealed Symmetric Comparative (RSCA) index, this chapter shows that China, Indonesia and Thailand have comparative advantage in *unskilled labor*-intensive industry, meanwhile only Japan has comparative advantage in *technology*-intensive industry for the last two decades.

Chapter 6 – Dynamic specialization and convergence in Trade Pattern

The dynamic specialization and convergence in trade patterns of the East Asian countries are represented in **Chapter 6**. Theoretically, there are four possible combinations between trade specialization and trade-pattern convergence i.e. more-specialized together with diverging trade patterns (Case 1); less-specialized together with converging trade patterns (Case 2); more-specialized together with converging trade patterns (Case 3); and less-specialized together with diverging trade patterns (Case 4). The East Asian region consists of diverse economies. Accordingly, one main question intended to answer is: in which cases East-Asian economies are laid? In Cases 1, 2, 3 or 4?

Specialization	Increasing	Case 1: Increasing Specialization Diverging trade pattern across countries	Case 3: Increasing Specialization Converging trade pattern across countries
	Decreasing	Case 4: Decreasing Specialization Diverging trade pattern across countries	Case 2: Decreasing Specialization Converging trade pattern across countries
		Diverging	Converging
		Trade-Pattern Convergence	

Figure 6. Four Possible Combinations: Specialization and Convergence

An econometric model is used to examine the dynamics of comparative advantage across countries and across products. The following simple regression model is usually used to estimate the dynamics of comparative advantage (Laursen, 1998; Wörz, 2005):

$$RSCA_{ij,T} = \alpha + \beta RSCA_{ij,0} + \varepsilon_{ij} \quad (7)$$

where $RSCA_{ij,T}$ and $RSCA_{ij,0}$ are Revealed Symmetric Comparative Advantage of country i in product j for years T and 0 , respectively. The coefficient β indicates whether

existing comparative advantage or specialization patterns have been reinforced or not during the observation. If β is not significantly different from one ($\beta=1$), there is no change in the overall degree of specialization. $\beta>1$ indicates increased specialization of the respective country. $0<\beta<1$ indicates despecialization – that is, a country has gained comparative advantage in industries where it did not specialize and has lost competitiveness in those industries where it was initially heavily specialized (Wörz, 2005). In the event of $\beta\leq 0$, no reliable conclusion can be drawn on purely statistical grounds; the specialization pattern is either random, or it has been reversed.

It might be believed that the dynamics in specialization across countries and across industries are different. To examine this issue in the East Asian countries, this chapter adds dummy variables for countries (D_i^C) into equation (7)³:

$$RSCA_{ij,T} = \alpha + \beta RSCA_{ij,0} + \sum_{i=1}^7 \gamma_i (D_i^C RSCA_{ij,0}) + \omega_{ij} \quad (8)$$

Where $RSCA_{ij,T}$ and $RSCA_{ij,0}$ are Revealed Symmetric Comparative Advantage for product j of country i at year T and 0 , respectively, ω_j are white noise error terms, α, β, γ_i are constants and parameters estimated and D_i^C is dummy variable for countries. Since there are eight countries to be compared, there must be seven country dummy variables:

³ This chapter uses RSCA instead of RCA for some reasons proposed by Volrath (1991), Laursen (1998) Aiginger (1999) and Wörz (2005) among others. *First*, RCA is basically not comparable on both side of unity since the index ranges from zero to infinity. A country is said not to be specialized in a given product if the index ranges from zero to one. In contrast, a country is said to be specialized in a given product if the index ranges from one to infinity. *Second*, if RCA is used in estimating the econometric model, one might obtain biased estimates. RCA has disadvantage of an inherent risk of lack of normality. A skewed distribution violates the assumption of normality of the error term in regression analysis, thus not providing reliable inferential statistics. *Third*, the use of RCA in regression analysis gives much more weight to values above one, when compared to observation below one.

$$D_1^c = \begin{cases} 1 & \text{Korea} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_2^c = \begin{cases} 1 & \text{China} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_3^c = \begin{cases} 1 & \text{Singapore} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_4^c = \begin{cases} 1 & \text{Indonesia} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_5^c = \begin{cases} 1 & \text{Malaysia} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_6^c = \begin{cases} 1 & \text{Thailand} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_7^c = \begin{cases} 1 & \text{Philippine} \\ 0 & \text{Otherwise} \end{cases}$$

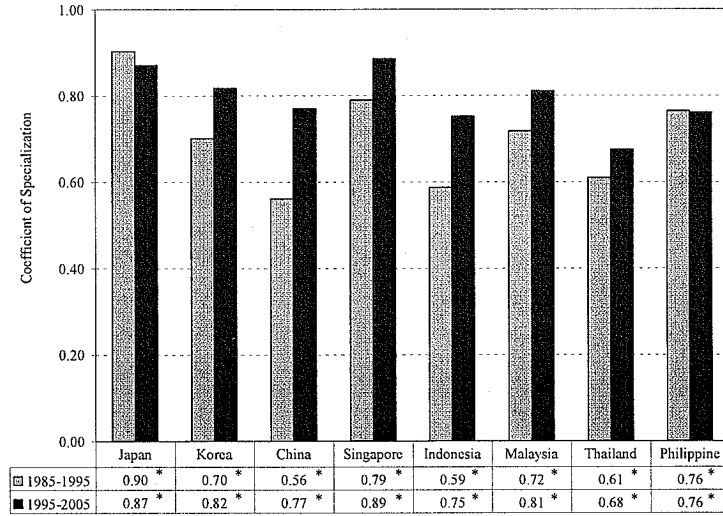
Table 4. Estimation Result: Specialization across Countries

Variable	Periods			
	1985-1995		1995-2005	
	Coefficient	Standard Error	Coefficient	Standard Error
Constant	-0.071*	0.016	-0.069*	0.013
Specialization (Japan)	0.903*	0.023	0.871*	0.022
Country Dummy 1 (Korea=1)	-0.201*	0.040	-0.053	0.034
Country Dummy 2 (China=1)	-0.341*	0.049	-0.100**	0.040
Country Dummy 3 (Singapore=1)	-0.113**	0.043	0.015	0.029
Country Dummy 4 (Indonesia=1)	-0.315*	0.040	-0.118*	0.031
Country Dummy 5 (Malaysia=1)	-0.185*	0.038	-0.060	0.026
Country Dummy 6 (Thailand=1)	-0.293*	0.048	-0.195*	0.038
Country Dummy 7 (Philippine=1)	-0.138*	0.039	-0.110*	0.041
R-squared	0.554		0.676	
Durbin-Watson Statistic	1.514		1.650	
F-statistic	289.233		485.625	
Method of estimation	Newey-West HAC Standard Errors and Covariance		Newey-West HAC Standard Errors and Covariance	

Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. HAC is Heteroscedasticity and Autocorrelation Consistent Covariance.

Source: UN-COMTRADE, *author's calculation*.

Table 4 and Figure 7 show the estimation result of the econometric model (8). All coefficients of countries dummy variable in both periods 1985-1995 and 1995-2005 are negative (except country dummy 3 (Singapore=1) for 1995-2005) and statistically significant (except country dummy 1 (Korea=1) and country dummy 5 (Malaysia=1) for 1995-2005). All countries exhibit decreases in specialization since the coefficients of specialization are statistically less than one.



Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. Source: UN-COMTRADE, *author's calculation*.

Figure 7. Coefficient of Specialization

Dynamic specialization might be different across industries. It might be generally believed that comparative advantage in primary and natural-resource intensive industry changes very little compared with unskilled-labor intensive industry, technology-intensive industry and human-capital intensive industry. To deal with this issue, a little modification of econometric model (7) is done by adding dummy variables for industries D_i^p as follows:

$$RSCA_{j,T} = \phi + \eta RSCA_{j,0} + \sum_{k=1}^4 \delta_k (D_k^p RSCA_{j,0}) + \varepsilon_j \quad (9)$$

where $RSCA_{j,T}$ and $RSCA_{j,0}$ are Revealed Symmetric Comparative Advantage for product j at years T and 0 , respectively, ε_j are white noise error terms, α, β, δ_k are constant and estimated parameters; D_i^p are dummy variables for industries. Since there are five categories of industries, four country dummy variables are set:

$$D_1^p = \begin{cases} 1 & \text{Natural – resource intensive industry} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_2^p = \begin{cases} 1 & \text{Unskilled – labor intensive industry} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_3^p = \begin{cases} 1 & \text{Technology intensive industry} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_4^p = \begin{cases} 1 & \text{Human – capital intensive industry} \\ 0 & \text{Otherwise} \end{cases}$$

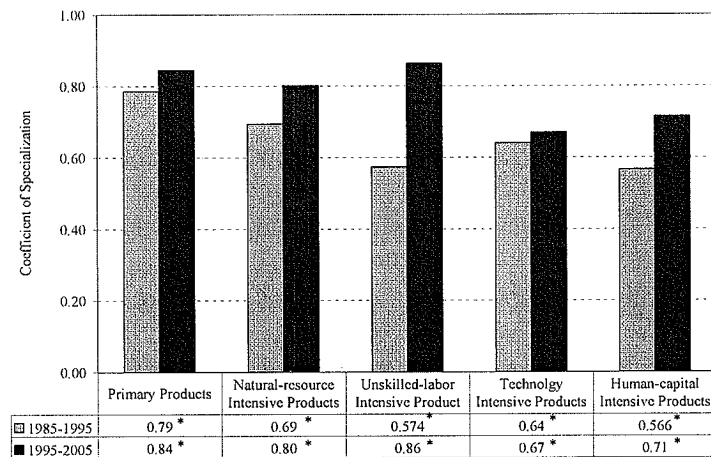
Table 5. Estimation Result: Specialization across Products

Variable	Period			
	1985-1995		1995-2005	
	Coefficient	Standard Error	Coefficient	Standard Error
Constant	-0.081*	0.016	-0.078*	0.013
Specialization (Primary)	0.785*	0.024	0.845*	0.017
Product Dummy 1 (Natural-resource)	-0.091**	0.042	-0.043	0.029
Product Dummy 2 (Unskilled-labor)	-0.211*	0.073	0.019	0.036
Product Dummy 3 (Technology)	-0.145*	0.033	-0.176*	0.027
Product Dummy 4 (Human-capital)	-0.219*	0.034	-0.130*	0.032
R-squared	0.548		0.679	
Durbin-Watson Statistic	1.497		1.657	
F-statistic	453.195		791.010	
Method of estimation	Newey-West HAC Standard Errors and Covariance		Newey-West HAC Standard Errors and Covariance	

Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. HAC is Heteroscedasticity and Autocorrelation Consistent Covariance.

Source: UN-COMTRADE, *author's calculation*.

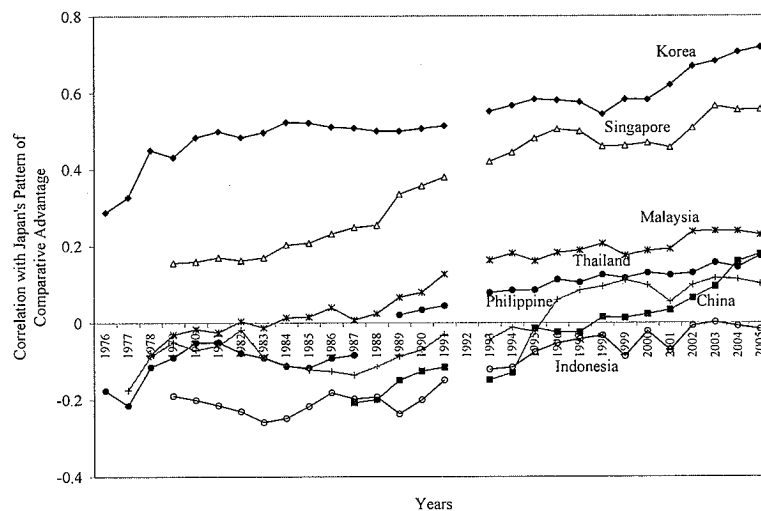
Table 5 and Figure 8 show the estimation results of the econometric model (9). All industries represent decreases in their specialization since the coefficients of specialization statistically are less than one. In general, comparing the two periods, despecialization in 1985-1995 was more dynamic than despecialization in 1995-2005. *Primary* industries and *natural resource*-intensive industries had higher coefficients of specialization.



Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. Source: UN-COMTRADE, *author's calculation*.

Figure 8. Coefficient of Specialization: Across Products

This chapter also applies the Spearman's rank correlation to examine convergence of the specialization patterns in the East Asia. Figure 9 exhibits the trend in the correlation of specialization patterns between Japan and other countries. It can be firmly stated that there have been a nice positive trend in the correlation. It implies that the all countries' patterns of specialization have become similar with that of Japan. In other words, there is convergence in the patterns of specialization.



Source: UN-COMTRADE, *author's calculation*.

Figure 9. Trends in Correlation of Specialization Pattern between Japan and Individual Countries

Some conclusions are withdrawn. *First*, all countries show despecialization with differences in speed. It implies that all East Asian countries have boosted products with low comparative advantage in the past, to have relatively higher comparative advantage in the future. China, Thailand and Indonesia have more dynamic in their despecialization. *Second*, the East Asian countries have also shown despecialization across industries. *Human capital*-intensive industries represent most dynamic despecialization during 1985-1995 compared with the other industries. Currently, *technology*-intensive industries have most dynamic despecialization. For all industries, despecialization in period 1985-1995 was more dynamic than that in period 1995-2005.

Chapter 7 – ‘Flying Geese’ and ‘Products Mapping’

Chapter 7 analyzes the comparative advantage of the ASEAN+3 countries on factor intensity classification i.e. *primary*-products, natural *resource*-intensive products, *unskilled labor*-intensive products, *human capital*-intensive products and *technology*-intensive products. To investigate the existence of FG pattern in the East Asia, this chapter proposes an analytical tool namely “products mapping”. This tool combines the RSCA and Trade Balance Index (TBI). The TBI is formulated as follows:

$$TBI_{ij} = (x_{ij} - m_{ij}) / (x_{ij} + m_{ij}) \quad (10)$$

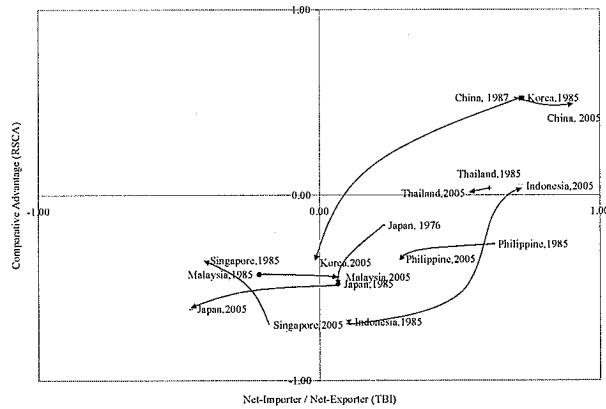
By combining RSCA and TBI, there are four categories, which a specific product might lie in i.e.: having comparative advantage and having specialization; having comparative advantage but no specialization; having specialization but no comparative advantage; no comparative advantage and no specialization as depicted in Figure 10.

Revealed Symmetric Comparative Advantage Index (RSCA)	RSCA > 0	Group B: Have Comparative Advantage No Export-Specialization (net-importer) (RSCA > 0 and TBI < 0)	Group A: Have Comparative Advantage Have Export-Specialization (net-exporter) (RSCA > 0 and TBI > 0)
	RSCA < 0	Group D: No Comparative Advantage No Export-Specialization (net-importer) (RSCA < 0 and TBI < 0)	Group C: No Comparative Advantage Have Export-Specialization (net-exporter) (RSCA < 0 and TBI > 0)
		TBI < 0	TBI > 0
Trade Balance Index (TBI)			

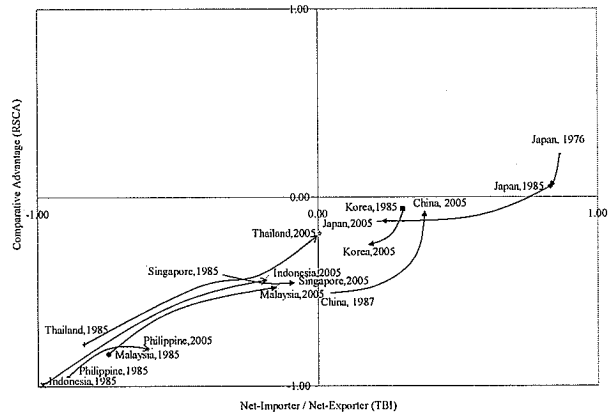
Figure 10. Products Mapping

By using the “products mapping”, this chapter describes the existence of FG formation in the pattern of comparative advantage. The products of the FG pattern in the past, current and future are also presented. In Figures 11, panels (a), (b) and (c) show the results of “products mapping” for the East Asian countries by the industries. These figures are obtained by following three stages. *Firstly*, the RSCA and TBI indexes for each SITC are calculated. *Secondly*, the median of RSCA and TBI indexes for each industry classification are calculated. *Thirdly*, for each industries classification, the median RSCA and TBI indexes are plotted into the “products mapping” (in Figure 10) for two year observations i.e. 1985 and 2005. From Figures 11 it might be argued that *unskilled labor*-intensive industries are in the first round, *human capital*-intensive industries are in the second round and *technology*-intensive industries are in the third round of the FG pattern in the East Asian region.

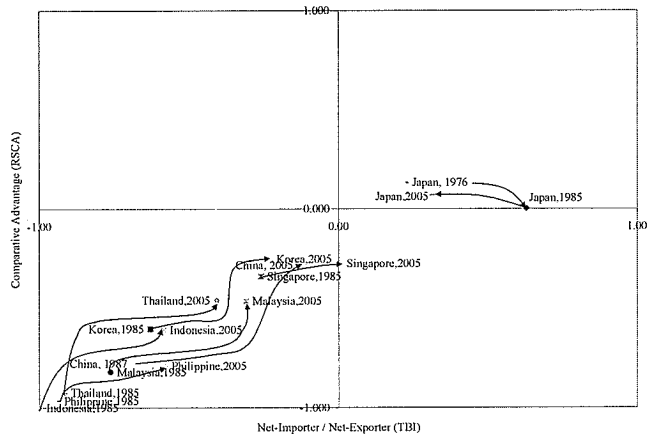
(a) *Unskilled labor-intensive industries*



(b) *Human capital-intensive industries*

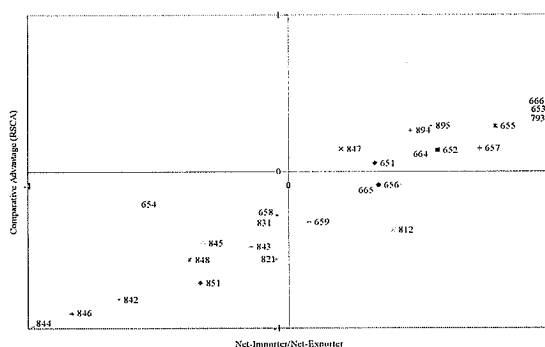


(c) *Technology-intensive industries*

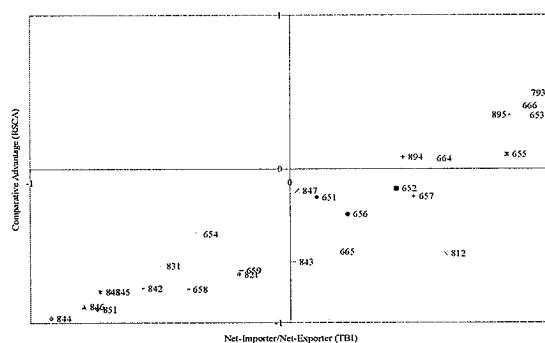


Source: UN-COMTRADE, author's calculation.

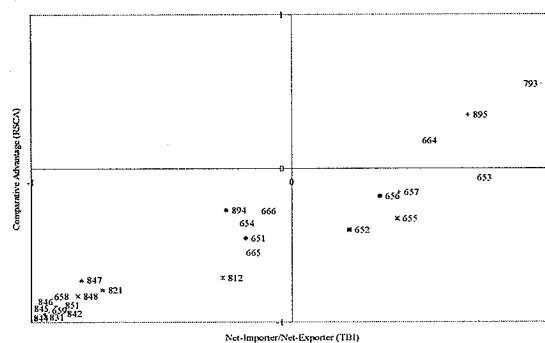
Figure 11. The East Asia FG Pattern



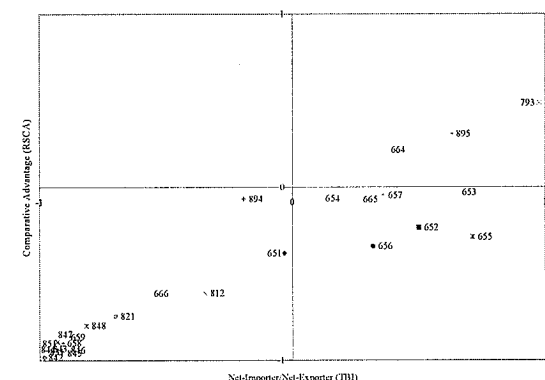
(a) 1976



(a) 1985



(b) 1995



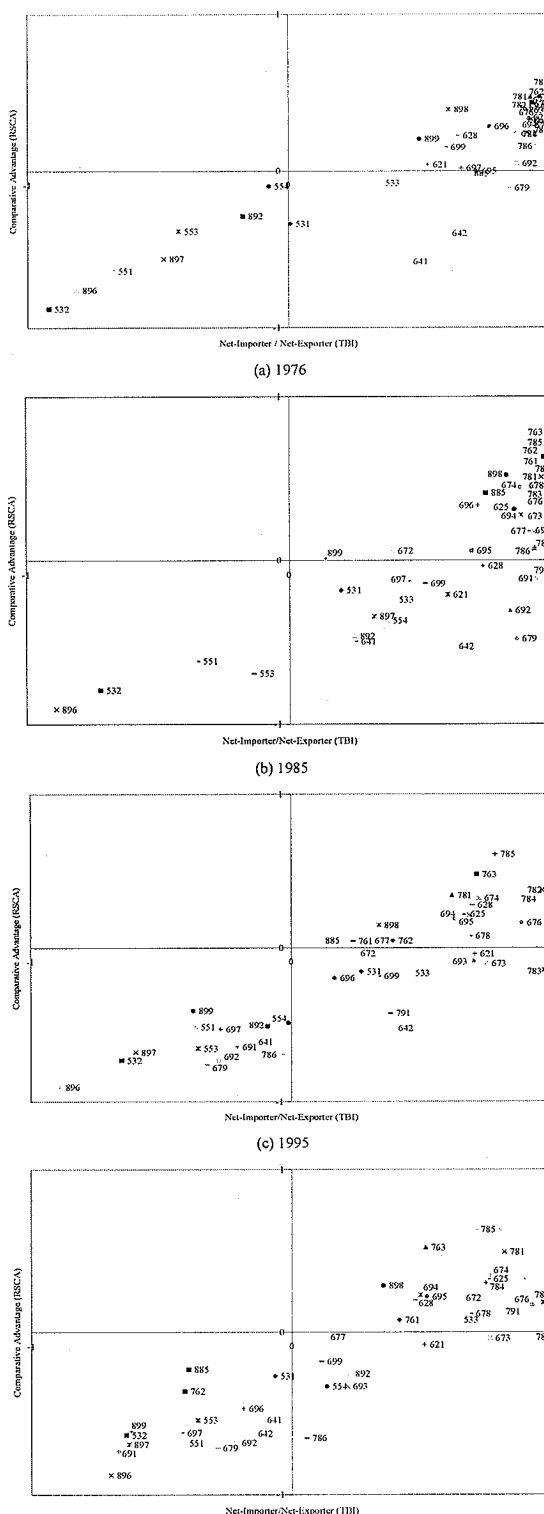
(d) 2005

Notes

SITC	Commodity Description
651	Textile yarn
652	Cotton fabrics, woven (not including narrow or special fabrics)
653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)
654	Textile fabrics, woven, other than cotton or man-made fibres
655	Knitted or crocheted fabrics (including tubular, etc, fabrics)
656	Tulle, lace, embroidery, ribbons, trimmings and other small wares
657	Special textile fabrics and related products
658	Made-up articles, wholly or chiefly of textile materials, nes
659	Floor coverings, etc
664	Glass
665	Glassware
666	Pottery
793	Ships, boats and floating structures
812	Sanitary, plumbing, heating, lighting fixtures and fittings, nes
821	Furniture and parts thereof
831	Travel goods, handbags etc, of leather, plastics, textile, others
842	Men's and boys' outerwear, textile fabrics not knitted or crocheted
843	Womens, girls, infants outerwear, textile, not knitted or crocheted
844	Under garments of textile fabrics, not knitted or crocheted
845	Outerwear knitted or crocheted, not elastic nor rubberized
846	Under-garments, knitted or crocheted
847	Clothing accessories, of textile fabrics, nes
848	Articles of apparel, clothing accessories, non-textile, headgear
851	Footwear
894	Baby carriages, toys, games and sporting goods
895	Office and stationary supplies, nes

Source: UN-COMTRADE, *author's calculation*

Figure 12. The “Products Mapping” of Japan’s *Unskilled Labor-Intensive* Industries: 1976, 1985, 1995 and 2005



Notes

SITC	Commodity Description
531	Synthetic dye, natural indigo, lakes
532	Dyeing and tanning extracts, and synthetic tanning materials
533	Pigments, paints, varnishes and related materials
551	Essential oils, perfume and flavour materials
553	Perfumery, cosmetics, toilet preparations, etc
554	Soap, cleansing and polishing preparations
621	Materials of rubber
625	Rubber tires, tire cases, inner and flaps, for wheels of all kinds
628	Articles of rubber, nes
641	Paper and paperboard
642	Paper and paperboard, precut, and articles of paper or paperboard
672	Ingots and other primary forms, of iron or steel
673	Iron and steel bars, rods, shapes and sections
674	Universals, plates, and sheets, of iron or steel
676	Rails and railway track construction materials, of iron or steel
677	Iron or steel wire (excluding wire rod), not insulated
678	Tube, pipes and fittings, of iron or steel
679	Iron, steel casting, forging and stamping, in the rough state, nes
691	Structures and parts, nes, of iron, steel or aluminium
692	Metal containers for storage and transport
693	Wire products (excluding insulated electrical wire), fencing grills
694	Nails, screws, nuts, bolts, rivets, etc, of iron, steel or copper
695	Tools for use in the hand or in machines
696	Cutlery
697	Household equipment of base metal, nes
699	Manufactures of base metal, nes
761	Television receivers
762	Radio-broadcast receivers
763	Gramophones, dictating machines and other sound recorders
781	Passenger motor vehicles (excluding buses)
782	Lorries and special purposes motor vehicles
783	Road motor vehicles, nes
784	Motor vehicle parts and accessories, nes
785	Cycles, scooters, motorized or not; invalid carriages
786	Trailers, and other vehicles, not motorized, nes
791	Railway vehicles and associated equipment
885	Watches and clocks
892	Printed matter
896	Works of art, collectors' pieces and antiques
897	Gold, silver ware, jewelry and articles of precious materials, nes
898	Musical instruments, parts and accessories thereof
899	Other miscellaneous manufactured articles, nes

Source: UN-COMTRADE, *author's calculation*

Figure 13. The “products mapping” of Japan’s human capital-intensive industries: 1976, 1985, 1995 and 2005

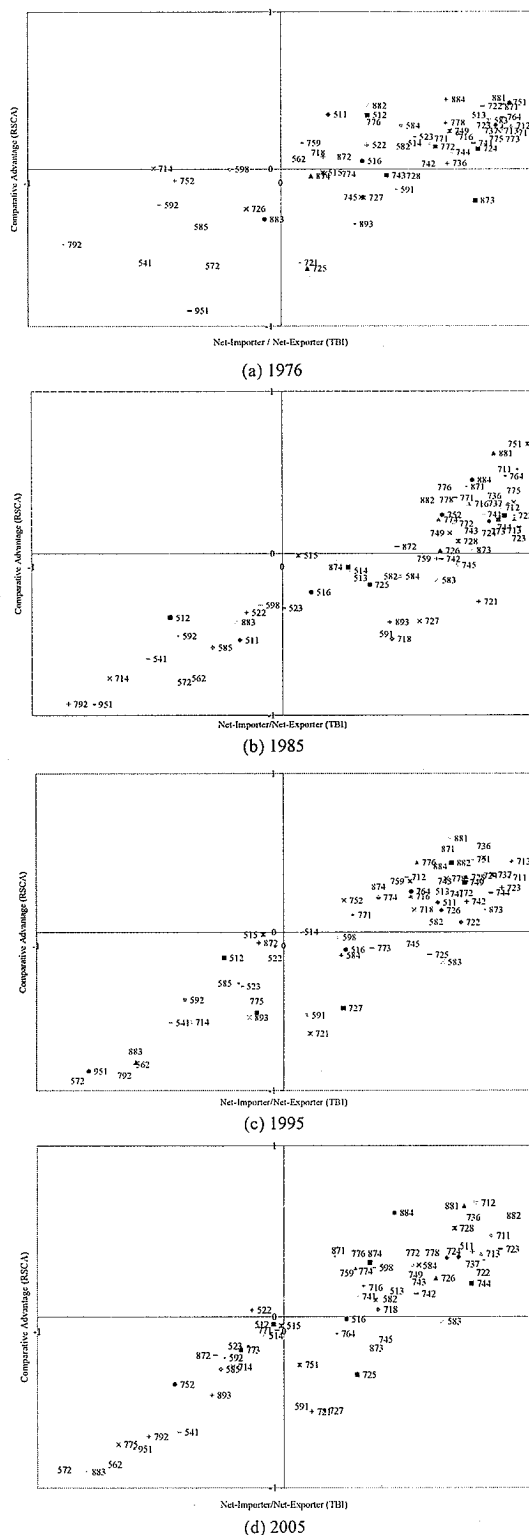


Figure 14. The “products mapping” of Japan’s *technology-intensive* industries: 1976, 1985, 1995 and 2005

Notes;

- SITC Commodity Description
- 511 Hydrocarbons, nes, and derivatives
 - 512 Alcohols, phenols etc, and their derivatives
 - 513 Carboxylic acids, and their derivatives
 - 514 Nitrogen-function compounds
 - 515 Organo-inorganic and heterocyclic compounds
 - 516 Other organic chemicals
 - 522 Inorganic chemical elements, oxides and halogen salts
 - 523 Other inorganic chemicals; compounds of precious metals
 - 541 Medicinal and pharmaceutical products
 - 562 Fertilizers, manufactured
 - 572 Explosives and pyrotechnic products
 - 582 Condensation, polycondensation and polyaddition products
 - 583 Polymerization and copolymerization products
 - 584 Regenerated cellulose; derivatives of cellulose; vulcanized fibre
 - 585 Other artificial resins and plastic materials
 - 591 Pesticides, disinfectants
 - 592 Starches, insulin and wheat gluten; albuminoid substances; glues
 - 598 Miscellaneous chemical products, nes
 - 711 Steam boilers and auxiliary plant; and parts thereof, nes
 - 712 Steam engines, turbines
 - 713 Internal combustion piston engines, and parts thereof, nes
 - 714 Engines and motors, non-electric; parts, nes; group 714, item 71888
 - 716 Rotating electric plant and parts thereof, nes
 - 718 Other power generating machinery and parts thereof, nes
 - 721 Agricultural machinery (excluding tractors) and parts thereof, nes
 - 722 Tractors (other than those falling in heading 74411 and 7832)
 - 723 Civil engineering, contractors' plant and equipment and parts, nes
 - 724 Textile and leather machinery, and parts thereof, nes
 - 725 Paper and paper manufacture machinery, and parts thereof, nes
 - 726 Printing, bookbinding machinery, and parts thereof, nes
 - 727 Food-processing machines (non-domestic) and parts thereof, nes
 - 728 Other machinery, equipment, for specialized industries; parts nes
 - 736 Metalworking machine-tools, parts and accessories thereof, nes
 - 737 Metalworking machinery (other than machine-tools), and parts, nes
 - 741 Heating and cooling equipment and parts thereof, nes
 - 742 Pumps for liquids; liquid elevators; and parts thereof, nes
 - 743 Pumps, compressors; centrifuges; filtering apparatus; etc, parts
 - 744 Mechanical handling equipment, and parts thereof, nes
 - 745 Other non-electric machinery, tools and mechanical apparatus, nes
 - 749 Non-electric parts and accessories of machinery, nes
 - 751 Office machines
 - 752 Automatic data processing machines and units thereof
 - 759 Parts, nes of and accessories for machines of headings 751 or 752
 - 764 Telecommunication equipment, nes; parts and accessories, nes
 - 771 Electric power machinery, and parts thereof, nes
 - 772 Electrical apparatus for making and breaking electrical circuits
 - 773 Equipment for distribution of electricity
 - 774 Electro-medical and radiological equipment
 - 775 Household type equipment, nes
 - 776 Thermionic, microcircuits, transistors, valves, etc
 - 778 Electrical machinery and apparatus, nes
 - 792 Aircraft and associated equipment, and parts thereof, nes
 - 871 Optical instruments and apparatus
 - 872 Medical instruments and appliances, nes
 - 873 Meters and counters, nes
 - 874 Measuring, checking, analysis, controlling instruments, nes, parts
 - 881 Photographic apparatus and equipment, nes
 - 882 Photographic and cinematographic supplies
 - 883 Cinematograph film, exposed and developed
 - 884 Optical goods nes
 - 893 Articles, nes of plastic materials
 - 951 Armoured fighting vehicles, war firearms, ammunition, parts, nes

Source: UN-COMTRADE, *author's calculation*

Most *unskilled labor*-intensive industries and several *human capital*-intensive industries have been transferred from Japan as the lead goose to the other East Asian countries as the follower geese. Figure 12, 13 and 14 show that the industries (SITC) might be potentially transferred in the future.

Chapter 8 – Export Performance: Constant Market Shares Analysis

Chapter 8 describes the analysis of the East Asian countries' dynamic export market. Constant Market Shares (CMS) method is applied. The CMS method by Leamer and Stern (1970) is formulated as follows:

$$\begin{aligned}
 V_{..}^{At} - V_{..}^{A0} &= \sum_i \sum_j r_{ij} V_{ij}^{A0} + \sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \\
 &\equiv r V_{..}^{A0} + \sum_i (r_i - r) V_{i.}^{A0} + \sum_i \sum_j (r_{ij} - r_i) V_{ij}^{A0} + \sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \quad (11) \\
 &\quad (a) \qquad \qquad (b) \qquad \qquad (c) \qquad \qquad (d)
 \end{aligned}$$

where $V_{i.}^{A0}$ and $V_{i.}^{At}$ are the values of country A's exports of commodity i in the periods 0 and t, respectively; $V_{.j}^{A0}$ and $V_{.j}^{At}$ represent values of country A's exports to country j in period 0 and t, respectively; V_{ij}^{A0} and V_{ij}^{At} are the values of country A's exports of commodity i to country j in period 0 and t, respectively; r is the percentage increase in total world exports; r_i is the percentage increase in world exports of commodity i; r_{ij} denotes percentage increase in world exports of commodity i to country j. Considering Tyszynski (1951), Richardson (1971a, 1971b) and Fagerberg and Sollie (1987) works, this chapter derives a new version of the CMS method of Leamer and Stern (1970). The new version is formulated as follows:

$$\begin{aligned}
\Delta V_{..}^A = & S_t^A \Delta V_{..}^W + V_{..}^{W0} \sum_j (\alpha_t^{Aj} - \alpha_0^{Aj}) \beta_0^{Wj} \delta_0^{Wj} \\
& + V_{..}^{W0} \sum_j \alpha_0^{Aj} (\beta_t^{Wj} - \beta_0^{Wj}) \delta_0^{Wj} + V_{..}^{W0} s_0^A (\delta_t - \delta_0) \\
& + V_{..}^{W0} \sum_j (\alpha_t^{Wj} - \alpha_0^{Wj}) (\beta_t^{Wj} - \beta_0^{Wj}) \delta_0^{Wj} + V_{..}^{W0} (s_t^A - s_0^A) (\delta_t^A - \delta_0^A)
\end{aligned} \tag{12}$$

(a)
(b)
(c)
(d)
(e)
(f)

Equation (12) implies that the change in country A's exports can be caused by (a) the general changes in the world's export, (b) the market share effect, (c) the commodity composition effect, (d) the market composition effect, (e) the commodity adaptation effect, (f) the market adaptation effect. There are some main differences between the *new* version (12) by the author and the original version by Leamer and Stern (1970). *First*, the problem of subjectivity in the choice of which effects coming first – i.e. the market distribution effect or the commodity composition effect in the CMS version by Leamer and Stern (1970) – is avoided in this *new* version. *Second*, the *new* version gives six effects instead of Leamer and Stern's four effects. In the *new* version the market adaptation and commodity adaptation effects are introduced instead of Leamer and Stern's residual effect. Clear economic interpretation of the two effects is also given. *Third*, Laspeyres index were employed throughout the calculations. Therefore, lack of comparability due to differences in weighting procedures is avoided (Fagerberg and Sollie, 1987).

The *new* version of the CMS is then employed to analyze the exports performance of some regions and the East Asian countries. This chapter uses data on exports based on 3-digit SITC Revision 2. This chapter applies the definitions of products by the Empirical Trade Analysis (ETA): (a) *primary* products (83 SITC), (b) *natural resource-intensive* products (21 SITC), (c) *unskilled labor-intensive* products (26 SITC),

(d) *technology*-intensive products (62 SITC), (e) *human capital*-intensive products (43 SITC), (f) *others* (5 SITC).

Table 6. The CMS Analysis: Some Regions

Table 6. The EMS Analysis: Some Regions							
Regions	Change in Export (\$ US)	Due to (%)					
		General rise in world exports	Market share	Commodity composition	Market composition	Commodity adaptation	Market adaptation
EU							
1980-1985	-42,312,516,458	-12.5	-66.5	-20.4	213.0	21.0	-34.5
1985-1990	565,284,106,231	92.1	4.1	3.1	1.3	-0.3	-0.3
1990-1995	985,560,243,598	57.2	41.4	0.7	-7.5	1.5	6.7
1995-2001	255,376,839,742	193.9	-73.6	-5.0	-19.8	-0.5	4.9
2001-2006	2,132,901,664,724	95.4	2.3	-0.5	3.0	0.0	-0.2
NAFTA							
1980-1985	229,064,546,136	0.3	69.6	-1.5	-6.0	2.4	35.3
1985-1990	252,110,703,572	113.8	-0.5	-3.9	-7.7	-0.8	-1.0
1990-1995	307,513,205,593	91.0	12.8	3.0	5.7	-4.6	-8.0
1995-2001	296,865,124,180	68.3	0.9	4.6	24.3	-0.9	2.8
2001-2006	524,521,576,640	190.7	-66.2	3.7	-28.2	-0.1	0.1
North East Asia							
1980-1985	83,950,312,412	1.8	31.8	12.7	-18.0	4.3	67.4
1985-1990	245,965,384,960	100.0	-11.2	10.8	-5.0	0.8	4.6
1990-1995	394,419,248,361	64.7	20.5	5.2	11.0	-0.1	-1.3
1995-2001	120,698,001,433	175.7	-51.0	-15.0	-2.7	-1.0	-5.9
2001-2006	1,250,523,763,181	70.4	32.9	-4.4	1.6	-0.9	0.3
ASEAN5							
1980-1985	2,298,828,307	26.6	381.0	-289.9	-281.0	-217.7	480.9
1985-1990	70,278,175,887	95.5	4.7	-16.5	16.7	7.1	-7.5
1990-1995	172,246,567,596	41.4	46.6	-4.1	15.1	3.4	-2.4
1995-2001	51,798,578,630	142.8	-14.8	7.0	-25.8	4.4	-13.7
2001-2006	348,114,593,172	90.7	7.0	-0.9	2.6	0.4	0.1
Rest of the world							
1980-1985	-69,534,603,370	-17.9	-165.5	97.5	317.8	2.1	-134.0
1985-1990	1,296,565,534,480	96.3	8.4	-1.7	-6.1	0.0	3.0
1990-1995	1,206,765,438,781	109.4	3.2	0.1	-15.4	-0.8	3.5
1995-2001	1,001,811,398,856	89.7	5.5	2.9	0.3	0.4	1.3
2001-2006	3,832,094,025,864	108.5	-10.1	1.0	0.5	0.6	-0.5

Source: UN-COMTRADE, *author's calculation*.

This research defines the export destinations consisting of the ASEAN5 (Singapore, Indonesia, Malaysia, Thailand and the Philippines), the North East Asia (Japan, Mainland-China, Hong Kong-China and Korea), the European Union (the EU: all 27 countries) and the North America Free Trade Area (the NAFTA: the US, Canada and

Mexico), and the rest of the world (Rest). Table 6 shows the CMS analysis for some regions i.e. the EU, the NAFTA, the North East Asia, the ASEAN5 and rest of the world. Table 7 shows the CMS analysis for the North East Asian countries (Japan, Korea, Hong Kong and China) and the US.

Table 7. The CMS Analysis: the US and the North East Asian Countries

Countries	Change in Export (\$ US)	Due to (%)					
		General rise in world exports	Market share	Commodity composition	Market composition	Commodity adaptation	Market adaptation
the US							
1980-1985							
1985-1990	186,345,160,224	108.1	-5.8	1.1	-0.9	-0.8	-1.6
1990-1995	190,098,861,680	105.9	-6.7	10.9	6.9	-5.6	-11.5
1995-2001	148,041,156,897	93.6	-11.3	8.5	10.7	-1.8	0.3
2001-2006	306,023,386,745	207.6	-95.8	1.8	-9.5	-1.8	-2.3
Japan							
1980-1985	46,094,286,739	2.6	3.9	14.9	-25.1	2.7	101.0
1985-1990	111,046,176,355	154.5	-60.8	16.3	-8.6	-3.5	2.1
1990-1995	155,989,910,885	94.3	-13.2	10.9	9.1	-0.7	-0.4
1995-2001	-39,573,750,448	-265.9	343.4	9.1	-2.3	8.6	7.1
2001-2006	243,361,449,419	144.1	-43.7	0.6	-5.1	0.6	3.6
Korea							
1980-1985	12,176,616,353	1.4	32.1	14.2	-12.5	0.3	64.5
1985-1990	34,732,846,170	85.1	2.6	16.1	-3.3	-2.9	2.4
1990-1995	60,040,778,560	55.5	37.2	2.9	10.7	-0.2	-6.2
1995-2001	25,378,033,898	117.1	6.3	-14.0	-8.3	1.8	-2.9
2001-2006	175,022,762,746	74.7	21.1	-3.7	3.4	2.4	2.0
Hong Kong							
1980-1985	10,353,759,326	1.8	12.5	18.9	-19.0	8.4	77.4
1985-1990	52,332,449,709	56.0	28.8	12.8	3.8	-0.4	-1.1
1990-1995	91,480,453,948	46.2	36.5	4.2	10.5	0.5	2.1
1995-2001	17,195,377,021	240.2	-122.0	-21.3	2.0	14.4	-13.2
2001-2006	131,602,652,422	126.2	-28.8	-12.1	8.2	5.0	1.5
China							
1980-1985	15,032,307,052						
1985-1990	47,059,084,449						
1990-1995	86,584,288,820	36.8	53.7	-2.6	14.9	0.4	-3.2
1995-2001	117,422,528,269	30.1	80.0	-6.1	-2.2	-0.7	-1.1
2001-2006	702,837,392,423	32.9	74.5	-4.7	2.2	-3.4	-1.5

Source: 3-digit SITC Revision 2, UN-COMTRADE. Author's calculation

Table 8 shows the CMS analysis for the individual ASEAN5 countries namely Singapore, Indonesia, Malaysia, Thailand and the Philippines.

Table 8. The CMS Analysis: ASEAN5

Countries	Change in Export (\$ US)	Due to (%)					
		General rise in world exports	Market share	Commodity composition	Market composition	Commodity adaptation	Market adaptation
Singapore							
1980-1985	3,470,348,201	5.1	146.0	-8.7	-75.3	-53.1	86.0
1985-1990	29,870,082,224	74.6	21.7	-2.2	8.5	1.0	-3.6
1990-1995	65,547,210,386	41.2	40.2	1.4	11.6	6.0	-0.3
1995-2001	3,490,635,025	804.9	-554.9	114.0	-187.6	-12.3	-64.1
2001-2006	150,047,157,087	70.5	25.3	0.8	2.6	0.1	0.7
Indonesia							
1980-1985	-3,322,178,480	-6.1	38.0	128.5	38.8	26.0	-125.2
1985-1990	7,088,612,816	255.8	-144.2	-76.7	53.9	35.1	-23.9
1990-1995	19,742,639,595	66.7	40.6	-26.0	31.0	1.7	-14.0
1995-2001	10,898,869,340	99.0	41.2	-10.1	-17.3	-0.8	-11.9
2001-2006	44,481,783,995	110.0	-14.4	-4.7	9.0	1.5	-1.4
Malaysia							
1980-1985	2,693,190,560	4.4	228.5	-52.7	-50.3	-82.0	52.2
1985-1990	13,815,331,786	110.4	-9.9	-30.6	30.4	12.8	-13.1
1990-1995	44,324,940,200	34.1	51.7	-5.5	18.8	4.0	-3.1
1995-2001	14,226,337,763	123.2	0.6	9.0	-23.8	4.5	-13.5
2001-2006	72,664,743,931	105.3	-2.3	-1.3	0.6	-0.1	-2.2
Thailand							
1980-1985	616,301,097	9.7	154.6	-63.8	-134.7	-40.5	174.7
1985-1990	15,947,077,204	43.6	58.7	-7.2	5.3	1.7	-2.1
1990-1995	33,370,621,437	35.4	61.4	-3.5	8.4	-1.5	-0.2
1995-2001	8,479,712,660	158.1	-33.5	2.6	-25.1	2.3	-4.4
2001-2006	65,660,993,411	85.9	10.6	-0.3	2.1	0.4	1.2
the Philippines							
1980-1985	-1,158,833,071	-4.6	185.7	24.2	31.9	-13.8	-123.4
1985-1990	3,557,071,857	127.0	-26.0	-3.7	9.6	3.4	-10.2
1990-1995	9,261,155,978	45.3	27.6	8.5	12.2	3.2	3.2
1995-2001	14,703,023,842	28.2	67.7	-4.9	4.1	13.4	-8.6
2001-2006	15,259,914,748	183.1	-81.0	-7.3	-4.2	3.4	5.9

Source: 3-digit SITC Revision 2, UN-COMTRADE, *author's calculation*.

Some conclusions are obtained. *First*, the constant share norm seems powerful in explaining a country's exports performance since the mid 1980s. *Second*, the proliferation of regionalism and economic integrations in the beginning of 1990-s caused the change in trade pattern. Intra-regional trade has increased significantly. However, this chapter finds that the change in trade pattern only happened in short term (in the beginning of economic integration) i.e. 1990-1995 in the case of the EU, the North East Asia and the ASEAN5 and 1995-2001 in the case of the NAFTA.

Chapter 9 – Intra-Regional and Intra-Industry Trade

Chapter 9 analyzes the phenomenon of intra- and inter-industry trade in both intra- and inter-regional trade in the East Asia. Grubel and Lloyd (1975) formulated inter- and intra-industry trade as follows:

$$\text{Inter-industry trade: } Iie_{ijk} = \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} * 100 \quad (13)$$

$$\begin{aligned} \text{Intra-regional trade: } Iia_{ijk} &= \frac{(X_{ijk} + M_{ijk}) - |X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} * 100 \\ &= \left(1 - \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} \right) * 100 \end{aligned} \quad (14)$$

where i, j and k are industry (SITC), country, the exports destination markets or the region source of imports, respectively. X and M are values of exports and imports, respectively. We modify the intra- and inter-industry trade measures originally made by Grubel and Lloyd (1975) to incorporate intra- and inter-regional trade. The modified measures then are applied to scrutinize the phenomena of intra- and inter-industry trade in both intra- and inter-regional trade in the East Asia.

- Inter-industry trade in inter-regional trade:

$$Iie_{ijl} = \frac{\left| X_{ijl} - \frac{M_{ijl}}{\alpha_{ikl}} \right|}{\left(X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}} \right)} * 100 \quad (15)$$

- Inter-industry trade in intra-regional trade:

$$Iie_{ijk} = \frac{\left| X_{ijk} - \frac{M_{ijk}}{\alpha_{ikk}} \right|}{\left(X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}} \right)} * 100 \quad (16)$$

- Intra-industry trade in inter-regional trade:

$$\Pi a_{ijl} = \left(1 - \frac{\left| X_{ijl} - \frac{M_{ijl}}{\alpha_{ikl}} \right|}{\left(X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}} \right)} \right) \times 100 \quad (17)$$

- Intra-industry trade in intra-regional trade:

$$\Pi a_{ijk} = \left(1 - \frac{\left| X_{ijk} - \frac{M_{ijk}}{\alpha_{ikk}} \right|}{\left(X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}} \right)} \right) \times 100 \quad (18)$$

where α_{ikl} is the region's k adjustment coefficient industry i for region l i.e.

$\alpha_{ikl} = \frac{X_{ikl}}{M_{ikl}}$. This is due to exports FOB (free on board) and imports CIF (cost, insurance

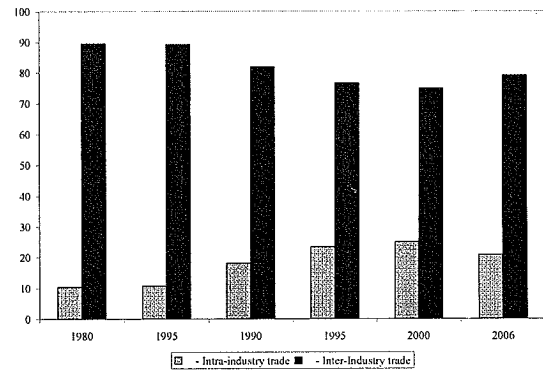
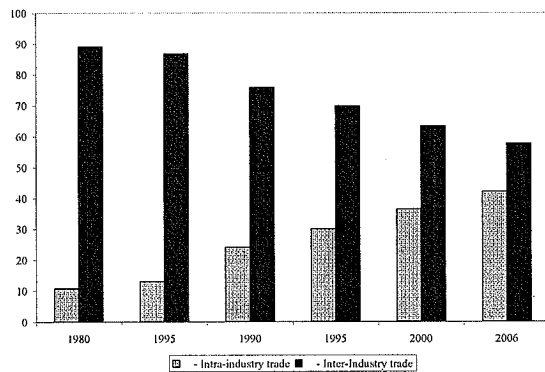
and freight). Figure 15 shows trends of intra-industry trade and inter-industry trade in both intra-regional trade (left hand side) and inter-regional trade (right hand side) in the East Asian countries.

Some conclusions are obtained in this chapter. *First*, intra-regional trade increased significantly in the case of the East Asia and the NAFTA. *Second*, the more significant intra-industry trade has reduced the dominance of inter-industry trade in the East Asia. *Third*, intra-industry trade in intra-regional trade has higher increase than that in inter-regional trade. It suggests that more trade liberalization among the East Asian countries is required to increase intra-industry trade in intra-regional trade in the region.

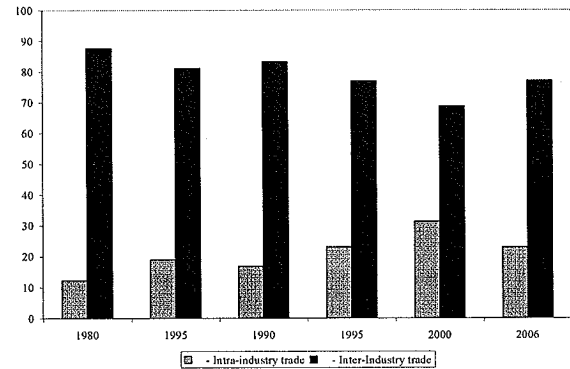
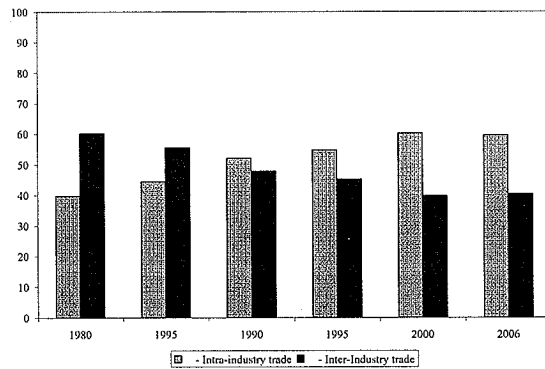
Trade by Region

Intra-Regional Trade

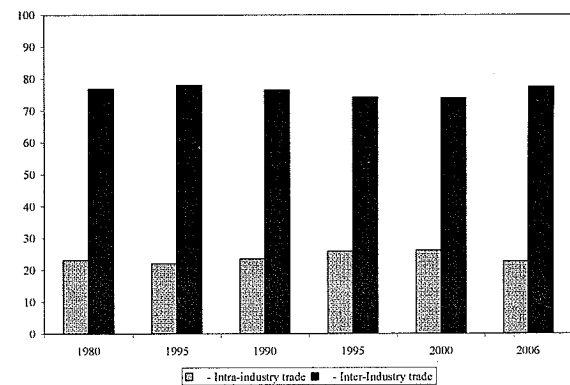
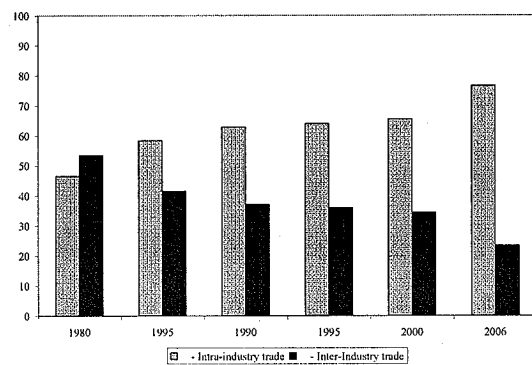
Inter-Regional Trade



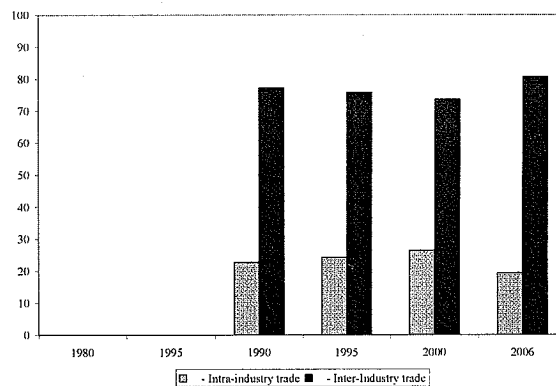
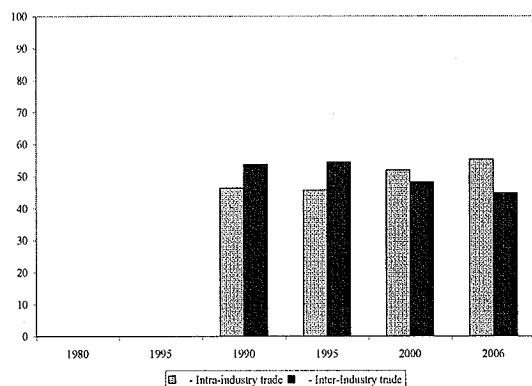
a. Japan



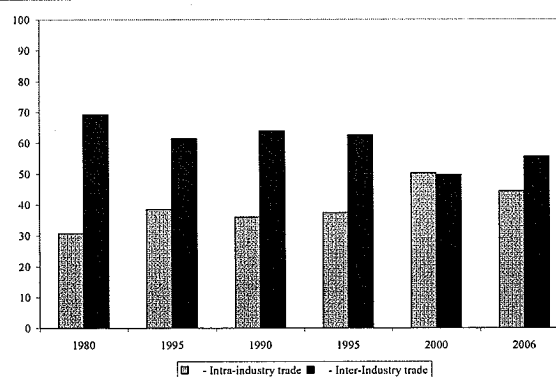
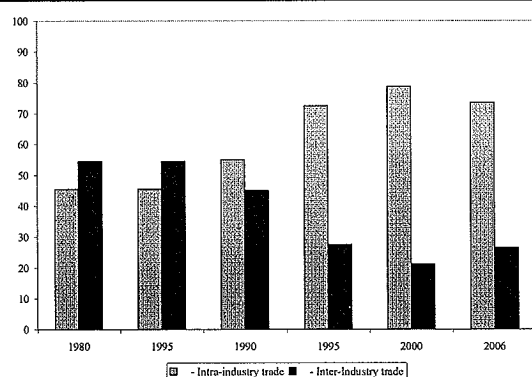
b. Korea



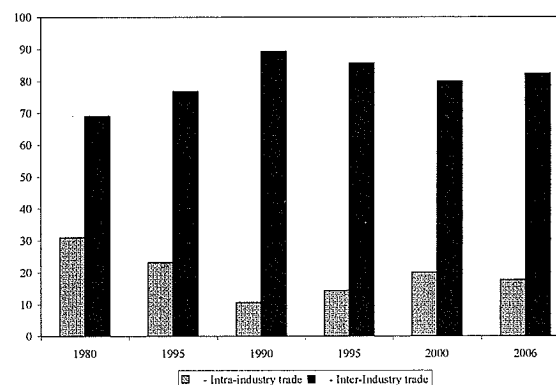
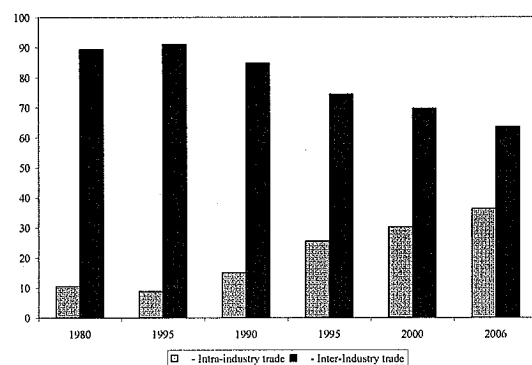
c. Hong Kong



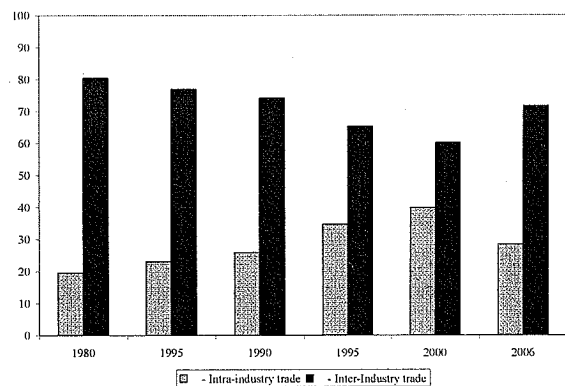
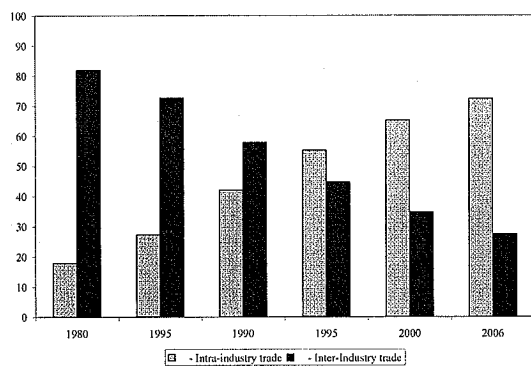
d. China



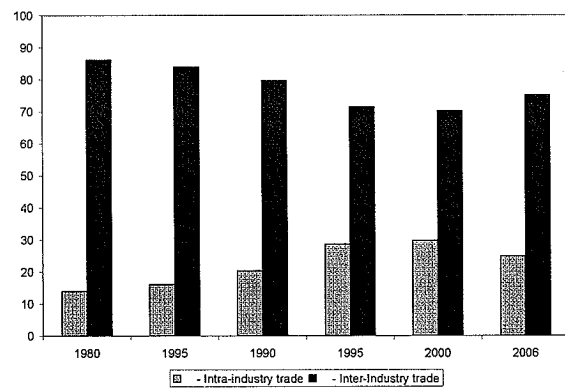
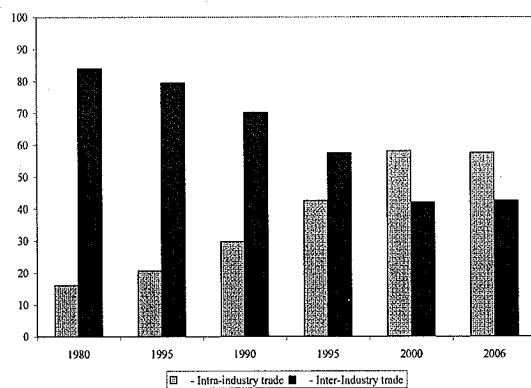
e. Singapore



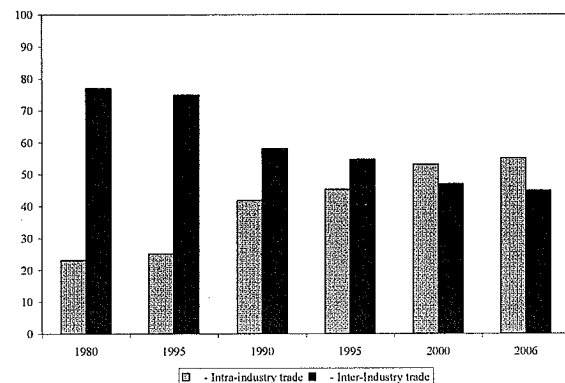
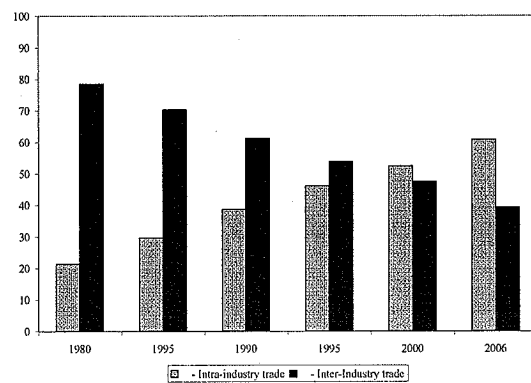
f. Indonesia



g. Malaysia



h. Thailand



i. Philippine

Source: UN-COMTRADE, author's calculation

Figure 15. Intra-industry and Inter-industry Trade: East Asian Countries

Chapter 10 – Purchasing Power Parity Adjusted Non-Traded Goods

Chapter 10 analyzes the Purchasing Power Parity (PPP) hypothesis in the cases of East Asian countries. One of the important determinants is productivity differentials that alter equilibrium relative prices between tradable and non-tradable goods. It is commonly called the “productivity-bias hypothesis” or the Balassa-Samuelson effect after two seminal papers, which have placed the foundation for the structural models of inflation, were published by Balassa (1964) and Samuelson (1964). The East Asian countries, which have different exchange rate regimes, level of economic development and trade barriers are interesting subjects for research on PPP. Does PPP not hold in the strong sense in the case of East Asian countries? Do relative prices of non-traded goods and the terms of trade play an important role in causing deviations away from PPP? This chapter tests the PPP hypothesis adjusted for Balassa-Samuelson effect (hereinafter called bse) as follows:

$$e_t = \beta_1 + \beta_2(\beta_3 p_{N,t} + (1 - \beta_3)p_{T,t}) + \beta_4(\beta_3 p_{N,t}^f + (1 - \beta_3)p_{T,t}^f) + \beta_5 bse_t + u_t \quad (19)$$

where e_t is the nominal exchange rate; p_N and p_T represent domestic prices of non-trade goods and traded goods, respectively; p_N^f and p_T^f denote foreign prices of non-trade goods and traded goods, respectively; $bse = (p_N - p_T) - (p_N^f - p_T^f)$ denotes Balassa-Samuelson effect. All variables are in logarithm form. This chapter applies univariate (stationary test on real exchange rate, RER); a multi-variable econometric model of PPP adjusted Balassa-Samuelson effect and multivariate cointegration to analyze the PPP hypothesis in the cases of East Asian countries.

Table 9 summarizes the results of the Phillips-Perron (PP)-test. Since the PP-test statistic is greater than the critical value of corresponding level of significance used (1 percent, 5 percent and 10 percent), we accept the hypothesis (H_0) of unit roots and conclude that the series are not stationary. For all level of significance, we can conclude that RER is not stationary.

Table 9. PPP Test Based on Real Exchange Rate (RER)

Country	PP test Statistic	Level of Significance	Critical Value	Conclusion	
				RER stationary or non-stationary	PPP Hold or not Hold
1. Japan	-2.316662	1%	-4.0241	Non-stationary	Not Hold
		5%	-3.4415	Non-stationary	Not Hold
		10%	-3.1451	Non-stationary	Not Hold
2. Korea	-1.905949	1%	-3.4767	Non-stationary	Not Hold
		5%	-2.8815	Non-stationary	Not Hold
		10%	-2.5773	Non-stationary	Not Hold
3. Hong Kong	1.766085	1%	-3.5625	Non-stationary	Not Hold
		5%	-2.9190	Non-stationary	Not Hold
		10%	-2.5970	Non-stationary	Not Hold
4. China	-1.481158	1%	-3.6228	Non-stationary	Not Hold
		5%	-2.9446	Non-stationary	Not Hold
		10%	-2.6105	Non-stationary	Not Hold
5. Singapore	-2.337505	1%	-4.0320	Non-stationary	Not Hold
		5%	-3.4452	Non-stationary	Not Hold
		10%	-3.1473	Non-stationary	Not Hold
6. Indonesia	-2.088084	1%	-3.4779	Non-stationary	Not Hold
		5%	-2.8821	Non-stationary	Not Hold
		10%	-2.5776	Non-stationary	Not Hold
7. Malaysia	-0.440427	1%	-4.0648	Non-stationary	Not Hold
		5%	-3.4608	Non-stationary	Not Hold
		10%	-3.1564	Non-stationary	Not Hold
8. Thailand	-1.445808	1%	-3.4767	Non-stationary	Not Hold
		5%	-2.8815	Non-stationary	Not Hold
		10%	-2.5773	Non-stationary	Not Hold
9. Philippine	-0.174259	1%	-4.1584	Non-stationary	Not Hold
		5%	-3.5045	Non-stationary	Not Hold
		10%	-3.1816	Non-stationary	Not Hold

Source: International Monetary Fund, *International Financial Statistic* (IFS-IMF), author's calculation.

Tables 10 and 11 show the econometric model (19) using Ordinary Least Squares (OLS) and Generalized Autoregressive Conditional Heteroscedasticity (GARCH). Table 12 exhibits a summary of the test for the number of cointegrating vector. Some conclusions are obtained. *First*, the PPP hypothesis does not hold in the strong sense in the case of all selected Asian countries. Japan and Hong Kong have contrary signs for the estimated coefficient. *Second*, the relative non-traded goods prices plays significant role

in causing deviation away from the PPP hypothesis. *Third*, the Balassa-Samuelson effect does exist in the case of Asian countries, except Japan, Hong Kong and the Philippines.

Table 10. Estimation Result and Tests: Least Squares (LS)

	Japan	Korea	Hong Kong	China	Singapore	Indonesia	Malaysia	Thailand	Philippine
A. Estimation									
Constant (β_1)	4.612866**	6.896222**	2.295216**	4.756599	1.701035**	10.87004**	2.130584**	3.509414**	9.439379**
Coefficient of Domestic Prices (β_2)	-0.991813**	1.091581**	-0.061204**	0.276422**	0.243865**	0.917723**	1.633930**	1.164261**	1.768024**
Coefficient of BSE (β_3)	-433.6979	0.321637*	0.000733	0.171144**	-0.398875**	-0.675738**	-0.259818	-0.344140*	0.088880
Coefficient of Foreign Prices (β_4)	0.999924**	-1.089646**	0.007767	-0.947789	-0.500321**	-1.327416**	-1.823919**	-1.158134**	-3.015229**
R-squared	0.881278	0.901270	0.446698	0.770358	0.843926	0.986907	0.753459	0.821679	0.956374
B. PPP and BSE tests:									
Proportionality and symmetry $H_0: \beta_2=1, \beta_3=0, \beta_4=-1$ (F-statistics)	15912422*	14.65994**	36061.68**	231.0972**	195.3804**	142.9731**	34.04307**	29.68989**	20.13348**
Conclusion	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold
Balassa-Samuelson effect $H_0: \beta_3=0$ (z-statistics)	0.004113	6.611689*	0.006316	69.37227**	18.19620**	94.74031**	2.728694	4.197531*	1.086955
Conclusion	BSE does not exist	BSE exists	BSE does not exist	BSE exists	BSE exists	BSE exists	BSE does not exist	BSE exists	BSE does not exist
C. Classical assumption tests:									
- Autocorrelation³									
LM test (F-statistic)	233.1635**	1105.146**	51.44209**	9.396010**	305.5572**	172.4317**	150.1523**	811.1989**	25.43390**
Conclusion	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation
- Heteroscedasticity⁴									
White Heteroscedasticity (F-statistic)	5.951518**	7.954037**	10.35660**	6.469656**	8.666113**	13.26724**	13.94169**	4.221749**	1.836909
Conclusion	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	No Heteroscedasticity
- ARCH LM test									
F-statistic	233.1635**	562.8050**	29.43318**	31.84248**	248.3391**	155.8938**	116.4187**	381.7797**	11.81002**
Conclusion	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect

Notes: (**) denotes rejection of the hypothesis at the 5%(1%) level

Source: IFS-IMF, *author's calculation*.

Table 11. Estimation Results: ARCH and GARCH¹

	Japan	Korea	Hong Kong	China	Singapore	Indonesia	Malaysia	Thailand	Philippine
A. Estimation									
Constant (β_1)	4.586916**	7.545136**	2.298815**	2.903789	2.055269**	11.33702**	1.826409**	3.774185**	10.37400**
Coefficient of Domestic Prices (β_2)	-0.988994**	1.235045**	-0.066142*	0.289693**	0.144562**	0.941231**	1.597417**	1.111896**	1.719131**
Coefficient of BSE (β_3)	-327.5470	0.338779***	0.009231**	0.163341**	-0.456586**	-0.619072**	-0.230753	-0.753735**	0.040890
Coefficient of Foreign Prices (β_4)	1.000115**	-1.372841**	0.011792**	-0.545573	-0.468048**	-1.456538**	-1.721524**	-1.160216**	-3.173558**
R-squared	0.864664	0.890716	0.385081	0.752856	0.802600	0.981800	0.771129	0.796995	0.925373
B. PPP and BSE tests:									
Proportionality and symmetry $H_0: \beta_2=1, \beta_3=0, \beta_4=-1$ (F-statistics)	24477739**	71.93126**	17304891**	935.6101**	1536.558**	444.8464**	93.60865**	270.5490**	861.6984**
Conclusion	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold
Balassa-Samuelson effect $H_0: \beta_3=0$ (z-statistics)	0.013928	47.16661**	3.941037	241.9555**	56.09233**	473.8601**	4.636085*	42.42311**	1.192457
Conclusion	BSE does not exist	BSE exists	BSE does not exist	BSE exists	BSE exists	BSE exists	BSE exists	BSE exists	BSE does not exist
C. Residual test									
ARCH LM test	1.224178	3.598574	1.612845	0.651231	0.538784	2.426381	0.731372	0.113736	0.548166
F-statistic	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH
Conclusion	effect	effect	effect	effect	effect	effect	effect	effect	effect
Normal distribution test	6.657844**	9.990397***	44.45103***	5.002873	2.7277399	1.117568	2.034470	3.452714	0.155197
Jarque-Bera statistic	Not Normal	Not Normal	Not Normal	Normal	Normal	Normal	Normal	Normal	Normal
Conclusion	distribution	distribution	distribution	distribution	distribution	distribution	distribution	distribution	distribution
Model	GARCH (1,2)	ARCH(1)	GARCH (1,1)	GARCH (1,1)	GARCH (1,1)	ARCH(1)	GARCH (1,1)	GARCH (1,2)	ARCH(1)

Notes:*(**) denotes rejection of the hypothesis at the 5%(1%) level

Source: IFS-IMF, *author's calculation*.

Table 12. Johansen Test (Trace Statistics) for Number of Cointegrating Vectors

	Japan	Korea	Hong Kong	China	Singapore	Indonesia	Malaysia	Thailand	Philippine
r=0 (none)	27.7845**	104.3318**	106.1524**	148.6335**	95.81908**	102.8254**	89.92661**	92.37723**	124.6857**
r=1 (at most 1)	68.89705**	54.39773	63.85000*	86.21280**	49.56345	51.95094	55.76370*	44.64629*	80.54729**
r=2 (at most 1)	40.33943*	21.33503	34.56015	47.16040*	26.69840	17.40404	24.70146	20.72133	46.19249*
r=3 (at most 1)	12.36722	7.062148	19.92361	26.04861*	11.38232	6.886515	7.118632	9.654901	27.17620*
r=4 (at most 1)	0.361564	0.477565	8.433609	10.27728	0.000753	0.401800	0.005931	0.144724	11.47110
Cointegration Test Specification	Intercept, Quadratic deterministic trend	Intercept, Quadratic deterministic trend	Intercept, Linear deterministic trend	Intercept, Linear deterministic trend	Intercept, Quadratic deterministic trend	Intercept, Quadratic deterministic trend	Intercept, Quadratic deterministic trend	No intercept, No trend	Intercept, Linear deterministic trend

Chapter 11 – Structure of Protection in Manufacturing Sector: Indonesian Case Study

Chapter 11 shows a case study i.e. structure of protection in Indonesian manufacturing sector. This chapter uses the Indonesian Input-Output (IO) tables and data on tariffs to calculate a degree of protection, namely effective rate of protection (ERP) by Balassa (1971). The ERP is formulated as:

$$D_i = \frac{T_i - \sum_j a_{ij} T_j}{1 - \sum_j a_{ij}} \quad (20)$$

where D_i is effective rate of protection in industry i ; a_{ij} represent input-output coefficients. T_i and T_j denote the nominal rates of protection for industry i and j , respectively. The calculation results are presented in Table 13.

Effective Rate of Protection (ERP) analysis shows that Indonesian manufacturing sector has become more liberalized i.e. starting from very high rate of protection during inward-looking regimes to the lower rate of protection after the Asian financial crisis onward. Trade liberalization was intensified at the start of IMF program, with highlight on the elimination of non-tariff measures for agricultural products and measures to protect the national car scheme (called *Timor*). During the crisis, the government committed itself to removing almost all import licenses, including the import licenses that fell outside previous WTO commitments (Vanzetti *et al.*, 2005). Moreover, the liberalization in manufacturing sector has also been encouraged by international/regional commitments under the AFTA, APEC, WTO and PTAs. Compared with the other old ASEAN members, the Indonesian liberalization process in manufacturing sector can

catch up with the Malaysian liberalization process, especially after Asian financial crisis.

It was much faster than the Thai liberalization process, which showed slower progress.

**Table 13. ERP Manufacturing Sector in Selected East Asian Countries
(in percent)**

Country	Year	ERP	Source
Indonesia	1975	74	World Bank (1993)**
	1987	70	Fane and Condon (1996)**
	1990	59	World Bank (1993)**
	1991	51 ^a , 55.6 ^b	This research
	1995	25 ^c ; 42.4 ^{a,d} , 45.6 ^{b,d}	^c Fane and Condon (1996)**; ^d This research
	2000	25.7	Soesastro and Basri (2005)
	2001	16.5 ^a , 23.4 ^b	This research
	2005	10.2 ^a , 11.6 ^b	This research
South Korea	1970	40	World Bank (1993)
	1975	55	World Bank (1993)
	1980	67	World Bank (1993)
	1985	80	World Bank (1993)
	1988	28	Panagariya (1993)
Malaysia	1969	45	Shalleh and Meyanadan (1993)
	1979/80	31	Shalleh and Meyanadan (1993)
	1988	23	Panagariya (1994)
	2003	16 ^e ; 10.4 ^f	^e Athukorala (2005a); ^f This research
Philippines	1992	32	Panagariya (1994)
	1999	10	WTO (1999)*
Thailand	1981	74	World Bank (1993)
	1988	51	Panagariya (1994)
	2002	25.2	Athukorala <i>et al.</i> (2004)
	2004	22.7	Athukorala <i>et al.</i> (2004)
Vietnam	1997	121	Athukorala (2002)
	2002	95	Athukorala (2002)
	2003	44	Athukorala (2005)

Note:

* Calculated as the weighted average of estimates by industry reported in the given source. Weighting was done by using value added data from UNIDO.

** Estimate for non-oil manufacturing.

^a the simple average of ERP of industry ISIC (taken from Table 11.3); ^b the simple average of ERP industry IO-codes (taken from Table 11.4)

Source: mainly from Athukorala (2005b) and *author's calculation*.

Conclusion

- From the background of establishment and the evolution in organizational structure of the ASEAN, it is argued that the ASEAN has changed its focus from political to economic interests. Parallel with the proliferation of

economic regionalism in the world and the period of active trade liberalization in the 1980s and 1990s, the ASEAN has pushed economic cooperation forward.

- In inter-regional trade, there have been shifts in the destinations of the ASEAN countries' exports. Although Japan, the EU and the NAFTA are still dominant trade partners, China (Mainland), Hong Kong and Taiwan have increasingly become important destinations to the ASEAN countries' exports. Meanwhile, the five original ASEAN members have still dominated the intra-regional trade (95 percent) in the ASEAN region. There is positive relationship between the size of country and the share of intra-regional trade in the region. The intra-regional trade in the ASEAN region has been larger (intense) than expected, given the ASEAN's importance in world trade, excepting Cambodia.
- There have been changes in the pattern of comparative advantage; therefore, it must be examined in the dynamic sense rather than static matter. The ASEAN has exhibited the most dynamic change in the pattern of comparative advantage, followed by China, Korea and Japan. The ASEAN, China and Korea have shown increases in overall comparative advantage together with decreases in the standard deviation. This implies that the increase in overall comparative advantage is encouraged by the higher increase in comparative advantage of products, which had no or lower comparative advantage in the past.

- The H-O theory is constructed under strict assumptions. The H-O theorem does not necessarily hold when assumptions on production and consumption are violated. The static comparative advantage can only explain inter-industry trade but not intra-regional trade. China, Indonesia and Thailand have comparative advantage in *unskilled labor*-intensive industry, meanwhile only Japan has comparative advantage in *technology*-intensive industry for the last two decades.
- The East Asian countries have exhibited despecialization together with convergence in the pattern of comparative advantage that might indicate the existence of intra-regional trade in the region. China, Thailand and Indonesia have shown more dynamic despecialization. In general, such despecialization processes are different across countries as well across industries.
- The ‘Flying Geese’ pattern is recognized in the case of the East Asian region. The industries in the first round of the FG pattern are *unskilled labor*-intensive industries, followed by *human capital*-intensive industries in the second round and *technology*-intensive industries in the third round.
- By employing a new version of the CMS derived in this thesis, we find that the constant share norm seems powerful in explaining a country’s exports performance since the mid 1980s. In the case of China, the general rise in world export can only explain about 30 percent of the China’s change in exports. The more dominant factor underlying China’s exports has been the market share effect i.e. 53 percent during 1990-1995, 80 percent during 1995-2001 and 74.5 percent during 2001-2006. The proliferation of regionalism and

economic integrations in the beginning of 1990-s caused the change in trade pattern. Intra-regional trade has increased significantly. Trade creation and trade diversion occur. However, this thesis finds that the change in trade pattern happened only in the short period (in the beginning of economic integrations) i.e. 1990-1995 in the case of the EU, the North East Asia and the ASEAN5 and 1995-2001 in the case of the NAFTA.

- By using a modified intra- and inter-industry trade measures (incorporating intra- and inter-regional trade), we find that intra-regional trade increased significantly in the case of the East Asia and the NAFTA. As the importance of the intra-industry trade increases, the dominance of inter-industry trade decreases in the East Asia. Intra-industry trade in intra-regional trade has larger increases than that in inter-regional trade in the East Asia.
- The three widely used methods in analyzing PPP i.e. univariate time series of Real Exchange Rate (RER); multivariate regression; and Johansen framework of multivariate cointegration give the same conclusion that the PPP hypothesis does not hold in the strong sense in the case of all selected East Asian countries. Japan and Hong Kong have opposite signs of estimated coefficients with that of the PPP theory postulates. In general, the Balassa-Samuelson effect plays significant role in causing deviation away from PPP.
- Indonesian industrial and trade policies follow the statement of a supporter of trade liberalization; 'good times mean bad policies and bad times mean good policies'. Effective Rate of Protection (ERP) analysis shows that Indonesian manufacturing sector has become more liberalized i.e. starting from very high

rate of protection during inward-looking regimes to the lower rate of protection after the Asian financial crisis onward.

**Shift in Comparative Advantage, Dynamic Market
and Purchasing Power Parity in the East Asia**

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Table of Contents

Table of Contents	i
List of Figures	vi
List of Tables	viii
Abstract	x
 Chapter 1 Introduction	
1.1. Background	1
1.2. Research Questions	3
1.3. Theoretical Framework and Research Plan	5
 Chapter 2 The Evolution of ASEAN	
2.1. Introduction	15
2.2. A Brief History of the Pre-ASEAN Cooperation	17
2.3. The ASEAN: from Political to Economic Issues	19
2.4. The AFTA through theCEPT Scheme	24
2.5. Conclusions and Policy Implications	31
 Chapter 3 Major Trade Trends in the ASEAN Region	
3.1. Introduction	34
3.2. Intra-regional Trade in the ASEAN region	35
3.3. Geographic Destinations of Exports	37
3.4. Intra-ASEAN Trade: Does the Size of Country matter?	38
3.5. Dependence upon Intra-regional Trade	42
3.6. The Intensity of Intra-regional Trade	44
3.7. The Intensity of Bilateral Trade	47
3.8. Conclusions	51
 Chapter 4 Shift in Pattern of Comparative Advantage	
4.1. Introduction	53
4.2. Methodology	57
4.2.1. Data	57
4.2.2. Revealed Comparative Advantage	58
4.2.3. Distribution of RSCA	60
4.2.4. Rank Correlation	64

4.3. Analysis	66
4.3.1. Trends of the overall comparative advantage	66
4.3.2. Increased comparative advantage with de-specialization	72
4.3.3. The structure of comparative advantage	77
4.3.4. Shifts in the pattern of comparative advantage	82
4.3.5. Relation of the patterns of comparative advantage: substitute or complement?	85
4.3.6. Convergence in the pattern of comparative advantage	89
4.4. Conclusions and Policy Implications	92
 Chapter 5 Factor Endowments and Comparative Advantage	
5.1. Introduction	93
5.2. The H-O model in the General Equilibrium Framework	95
5.3. Violations of the H-O Assumptions: Numerical Examples	100
5.3.1. Case 1: where all assumptions are fulfilled	100
5.3.2. Case 2: where utility functions are different	102
5.3.2. Case 3: where production functions are different	103
5.4. Comparative Advantage of East Asian Countries	104
5.4.1. Data	104
5.4.2. Measurement of comparative advantage	104
5.4.3. Definition of industry	104
5.4.4. Classification of industries	105
5.4.5. Results and analysis	106
5.5. Conclusion and Policy Implications	112
 Chapter 6 Dynamic Specialization and Convergence in Trade Pattern	
6.1. Introduction	113
6.2. Literature Review	114
6.3. Methodology	118
6.3.1. Data	118
6.3.2. Econometric model	119
6.3.3. Hypothesis testing	120
- Different dynamics in the specialization across countries	120
- Different dynamics in the specialization across industries	124
- Different dynamics in the specialization across industries within country	126
6.3.4. Estimation	126
6.3.5. The Spearman's rank correlation	128

6.4. Results and Analysis	129
6.4.1. Dynamic specialization across countries	129
6.4.2. Dynamic specialization across industries	134
6.4.3. Dynamic specialization across industries within country	138
6.4.4. Convergence in the trade pattern	140
6.5. Conclusions and Policy Implications	145
 Chapter 7 Flying Geese and “Products Mapping”	
7.1. Introduction	146
7.2. The FG Paradigm: Literature Review	148
7.2.1. The Akamatsu’s original model of flying geese	148
7.2.2. The modern “multi-sequentialist” concept	152
7.2.3. Previous empirical tests	156
7.3. Methodology	158
7.3.1. Data and industries classification	158
7.3.2. “Products Mapping”: RSCA and TBI	158
7.4. Results and Analysis	161
7.4.1. “Products mapping”	161
7.4.2. The Flying Geese pattern	174
7.4.2.1. The rounds of industries in the FG pattern	174
7.4.2.2. Potential industries transmitted from Japan to the the follower-geese	180
7.4.2.3. The third round: the FG paradigm might be less significant	185
7.5. Conclusions and Policy Implications	188
 Chapter 8 Export Performance: Constant Market Shares Analysis	
8.1. Introduction	192
8.2. Trends in Exports	194
8.3. The Constant Market Shares (CMS)	197
8.3.1. The constant share norm	198
8.3.2. The levels of analysis	200
8.3.3. The shortcomings of Leamer and Stern’s version	205
8.3.4. Changes in the share of exports: Fagerberg and Sollie’s Version	206
- The ‘several commodities-one market’ case	208
- The ‘several commodities-several markets’ case	211
8.3.5. Two different points of view: a new version of CMS	215

8.4. Empirical Results and Analysis	219
8.5. Conclusions and Policy Implications	228
Chapter 9 Intra-Regional and Intra-Industry Trade	
9.1. Introduction	231
9.2. Methodology	234
9.2.1. Data	234
9.2.2. Trade by industry and trade by region	234
9.2.3. The measurement of intra- and inter-industry trade	236
9.2.4. Adjustment of FOB or CIF	237
9.2.5. The aggregation	239
9.3. Trends in the Intra- and Inter-regional Trade	242
9.4. Trends in the Intra- and Inter-industry Trade	244
9.5. Policy Implications	250
9.6. Concluding Remarks	253
Chapter 10 Purchasing Power Parity Adjusted Non-Traded Goods	
10.1. Introduction	255
10.2. Literature Review	257
10.2.1. Types of PPP	257
10.2.2. Empirical techniques	258
10.2.3. Previous findings by several researcher	260
10.2.4. PPP and non-traded goods: Balassa-Samuelson effect	264
10.3. Methodology	266
10.3.1. Data	266
10.3.2. Estimation	268
10.4. Empirical Results and Analysis	271
10.4.1. Stationery test	271
10.4.2. Univariate time series analysis	274
10.4.3. Multivariate analysis: Least Squares	275
10.4.4. Multivariate analysis: ARCH	278
10.4.5. Long-term equilibrium	280
10.5. Policy Implications	282
10.6. Concluding Remarks	285
Chapter 11 Structure of Protection in Manufacturing Sector: Indonesian Case Study	
11.1. Introduction	287

11.2. Evolution of Industrial and Trade Policies	289
11.3. Trends in Comparative Advantage	298
11.4. Methodology	302
11.4.1. Effective rate of protection	302
11.4.2. Data	304
Input-Output table	304
Tariff	305
11.5. Result and Analysis	308
11.5.1. Effective rate of protection (ERP)	307
11.5.2. Some comparisons across countries	309
11.6. Concluding remarks	312
Chapter 12 Concluding Remarks	314
References	319
Supplements to Chapters 4 and 6	337
Appendixes	
A.4.1. Revealed Comparative Advantage (RCA)	
A.4.2. Revealed Symmetric Comparative Advantage (RSCA)	
A.4.3. Distribution of RSCA	
A.4.4. Spearman's Rank Correlation across Times	
A.4.5. Spearman's Rank Correlation across Countries	
A.5.1. Calculation Results	
A.5.2. Classification of Products by Factor Intensity	
A.6.1. Estimation Results: across Countries	
A.6.2. Estimation Results: across Products	
A.6.3. Spearman's Rank Correlation of Comparative Advantage by Products between Japan and the other East Asian Countries	
A.7.1. Trade Balance Index (TBI)	
A.7.2. Products Mapping	
A.9. Regional Inter- and Intra-Industry Trade Index	
A.10. Estimation Results on PPP	

List of Figures

Figure 1.1	The Research Framework	6
Figure 2.1	The Evolution in Institutional Structure of the ASEAN	23
Figure 2.2	The Evolution of the EU	25
Figure 3.1	The ASEAN Countries' Shares of Intra-regional trade and GDP: 1995, 2000 and 2005	40
Figure 3.2	Trade Intensity Indices of the ASEAN Countries: 1995, 2000 and 2005	45
Figure 4.1	Possible Change in the means of Comparative Advantages	61
Figure 4.2	Skewness of RSCA	63
Figure 4.3	Shifts in Comparative Advantage	64
Figure 4.4	Trends in Overall Median of Comparative Advantages, 1976-2005	68
Figure 4.5	Trends in Mean, Media, Standard Deviation and Skewness of Comparative advantages, 1976-2005	73
Figure 4.6	Trends in Sectoral Average Comparative Advantages, 1976-2005	76
Figure 4.7	Trends in Spearman's Rank Correlation Coefficient ASEAN+3	86
Figure 5.1	The H-O Model in General Equilibrium Framework	98
Figure 5.2	Gains from Trade	99
Figure 5.3	The Pareto Set of Factor Allocation for Sector 1 (good y)	101
Figure 5.4	The Pareto Set of Factor Allocation for Sector 1 (good y)	102
Figure 5.5	Trends in Revealed Comparative Advantage: Factor Intensity	107
Figure 6.1	Four Possible Combinations: Specialization and Convergence	117
Figure 6.2	Illustration of Dynamic Changes in Comparative Advantage	120
Figure 6.3	<i>F</i> -Critical Values	124
Figure 6.4	The Coefficients of Specialization: across Countries (1985-1995 and 1995-2005)	131
Figure 6.5	Coefficient of Specialization: Across Products	135
Figure 6.6	Coefficients of Specialization: by Countries and Industries	139
Figure 6.7	Trends in Correlations of the Specialization Pattern between Japan and Individual Countries	141
Figure 6.8	Trends in Correlations of the Specialization Pattern between Japan and Individual Countries: across Industries	144
Figure 7.1	The Akamatsu's Original FG Paradigm	150
Figure 7.2	The Modern "Multi-sequentialist" FG Paradigm	155

Figure 7.3	Products Mapping	160
Figure 7.4	Geese Flying and “Product Mapping”	161
Figure 7.5	Trends in Number of Products in Each Group A, B, C and D	173
Figure 7.6	The East Asia FG Pattern: <i>Unskilled Labor</i> -Intensive Industries	176
Figure 7.7	The East Asian FG Pattern: <i>Human Capital</i> -Intensive Industries	177
Figure 7.8	The East Asian FG Pattern: Technology-Intensive Industries	178
Figure 7.9	The Empirical Flying Geese Pattern	179
Figure 7.10	The “Products Mapping” of Japan’s Unskilled Labor-Intensive Industries: 1976, 1985, 1995 and 2005	181
Figure 7.11	The “Products Mapping” of Japan’s Human Capital-Intensive Industries: 1976, 1985, 1995 and 2005	184
Figure 7.12	The “Products Mapping” of Japan’s Technology-Intensive Industries: 1976, 1985, 1995 and 2005	187
Figure 8.1	Shares of Regions in World Exports	195
Figure 8.2	Exports by Regions	196
Figure 8.3	Exports by Countries in East Asia	197
Figure 8.4	Illustration of Exports Flows	201
Figure 8.5	The CMS Analysis: Some Regions	221
Figure 8.6	The CMS Analysis: USA and North East Asian Economies	224
Figure 8.7	The CMS Analysis: ASEAN5	227
Figure 9.1	Trade Pattern: by Industry and by Region	235
Figure 9.2	Selected Inter- and Intra-regional Trade Flows, 2006	241
Figure 9.3	Intra-regional and Inter-regional Trade: East Asia, EU and NAFTA	244
Figure 9.4	Intra-industry and Inter-industry Trade: East Asian Countries	248
Figure 11.1	Trends in Exports and Imports of Indonesia, 1960-2005	299
Figure 11.2	Trends in Comparative Advantage, 1979-2005	300

List of Tables

Table 1.1	The Analytical Tools and Case Studies	8
Table 2.1	The Documents relating to the AFTA	29
Table 2.2	The Timetable for Accelerating the AFTA (the CEPT Scheme)	30
Table 3.1	Intra-regional Trade: Values and Growth	36
Table 3.2	Geographic Destinations of the ASEAN's Exports: 1995, 2000 and 2005	38
Table 3.3	Shares of Intra-ASEAN Trade: 1995, 2000 and 2005 (in %)	41
Table 3.4	The ASEAN Countries' Shares of Exports by Geographic Destinations	43
Table 3.5	Expected Trade Intensity Indices of Bilateral Trades in the ASEAN region: 1995-2005	49
Table 3.6	Standard Trade Intensity Indices of Bilateral Trades in the ASEAN region: 1995-2005	49
Table 4.1	Top-Twenty SITC in Comparative Advantage 1985 and 2005: ASEAN	79
Table 4.2	Top-Twenty SITC in Comparative Advantage 1985 and 2005: Japan	80
Table 4.3	Top-Twenty SITC in Comparative Advantage 1985 and 2005: Korea	81
Table 4.4	Top-Twenty SITC in Comparative Advantage 1987 and 2005: China	82
Table 4.5	Spearman's Rank Correlation Coefficients Across Periods	84
Table 4.6.	Stationary Test on Pattern of Comparative Advantage	91
Table 5.1	Numerical Examples: Violations of the H-O Assumptions	100
Table 5.2	Revealed Symmetric Comparative Advantage by Factor Intensity 1985, 1995 and 2005	108
Table 5.3	Countries' Comparative Advantage in 2005	111
Table 6.1	Some Researches on Specialization and Convergence of Industrial Structure	116
Table 6.2	The Coefficients of Specialization and Hypothesis Testing: across Countries	122
Table 6.3	The Coefficients of Specialization and Hypothesis Testing: across Industries	125
Table 6.4	The Estimation Results: Specialization across Countries (1985-1995 and 1995-2005)	130

Table 6.5	Results of Hypothesis Testing across Countries: F -statistic	133
Table 6.6	The Estimation Results: Specialization across Industries (1985-1995 and 1995-2005)	134
Table 6.7	Results of Hypothesis Testing across Industries: F -statistic	137
Table 7.1	“Products Mapping”: Top-Ten Products in 1985 and 2005	163
Table 7.2	Average Number of Products in each Group A, B, C and D for 1976-2005	171
Table 8.1	The CMS Analysis: Some Regions	220
Table 8.2	The CMS Analysis: USA and North East Asian Economies	223
Table 8.3	The CMS Analysis: ASEAN5	225
Table 9.1	Tariff Barrier in EA, EU and NAFTA, by sector, 2002 (ad valorem tariff equivalent (%))	251
Table 10.1	Some Empirical Studies on the PPP Hypothesis	262
Table 10.2	Stationary Test (All variables in the logarithm form)	272
Table 10.3	PPP Test Based on Real Exchange Rate (RER)	274
Table 10.4	Estimation Results and Hypothesis Testing: Least Squares (LS)	277
Table 10.5	Estimation Results and Hypothesis Testing: ARCH and GARCH	279
Table 10.6	Johansen Test (Trace Statistics) for Number of Cointegration Vectors	281
Table 11.1	Industrial and Trade Policies in East Asia	290
Table 11.2	External Shocks and Policy Direction	292
Table 11.3	Tariffs in Manufacturing Sector (in percent)	306
Table 11.4	Effective Rate of Protection by ISIC 2-digit Industry (in percent)	308
Table 11.5	Effective Rate of Protection by IO Code Industry (in percent)	310
Table 11.6	ERP Manufacturing Sector in Selected East Asian Countries (in percent)	312

Abstract

The regional economic integrations, bilateral trade agreements (BTAs), and other international strategic alliances have affected countries' dynamic comparative advantages and specialization. Whether there are systematic changes in the comparative advantage and specialization of trade in the East-Asian countries has been a crucial issue for the future development of the East-Asian economic integration. One of the most important issues in the international trade is exchange rate. Purchasing Power Parity (PPP) is a simple empirical preposition that once converted to a common currency; national price levels should be equal. In spite of the relatively large body of literature examining the PPP theory for developed countries, relatively few researches have studied the proposition for developing countries, which have various distinctive international policies and degrees of liberalization such as the East Asian countries.

This dissertation has a title: "Shift in Comparative Advantage, Dynamic Market and Purchasing Power Parity in the East Asia". The dissertation aims to examine economic integration, comparative advantages and Purchasing Power Parity (PPP) of the East Asian countries. It consists of 12 chapters. The all ten research questions are answered in the entire ten chapters (Chapter 2-11). Chapter 1 is introduction. Chapter 2 discusses the evolution of the Association of Southeast Asian Nations (ASEAN). From the background of establishment and the evolution in organizational structure of the ASEAN, we find that the ASEAN has changed its focus from political to economic interests. Parallel with the proliferation of economic regionalism in the world and the period of active trade liberalization in the 1980s and 1990s, the ASEAN has pushed economic cooperation forward.

Chapters 4-7 and 11 deal with comparative advantage. In chapter 4, we analyze the shifts in patterns of comparative advantage of the ASEAN5 (Singapore, Indonesia, Malaysia, Thailand and the Philippines) as a single entity, Japan, Korea and China (abbreviated as the ASEAN+3) by applying statistical method. The ASEAN countries have shown the most dynamic change in the pattern of comparative advantage, followed by China, Korea and Japan. This chapter also indicates that comparative advantage must be considered in the dynamic sense instead of static one. This is elaborated further in the following three chapters (5-7) and Chapter 11. In chapter 5, we discuss a more theoretical issue on the relationship between a country's factor endowments and its comparative advantage. We find that China, Indonesia and Thailand have comparative advantage in *unskilled labor*-intensive industries, meanwhile only Japan has comparative advantage in *technology*-intensive industries for the last two decades in East Asia. This chapter also indicates the dynamic specialization and recognition of the Flying Geese (FG) pattern in East Asia, which is minutely examined in Chapters 6 and 7.

The dynamic specialization and convergence in trade patterns of the East Asian countries are represented in Chapter 6. The East Asian countries have shown despecialization together with convergence in their patterns of comparative advantage. This indicates the existence of intra-regional trade in the region examined further in Chapter 9. Chapter 7 analyzes the FG pattern in East Asia. We point out that the FG pattern is recognized in the case of the East Asian region. The industries in the first round of the FG pattern are *unskilled labor*-intensive industries, followed by *human capital*-

intensive industries in the second round and *technology*-intensive industries in the third round. Chapter 11 shows a case study i.e. structure of protection in Indonesian manufacturing sector. This chapter uses the Indonesian Input-Output (IO) tables and data on tariffs to calculate a degree of protection, namely effective rate of protection (ERP) by Balassa (1971). Indonesian industrial and trade policies remind us of the statement of a supporter of trade liberalization; ‘good times mean bad policies and bad times mean good policies’. Effective rate of protection (ERP) analysis shows that Indonesian manufacturing sector has become more liberal after the Asian financial crisis.

Chapters 3, 8 and 9 are related to the dynamic market of East Asian countries. In Chapter 3, we examine the regional trade in the ASEAN region. In inter-regional trade, there have been shifts in the destinations of the ASEAN countries’ exports. Although Japan, the EU and the NAFTA are still dominant trade partners, China (Mainland), Hong Kong and Taiwan have increasingly become important destinations to the ASEAN countries’ exports. The intra-regional trade in the ASEAN region has been larger (intense) than expected, given the ASEAN’s importance in world trade, excepting Cambodia. Chapter 8 describes the analysis of the East Asian countries’ dynamic export market. Constant Market Shares (CMS) method is applied. The constant share norm seems powerful in explaining a country’s exports performance since the mid 1980s. The proliferation of regionalism and economic integrations in the beginning of 1990-s caused the change in trade pattern. However, we point out that that the change in trade pattern happened only in the short period (in the beginning of economic integrations) i.e. 1990-1995 in the case of the EU, the North East Asia and the ASEAN5 and 1995-2001 in the case of the NAFTA.

Chapter 9 analyzes the phenomenon of intra- and inter-industry trade in both intra- and inter-regional trade in East Asia. By using a modified intra- and inter-industry trade measures (incorporating intra- and inter-regional trade), we find that intra-regional trade increased significantly in the case of the East Asia and the NAFTA. As the importance of the intra-industry trade increases, the dominance of inter-industry trade decreases in the East Asia. Intra-industry trade in intra-regional trade has larger increases than that in inter-regional trade in the East Asia.

In Chapter 10, we examine the PPP hypothesis in the cases of the East Asian countries. The three widely used methods in analyzing PPP i.e. univariate time series of Real Exchange Rate (RER); multivariate regression; and Johansen framework of multivariate cointegration give the same conclusion that the PPP hypothesis does not hold in the strong sense in the case of all selected East Asian countries. In general, the Balassa-Samuelson effect plays significant role in causing deviation away from PPP. Chapter 12 represents concluding remarks.

Several common analytical tools are applied, such as Trade Intensity (TI) index, Revealed Symmetric Comparative Advantage (RSCA), Spearman Rank Correlation, Trade Balance Index (TBI), Econometric model, Constant Market Shares (CMS), Intra-regional trade (IRT) and Intra-industry trade (IIa) and Effective Rate of Protection (ERP). However, we have contributed to the empirical analytical tools in international economics and applied them in the dissertation. *First*, we make a *new* method in analyzing the long run convergence of comparative advantage between two countries, i.e. by testing the stationarity of Spearman’s rank correlation coefficients between two countries’ Revealed Symmetric Comparative Advantage (RSCA) (Chapter 4). *Second*, we describe the

Heckscher-Ohlin (H-O) model in the General Equilibrium framework. We also represent the four common diagrams in one figure to show the clear relationships between production and consumption general equilibriums. *Third*, we introduce dummy variables (across countries and across industries) in the econometric model, which is commonly applied to examine countries' dynamic specialization (Laursen, 1998; Wörz, 2005) (Chapter 6). *Fourth*, by combining RSCA and Trade Balance Index (TBI), we make a *new* analytical tool, namely 'products mapping', which is suitable for analyzing the 'flying geese' (FG) pattern (Chapter 7). The FG pattern is one of the well-recognized models to be strongly considered in explaining economic development in East Asia. Kaname Akamatsu firstly introduced the model in the 1930s, as an analogous sequential development or catching-up process of manufacturing industries in developing countries. By applying the *new* analytical tool, we examine empirically the FG pattern in East Asia. *Fifth*, we refine the CMS method by Leamer and Stern (1970) (Chapter 8). Many researchers have tried to explain factors underlying countries' export performance. Paper by Tyszynski (1951) provides a fundamental analytical tool, which has been famous as Constant Market Shares (CMS). The more comprehensive and applicable version of the CMS is proposed by Leamer and Stern (1970). However, the Leamer and Stern's version has several shortcomings as noted by Richardson (1971a, 1971b), and Fagerberg and Sollie (1987). In this dissertation, we derive a *new* version of the Leamer and Stern's and applies it to examine the export performance of several regions and countries. *Sixth*, we modify the formula of inter-industry trade and intra-industry trade by Grubel and Lloyd (1975) to deal with the phenomena of inter-regional trade and intra-regional trade (Chapter 9). This modified formula is referred to as Regional Intra-Industry Trade index. We apply the three analytical tools on PPP; univariate time series, multivariate regression and Johansen cointegration framework (Chapter 10). We examine structure of production and calculate the effective rates of protection in Indonesian manufacturing sector (Chapter 11).

Chapter 1

Introduction

1.1. Background

Since the beginning of multilateral trade system, many regional trade agreements (RTAs) and regional economic integrations have been achieved, for examples the European Union (EU), the North American Free Trade Agreement (NAFTA), the *Mercado Común del Sur* (MERCOSUR, Southern Common Market), the Association of South East Asian Nations (ASEAN) - Free Trade Area (AFTA), etc. The achievements of RTAs and regional economic integrations, to some extent, have brought positive as well as negative implications that might appear in the forms of trade creation and trade diversion for the non-member countries (Viner, 1950; McCarthy, 2006). The East Asian region was noticeably late in proceeding to the *de jure* (legal) regional economic integration, even though the *de facto* (factual) economic integration is sometimes claimed (Fouquin *et al.*, 2006). Remarkable trade and investment activities, especially between Japan and China, as well as Japan and the individual ASEAN countries have increased significantly. RTAs in the East Asia did not exist until the ASEAN (only among the founding members: Indonesia, Malaysia, the Philippines, Singapore, and Thailand) reached the Preferential Trade Agreements (PTAs) in 1977.

Trade liberalization is sometimes illustrated as a two-edged sword since it can provide opportunities as well as threats for domestic economic development. The opening up of markets not only offers good opportunities for export developments but also carries

competitions in international and domestic markets. In the case of East Asia, Ng and Yeat (2003) find that since the mid-1980s intra-regional trade has grown at a rate mostly double that of world trade and at a rate much higher than the intra-regional trade of the NAFTA or even of the EU. In addition, there have been linkages and interdependences of the East Asian economies over the past two decades. The intra-regional trade especially in machineries, parts and components has generally grown faster than total world manufacturing trade and the degree of dependence of the East Asia has been proportionally larger compared with the NAFTA and the EU (Athukorala and Yamashita, 2006).

The RTAs, regional economic integrations, bilateral trade agreements (BTAs), and other international strategic alliances have affected countries' dynamic comparative advantages and specialization. Whether there are systematic changes in the comparative advantage and specialization of trade in the East Asian countries has been a crucial issue for the future development of the East Asian economic integration. Following a formation of 'flying geese' (FG)¹, it might be commonly believed that the systematic shifts in comparative advantage exist. The shifts have been in the most standardized, labor-intensive manufactures from Japan to the Newly Industrialized Economies (NIEs) and then to the ASEAN4 (Malaysia, Indonesia, Thailand and the Philippines) and so on (Kojima, 2000; Ozawa, 2001, 2006; Kasahara, 2004; Kwan, 2002).

¹ The 'flying geese' paradigm was introduced by Kaname Akamatsu in the 1930s in the several articles available only in Japanese. Kaname Akamatsu showed himself in the world academia after the World War II in the two articles (1961, 1962) in English. 'Flying geese' model intends to explain the catching-up process of industrialization of latecomer economies from intra-industry, inter-industry and international aspects. It might be argued that the structural transformation of industrialization in East Asia follows this 'flying geese' formation. Garment, Steel, Popular TV, Video and HDTV are frequently used to illustrate the formation. Those products have been transferred from Japan to Newly Industrialized Economies (NIEs: Hong Kong, Taiwan, Singapore and Korea); from NIEs to the ASEAN4 (Malaysia, Indonesia, Thailand and the Philippines); from the ASEAN4 to latecomer economies.

One of the most important issues in the international trade is exchange rate. Indeed, the nominal exchange rate determines the competitiveness of a country. The law of one price states that in competitive markets, free of transportation costs and no official barriers to trade (such as tariffs and non-tariff barriers), an identical commodity in different countries will have the same price when it is valued in the same currency. Purchasing Power Parity (PPP) is a simple empirical preposition that once converted to a common currency; national price levels should be equal. The theory of PPP explains the movements in the exchange rates between two countries and their changes in price levels (Krugman and Obstfeld, 2000:394). In spite of the relatively large body of literature examining the PPP theory for developed countries, few researchers have studied the implications of the preposition for developing countries such as the East Asian countries, which have various international trade policies.

1.2. Research Questions

The main aim of this thesis is to answer some critical questions relating to the economic integration, comparative advantages and Purchasing Power Parity (PPP) of the East Asian countries:

1. The first established economic integration in the East Asia is the ASEAN. How has the *de jure* economic integration changed? Has the focus of the ASEAN changed, parallel with the development of international regionalism?
2. In fact, the ASEAN member countries' factors endowments are relatively similar. Theoretically, they will also have similarities in comparative advantage. There have been skeptical views on the development of the

ASEAN because the substitute relationship among the members exists. How are the major trade trends in the ASEAN region? Has the intra-regional trade in the ASEAN region increased significantly?

3. Foreign direct investment (FDI) can change the relative endowment factors. Accordingly, the country's comparative advantage can be dynamic. How have the patterns of comparative advantage of the East Asian countries shifted?
4. The Heckscher-Ohlin (HO) theory suggests that a country will have comparative advantage on commodities produced with the country's abundant factors of production. How have the endowment factors determined the countries' comparative advantage?
5. To what directions have the trade specialization and trade patterns of the East Asian countries been going on? In other words, have they despecialized in their trade and converged in their patterns of comparative advantage?
6. One very famous theory in the "catching-up" process of economies is the flying geese (FG) pattern (in Japanese: *ganko keitai*): imports-domestic production-exports-reverse imports ("M-P-E-M"). Does the FG pattern exist in the East Asia?
7. Regionalism and economic integration affect countries' export performance. What are the dynamic markets for the East Asian countries' exports?
8. How are the intra-industry trade and the intra-regional trade in the East Asia going on? Has the intra-industry trade in the intra-regional trade become significant compared with the inter-industry trade in the region?

9. Does purchasing power parity (PPP) not hold in the strong sense in the case of East-Asian countries?
10. Finally, this thesis takes Indonesia as a case study. How is the structure of protection in Indonesian manufacturing sector?

1.3. Theoretical Framework and Research Plan

Figure 1.1 and Table 1.1 show the theoretical framework, analytical tools and case studies for each chapter of this thesis. To make clear analysis, all the above ten research questions are broken down into some more specific questions presented and answered systematically in the ten chapters (Chapters 2-11). All the ten research questions basically can be categorized into the following three groups, i.e. comparative advantage, dynamic market and exchange rate as depicted in Figure 1.1. Chapters 4-7 and 11 deal with questions on comparative advantage. Chapter 3, 8 and 9 are related to the dynamic market of East Asian countries' exports. Meanwhile, Chapter 10 is on the hypothesis testing PPP in the cases of East Asian countries.

Some common analytical tools are applied, such as Trade Intensity (TI) index, Revealed Symmetric Comparative Advantage (RSCA), Spearman's rank correlation, Trade Balance Index (TBI), Econometric model, Constant Market Shares (CMS), Intra-regional trade (IRT) and Intra-industry trade (IIa) and Effective Rate of Protection (ERP). However, this thesis makes a little more contributions to the analytical tools. *First*, this thesis proposes a new method in analyzing convergence of comparative advantage between two countries, i.e. by applying the stationary test on Spearman's rank correlation coefficients between the two countries' RSCA (Chapter 4). *Second*, this thesis introduces

dummy variables (across countries and across industries) in the econometric model that is commonly applied to examine country dynamic specialization (Laursen, 1998; Wörz, 2005) (Chapter 6).

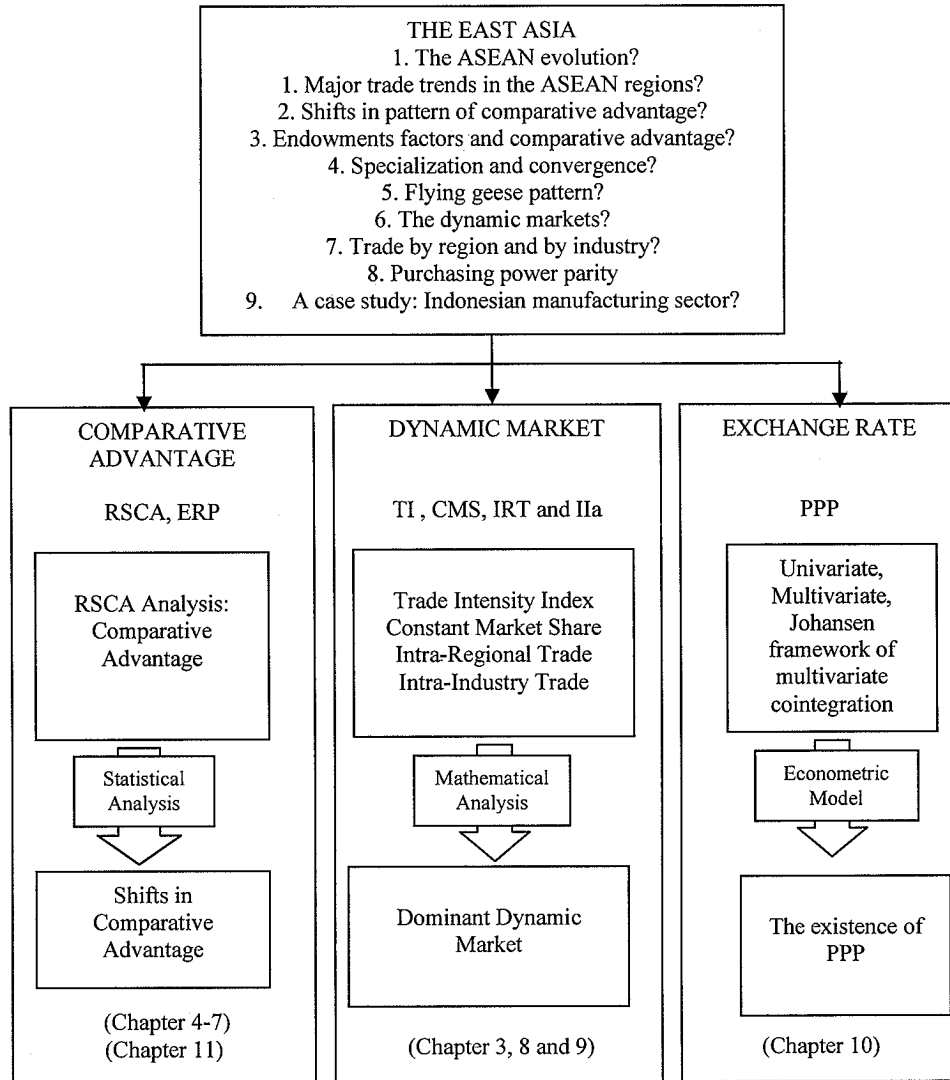


Figure 1.1 The Research Framework

Third, by combining RSCA and TBI, this thesis makes a new analytical tool, namely ‘products mapping’, which is appropriate for analyzing the FG pattern (Chapter 7). *Fourth*, this thesis refines the CMS method by Leamer and Stern (1970) (Chapter 8).

Fifth, this thesis modifies the formula of inter- and intra-industry trade by Grubel and Lloyd (1975) to deal with the phenomena of inter- and intra-regional trade (Chapter 9). This modification formula will be referred to as Regional Intra-Industry Trade index.

This thesis consists of twelve chapters. *First*, **Chapter 1** is introduction. *Second*, **Chapter 2** shows the evolution of the ASEAN. It might be argued that the ASEAN has changed its focus from international-political issues to economic ones, especially on trade and investment. Institutional approach and some descriptive statistics are mainly employed in this chapter to show the evolution.

Third, the major trade trends in the ASEAN region are represented in **Chapter 3**. The establishment of the ASEAN Free Trade Area (AFTA) is proposed to increase the intra-regional trade. This chapter is addressed to answer some more detailed critical questions: What are the geographic destinations of the ASEAN exports? Does the country size matter in the intra-ASEAN trade? Which countries are more dependent upon the intra-ASEAN trade? How far have the geographic patterns of regional trade dependence changed? How intense is the intra-ASEAN trade? Statistic descriptive and static comparative methods such as share analysis, Pearson correlation and trade intensity (TI) index are used to examine the intra-regional trade and geographical export destinations. The standard TI index by Drysdale and Garnout (1982) is formulated as follows:

$$TI_{jk} = \frac{\left[\frac{x_{jk}}{X_j} \right]}{\left[\frac{x_{wk}}{X_w} \right]_t} \quad (1.1)$$

where TI_{jk} is trade intensity index of country j for export destination k ; x_{jk} and x_{wk} denote exports of country j and world to k , respectively. X denotes the total exports. Considering

the geographic distances among countries in the ASEAN region, a modified application of the standard TI index is used to analyze the intensity of bilateral trade among the ten ASEAN countries.

Table 1.1 The Analytical Tools and Case Studies

Analytical Tools and Case Studies	Chapters											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Analytical Tools												
- Descriptive statistic		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
- TI			⊙									
- RSCA				⊙	⊙	⊙	⊙				⊙	
- Spearman's rank corr.				⊙		⊙						
- TBI							⊙					
- Econometric Model				⊙			⊙			⊙		
- CMS								⊙				
- IRT and Ila			⊙						⊙			
- Mathematical approach					⊙			⊙				
- ERP											⊙	
2. Case Studies												
a. The ASEAN												
- Singapore		⊙	⊙	⊙		⊙	⊙	⊙	⊙	⊙		
- Indonesia		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
- Malaysia		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Thailand		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- the Philippines		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Brunei D.		⊙	⊙									
- Vietnam		⊙	⊙									
- Lao		⊙	⊙									
- Myanmar		⊙	⊙									
- Cambodia		⊙	⊙									
b. The North East Asia												
- Japan				⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Korea				⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- China				⊙	⊙	⊙	⊙	⊙	⊙	⊙		
- Hong Kong								⊙	⊙	⊙		

Notes: TI = Trade Intensity Index, RSCA = Revealed Symmetric Comparative Advantage, TBI = Trade Balance Index, CMS = Constant Market Share, IRT = Intra-Regional Trade, Ila = Intra-Industry Trade, ERP = Effective Rate of Protection, ⊙ means that it is applied.

Fourth, Chapter 4 analyzes the shifts in pattern of comparative advantage of the ASEAN5² (Singapore, Indonesia, Malaysia, Thailand and the Philippines), Japan, Korea and China (abbreviated as the ASEAN+3, from now on) by applying statistical method. This chapter is addressed to answer some particular questions: what sorts of exported

² The other ASEAN countries are excluded from the analysis due to unavailability of the data.

products do the ASEAN+3 have comparative advantages? How far have comparative advantages of the ASEAN+3 shifted dynamically? Does the ASEAN's pattern of comparative advantages follow a sequential change similar to that of Japan, China, and Korea?

An indicator of comparative advantage, namely Revealed Symmetric Comparative Advantage (RSCA) by Laursen (1998) is applied in this chapter as well as the next three chapters. The RSCA index is a simple transformation of Revealed Comparative Advantage (RCA) or Balassa index (Balassa, 1965). The RCA and RSCA indices are formulated as follows:

$$RCA_{ij} = (x_{ij} / x_{in}) / (x_{rj} / x_{rn}) \quad (1.2)$$

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (1.3)$$

where RCA_{ij} denotes revealed comparative advantage of country i for group of products (Standard International Trade Classification, SITC) j . x_{ij} symbolizes total exports of country i in group of products (SITC) j . Subscript r denotes all countries without country i , and subscript n refers all groups of products (SITC) except group of product j . Descriptive statistics (mean, median, standard deviation and correlation) are applied to summarize the RSCA across commodities. Stationary test (Augmented Dickey-Fuller, ADF) on the Spearman's rank correlation coefficients between two countries' comparative advantages is employed to examine the convergence of their comparative advantage. The Spearman's rank correlation is formulated as follows:

$$\rho_{s, Ct_a, Ct_b} = 1 - 6 \left[\frac{\sum_{i=1}^n d_{R_{it}}^2}{n(n^2 - 1)} \right] \quad (1.4)$$

where ρ_{s,Ct_a,Ct_b} denotes 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); $d_{R_j}^2 = (R_{RSCA_{jC,t_a}} - R_{RSCA_{jC,t_b}})^2$ is squared differences in ranks of RSCA; $R_{RSCA_{jC,t_a}}$ is the rank of country C's RSCA of group of products j at time t_a ; $R_{RSCA_{jC,t_b}}$ is the rank of country C's RSCA of group of products j at time t_b ; n is number of observation groups of products.

Fifth, Chapter 5 discusses a more theoretical issue on the relation between a country's factor endowments and its comparative advantage. Factor endowments play important roles in international trade. This chapter describes the Heckscher-Ohlin (H-O) theory in the general equilibrium (GE) framework, and is addressed to examine mathematically the two important assumptions of the H-O model i.e. on production and consumption since those assumptions are used to derive the production possibility frontier (PPF) and community indifference curve (CIC), which are the central analytical tools in the neoclassical theory on gains from trade. If the production functions are different in two countries, does the H-O theorem still necessarily hold? If the utility (tastes and preferences) functions are different in both countries, does the H-O theorem still necessarily hold? By using numerical examples, this chapter shows that the H-O theorem does not necessarily hold when assumptions on production and consumption are violated. Countries in the East Asian region have large discrepancies in the factor endowments. By applying Revealed Symmetric Comparative (RSCA) index, we examine the comparative advantage of products in the cases of East Asian countries.

Sixth, the dynamic specialization and convergence in trade pattern of the East Asian countries are discussed in **Chapter 6**. Theoretically, there are four possible combinations between trade specialization and trade-pattern convergence i.e. more-specialized together with diverging trade patterns (Case 1); less-specialized together with converging trade patterns (Case 2); more-specialized together with converging trade patterns (Case 3); and less-specialized together with diverging trade patterns (Case 4). The East Asian region consists of diverse economies. Accordingly, one main question intended to answer is: in which cases do East-Asian economies lie? In the cases 1, 2, 3 or 4? This chapter applies an econometric model to analyze the specialization or de-speciation (Laursen, 1998; Wörz, 2005):

$$RSCA_{ij,T} = \alpha + \beta RSCA_{ij,0} + \varepsilon_{ij} \quad (1.5)$$

In this chapter, the simple regression econometric model (1.5) is modified by considering the differences across countries (adding country-dummy variables) as well as across industries (adding industry-dummy variables) in the ASEAN+3. This chapter also applies the Spearman's rank correlation (equation 1.4) to investigate the convergence or divergence of trade patterns in the East Asia.

Seventh, **Chapter 7** analyzes the comparative advantage of the ASEAN+3 countries based upon factor intensity classification i.e. *primary*-products, *natural*-intensive products, *unskilled labor*-intensive products, *human capital*-intensive products and *technology*-intensive products. To investigate the existence of FG pattern in the East Asia, this chapter proposes a new analytical tool, namely 'products mapping'. This tool combines the RSCA and Trade Balance Index (TBI). The TBI is formulated as follows:

$$TBI_{ij} = (x_{ij} - m_{ij}) / (x_{ij} + m_{ij}) \quad (1.6)$$

By combining RSCA and TBI, four categories can be shown where products might be laid, i.e. having comparative advantage and having specialization; having comparative advantage but no specialization; having specialization but no comparative advantage; no comparative advantage and no specialization. By using the ‘products mapping’, this chapter recognizes the FG formation in the East Asia. The products of the FG pattern in the past, current and future are also presented.

Eighth, Chapter 8 describes the analysis of East Asian countries’ dynamic export market. Constant Market Shares (CMS) method is applied. The CMS method by Leamer and Stern (1970) is formulated as follows:

$$\begin{aligned}
 V_{..}^{At} - V_{..}^{A0} &\equiv \sum_i \sum_j r_{ij} V_{ij}^{A0} + \sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \\
 &\equiv \underbrace{r V_{..}^{A0}}_{(a)} + \underbrace{\sum_i (r_i - r) V_{i.}^{A0}}_{(b)} + \underbrace{\sum_i \sum_j (r_{ij} - r_i) V_{ij}^{A0}}_{(c)} + \underbrace{\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0})}_{(d)} \quad (1.7)
 \end{aligned}$$

where $V_{i.}^{A0}$ and $V_{i.}^{At}$ are the values of country A’s exports of commodity i in the periods 0 and t, respectively; $V_{.j}^{A0}$ and $V_{.j}^{At}$ represent values of country A’s exports to country j in period 0 and t, respectively; V_{ij}^{A0} and V_{ij}^{At} are the values of country A’s exports of commodity i to country j in period 0 and t, respectively; r is the percentage increase in total world exports; r_i is the percentage increase in world exports of commodity i; r_{ij} denotes percentage increase in world exports of commodity i to country j.

Considering Tyszynski (1951), Richardson (1971a, 1971b) and Fagerberg and Sollie (1987) papers, this chapter derives a *new version* of the CMS method by Leamer and Stern (1970). The *new version* of the CMS is then employed to analyze the exports performance of some regions and the East Asian countries.

Ninth, there have been changes in the pattern of international trade from inter-industry trade to intra-industry trade. Meanwhile, regionalism and economic integrations have proliferated and encouraged intra-regional trade rather than inter-regional trade. Has the intra-regional trade, then, gained bigger portion than the inter-regional trade? Has the intra-industry trade become stronger in the intra-regional trade than in the inter-regional trade? **Chapter 9** analyzes the phenomenon of intra- and inter-industry trade in both intra- and inter-regional trade in the East Asia. Grubel and Lloyd (1975) formulated the inter- and intra-industry trade as follows:

$$\text{Inter-industry trade: } Iie_{ijk} = \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} * 100 \quad (1.8)$$

$$\begin{aligned} \text{Intra-regional trade: } Iia_{ijk} &= \frac{(X_{ijk} + M_{ijk}) - |X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} * 100 \\ &= \left(1 - \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} \right) * 100 \end{aligned} \quad (1.9)$$

We modify the intra- and inter-industry trade measures originally made by Grubel and Lloyd (1975) to incorporate intra- and inter-regional trade. This modified measure, then, is applied to examine the phenomenon of intra- and inter-industry trade in both intra- and inter-regional trade in the East Asia.

Tenth, **Chapter 10** analyzes the Purchasing Power Parity (PPP) hypothesis in the cases of East Asian countries. One important factor affecting the PPP is the existence of non traded goods (Balassa-Samuelson effects). The East Asian countries, which have different exchange rate regimes, level of economic development and trade barriers are interesting subjects for researchers of PPP. Does PPP not hold in the strong sense in the case of East Asian countries? Do relative prices of non-traded goods and the terms of

trade play an important role in causing deviations away from PPP? This chapter tests the PPP hypothesis adjusted for Balassa-Samuelson effect (hereinafter called *bse*) as follows:

$$e = \psi + (\tau p_N + (1 - \tau)p_T) - (\tau p_N^f + (1 - \tau)p_T^f) - \tau bse \quad (1.10)$$

where e_t is the nominal exchange rate; p_N and p_T represent domestic prices of non-trade goods and traded goods, respectively; p_N^f and p_T^f denote foreign prices of non-trade goods and traded goods, respectively; $bse = (p_N - p_T) - (p_N^f - p_T^f)$ denotes Balassa-Samuelson effect. All variables are in logarithm form. This chapter applies univariate (stationary test on real exchange rate, RER); a multi-variable econometric model of PPP adjusted Balassa-Samuelson effect and multivariate cointegration to analyze the PPP hypothesis in the cases of East Asian countries.

Eleventh, Chapter 11 shows a case study i.e. structure of protection in Indonesian manufacturing sector. This chapter uses the Indonesian Input-Output (IO) tables and data on tariffs to calculate a measure of protection, namely effective rate of protection (ERP) by Balassa (1971). The ERP is formulated as:

$$D_i = \frac{T_i - \sum_j a_{ij} T_j}{1 - \sum_j a_{ij}} \quad (1.11)$$

where D_i is effective rate of protection industry i ; a_{ij} represent input-output coefficients. T_i and T_j denote the nominal rates of protection for industry i and j , respectively.

Finally, some concluding remarks are presented in **Chapter 12**.

Chapter 2

The Evolution of ASEAN

2.1. Introduction

The Association of South East Asia Nations (ASEAN) is the first established economic integration in the East Asian¹ region. The ASEAN was established on 8 August 1967 in Bangkok by the five original member countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand. Brunei Darussalam joined on 8 January 1984 followed by Vietnam on 28 July 1995, Lao PDR and Myanmar on 23 July 1997, and Cambodia on 30 April 1999. The member countries of ASEAN had the combined Gross Domestic Product (GDP) at current market prices of US \$ 876,104 millions in 2005 (ASEAN Secretariat, 2006). However, there are actually big economic disparities among the ASEAN members as depicted by the discrepancies in their GDP per capita. They ranged considerably from the highest US \$ 26,821 per capita (Singapore) to the lowest US \$ 106 per capita (Myanmar) in 2005². With the combined population of 567 million people in 2006, the ASEAN has become one of the largest regional markets in the world.

It is sometimes claimed that a *de facto* economic integration has progressed in the East Asia (Fouquin *et al.*, 2006). Although the *de jure* economic integration in the East

¹ Geographically, East Asia region consists of Japan, Korea, China, and Mongolia (Please refer to The Times Comprehensive Atlas of the World – 12th Edition, for example). However, recently many scholars use the term of 'East Asia' in the economic sense. Ng and Yeats (2003) and Isogai *et al.* (2002), among others, used the term of 'East Asia' region comprising of Japan, Brunei, Cambodia, China, Hong Kong, Indonesia, Korea, Lao PDR, Malaysia, Mongolia, Philippines, Singapore, Taiwan (China), Thailand and Vietnam.

² Brunei Darussalam had US \$ 16,882 of GDP per capita followed by Malaysia (US \$ 5,001), Thailand (US \$ 2,726), Indonesia (US \$ 1,275), Philippines (US \$ 1,160), Viet Nam (US \$ 635), Lao PDR (US \$ 623) and Cambodia (US \$ 404) in 2005 (ASEAN Secretariat, 2006).

Asia has not achieved the level as the EU or the NAFTA has accomplished, *de facto* economic integration has made progress almost to the level of the EU and the NAFTA owing to the increasing product sharing activities and inter-regional trade and investment. Theoretically, there are five stages of economic integration i.e. Free Trade Area, Customs Union, Common Market, Economic Union, and Complete Economic Integration (Balassa, 1961; McCarthy, 2006). In Free Trade Area, tariffs (and other quantitative restrictions) among the participating countries are abolished. However, each country still maintains its own tariffs against the nonmembers. In the Customs Union, besides introduction of the free movements of commodities within the union, the common external tariffs in trade with the nonmember countries are set up. In Common Market, not only trade restrictions but also restrictions on factor movements are abolished.

In Economic Union, the countries combine the suppression of restrictions on commodity and factor movements with some degree of harmonization of national economic policies, in order to remove discrimination due to disparities in these policies. In Complete Economic Integration, unification of monetary, fiscal, social and countercyclical policies will be observed. It also requires the setting-up of a supra-national authority whose decisions are binding for the member states. The direction currently followed by the East Asia seems to be different from that of the EU (Fouquin *et al.*, 2006). The *de jure* economic integrations such as the EU and the NAFTA have given much attention on institutional issues that are closely related to governmental roles. The only one *de jure* economic integration in the East Asia is the ASEAN Free Trade Area (AFTA). Indeed, the *de facto* economic integration in the East Asia has been strongly

supported by the private sectors such as domestic companies as well as multinational corporations (MNCs).

The aim of this chapter is to describe the evolution of *de jure* economic integration among the ASEAN countries. Section 2.2 shows a brief history of the pre-ASEAN cooperation. Section 2.3 examines the evolution of the ASEAN. From the background of establishment and the changing in institutional structure of the ASEAN, it is argued that the ASEAN has changed its focus from political to economic issues. Section 2.4 analyzes the AFTA through the Common Effective Preferential Tariff (CEPT) scheme. Finally, some conclusions and their policy implications are presented in section 2.5.

2.2. A Brief History of the Pre-ASEAN Cooperation

Historically, regionalism for the Southeast Asian countries is not completely a new experience. However, a solid regional association had been difficult to be realized. Wong (1979) argues that the early attempts in forming a regional association failed due to nationalism, lack of mutual trust and regional identity, territorial claims and conflicting perceptions of the regional political order.

The Southeast Asia Treaty Organization (SEATO in 1954-1977) was established on September 8, 1954 by the Southeast Asia Collective Defense Treaty or the Manila Pact, which was an international organization for collective defense. It was launched in a conference in Manila in 1954, which was held after the Geneva Conference on Indochina following the victory of the Viet Minh over the French colonizer (Tongzon, 1998). The member countries were France, Australia, New Zealand, Pakistan, the Philippines,

Thailand, the United Kingdom and the United States. In fact, the SEATO was a political-military set up, prepared for some Cold War purposes. The organization initiated by the United States was primarily to block further communist subversion in Southeast Asia. It might be argued that it was part of the worldwide US-led system of anti-communist military alliances or security arrangements (Wong, 1979). At least, it is supported by the fact that with the military withdrawal of the US military forces from Vietnam, SEATO came to end in 1977.

In 1960s the Association for Southeast Asia (ASA) (1961-1963), the MAPHILINDO (stillborn in 1963 with the members: Malaya, the Philippines and Indonesia) and the Asian and Pacific Council (ASPAC) were subsequently established. The ASA had a limited membership (Malaya, the Philippines and Thailand) and a set of economic objectives (i.e. to promote cooperation in economic and culture areas). With the formation of the Federation of Malaysia comprising of Malaya, Sabah, Sarawak and Singapore, the ASA was dissolved on September 16, 1963. The MAPHILINDO was a rival organization to the ASA. It was established at a conference in Manila on 31 July 1963 to promote cooperation in economic, military, cultural and social fields and primarily designed for the welfare of the Melayu region in the Southeast Asia. Similar with the ASA, the MAPHILINDO was dissolved on 16 September 1963 due to the formation of the Federation of Malaysia.

The ASPAC was a multi-regional organization established to bring together most of the leading non-communist nations in the Western Pacific region to deal with external threats and to provide a framework for more widespread cooperation. The members from the Southeast Asian countries were Malaysia, the Philippines, South Vietnam and

Thailand. It was dissolved in 1973. In economic field, several efforts were made for closer economic cooperation. Some regional projects were conducted under the auspices the Ministerial Conference for the Economic Development of South Asia (MCEDSEA), especially projects relating to technical research, training and information exchange (Wong, 1979).

2.3. The ASEAN: from Political to Economic Issues

The ASEAN was established with the signing of the Bangkok declaration by the five countries (Indonesia, Malaysia, the Philippines, Singapore and Thailand) on August 8, 1967. It might be argued that the establishment of the ASEAN was encouraged dominantly by international political motivations rather than economic ones. There are some strong reasons for this. *First*, historically the establishment was related to the process of reconciliation –mediated by Thailand- among Malaysia, Indonesia and the Philippines over certain international disagreement, especially some territorial disputes³. As cited by the ASEAN Secretariat⁴, one of the surviving protagonists of the historic process, Thanat Khoman of Thailand said:

“At the banquet marking the reconciliation between the three disputants, I broached the idea of forming another organization for regional cooperation with Adam Malik. Malik agreed without hesitation but asked for time to talk with his government and also to normalize relations with Malaysia now that the confrontation was over. Meanwhile, the Thai Foreign Office prepared a draft charter of the new institution. Within a few months, everything was ready. I therefore invited the two former members of the Association for Southeast Asia (ASA), Malaysia and the Philippines and Indonesia, a key member, to a meeting in Bangkok. In addition, Singapore sent S. Rajaratnam, he Foreign Minister, to

³ The Philippines, which had a claim on Sabah, did not recognize the enlarged Federation. Indonesia, under the regime of President Soekarno, was against the formation of the Federation of Malaysia. Soekarno launched a guerilla war against Malaysia (in Indonesian: *Ganyang Malaysia*), which led to confrontation (Tongzon, 1998).

⁴ See <http://www.aseansec.org/7069.htm>

see about joining the new set-up. Although the new organization was planned to comprise only the ASA members plus Indonesia, Singapore's request was favorably considered"

Second, the ASEAN originally put more stress on international political issues in its aims and purposes. The establishment of the ASEAN does not automatically mean the end of the intra-regional disputes, for soon after its creation, the issue of sovereignty over Sabah was raised between the Philippines and Malaysia. Furthermore, many disputes, especially territorial ones, among ASEAN countries persist; however, all members are seriously committed to fill the gaps in their opinions on territorial issues through peaceful means and in the spirit of mutual accommodation.

The ASEAN declaration (1967) states that the aims and purposes of the ASEAN covers:

1. To accelerate the economic growth, social progress and cultural development in the region through joint endeavors in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of South-East Asian Nations;
2. To promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries of the region and adherence to the principles of the United Nations Charter;
3. To promote active collaboration and mutual assistance on matters of common interest in the economic, social cultural, technical, scientific and administrative fields;
4. To provide assistance to each other in the form of training and research facilities in the educational professional, technical and administrative spheres;
5. To collaborate more effectively for the greater utilization of their agriculture and industries, the expansion of their trade, including the study of the problems of international commodity trade, the improvement of their transportation and communications facilities and the raising of the living standards of their peoples;
6. To promote South-East Asian studies;
7. To maintain close and beneficial cooperation with existing international and regional organizations with similar aims and purposes, and explore all avenues for even closer cooperation among themselves.

Third, at the meeting of the ASEAN countries, the five Foreign Ministers represented their nations⁵. Figure 2.1 shows the evolution of institutional structure of the ASEAN. It is clear that during the first ten years of the ASEAN existence (1967-1976)

⁵ The Foreign Ministers of Indonesia, Malaysia, the Philippines, Singapore and Thailand who signed the document were Adam Malik, Tn Abdul Razak, Narciso R. Ramos, S. Rajaratman and Thanat Khoman, respectively.

the highest decision making body was the Annual Meeting of Foreign Ministers as depicted in panel (a) of Figure 2.1. The ongoing work of the Association between ministerial meetings was conducted by the Standing Committee, consisting of the Foreign Minister of the host country as chairman and the resident ambassadors of the other four ASEAN countries in that country. For, the third point of the ASEAN Declaration states clearly:

...to carry out these aims and purposes, the following machinery should be established: (a) Annual Meeting of Foreign Ministers, which shall be by rotation and referred to as ASEAN Ministerial Meeting. Special Meetings of Foreign Ministers may be convened as required. (b) A Standing committee, under the chairmanship of the Foreign Minister of the host country or his representative and having as its members the accredited Ambassadors of the other member countries, to carry on the work of the Association in between Meetings of Foreign Ministers. (c) Ad-Hoc Committees and Permanent Committees of specialists and officials on specific subjects. (d) A National Secretariat in each member country to carry out the work of the Association on behalf of that country and to service the Annual or Special Meetings of Foreign Ministers, the Standing Committee and such other committees as may hereafter be established.

Although other aspects are not abandoned, economic ones have been put to the front since the late 1970s. It was reflected by the changing in the institutional structure – as depicted in panel (b) of Figure 2.1. The institutional changes were aimed to accommodate the new orientation of the Association and the need for expanded cooperation. The pre-1992 institutional structure of the ASEAN was derived mainly from the major restructuring approved at the time of the 1976 Bali summit meeting of the ASEAN Heads of Government (AHG). Tongzon (1998) finds that there were three changes in the institutional structure. *First*, two blocks of ministerial meetings were introduced in addition to the Foreign Ministers Meeting i.e. the Economic Ministers Meeting (AEM), and the Other Ministers Meeting (OAM), which covered separate meetings of the ASEAN Ministers of Labour, Social Welfare, Education, Information, Health, Environment, Energy, Science and Technology. *Second*, the permanent and ad

hoc committees of the pre-Bali period were regrouped into five economic and three non-economic committees. *Third*, the secretariat was newly introduced and it was based in Jakarta and headed by its own Secretary General.

The basic institutional structure of the ASEAN in the pre-1992 remains at the moment, though with some reforms since 1992. There have been some reforms, which are aimed to streamline its organization, to reduce overlapping of the functions and to support the ASEAN organization's new vision and objectives (Tongzon, 1998). *First*, the ASEAN Heads of Government meeting was institutionalized at the Fourth ASEAN Summit talks in 1992 in Singapore. *Second*, the establishment of the ASEAN Free Trade Area (AFTA) Council to supervise the implementation of the Common Effective Preferential Tariff (CEPT) scheme for the AFTA. *Third*, the five economic committees have been dissolved since 1992 and their functions have been taken over by the Senior Economic Officials Meetings. *Fourth*, the ASEAN Secretariat's role has recently been strengthened to support the Summit's initiatives. To some extent, the current ASEAN institutional structure reveals the nature and objectives of the association, which has put more emphasis to economic cooperation since the Bali Summit of 1976.

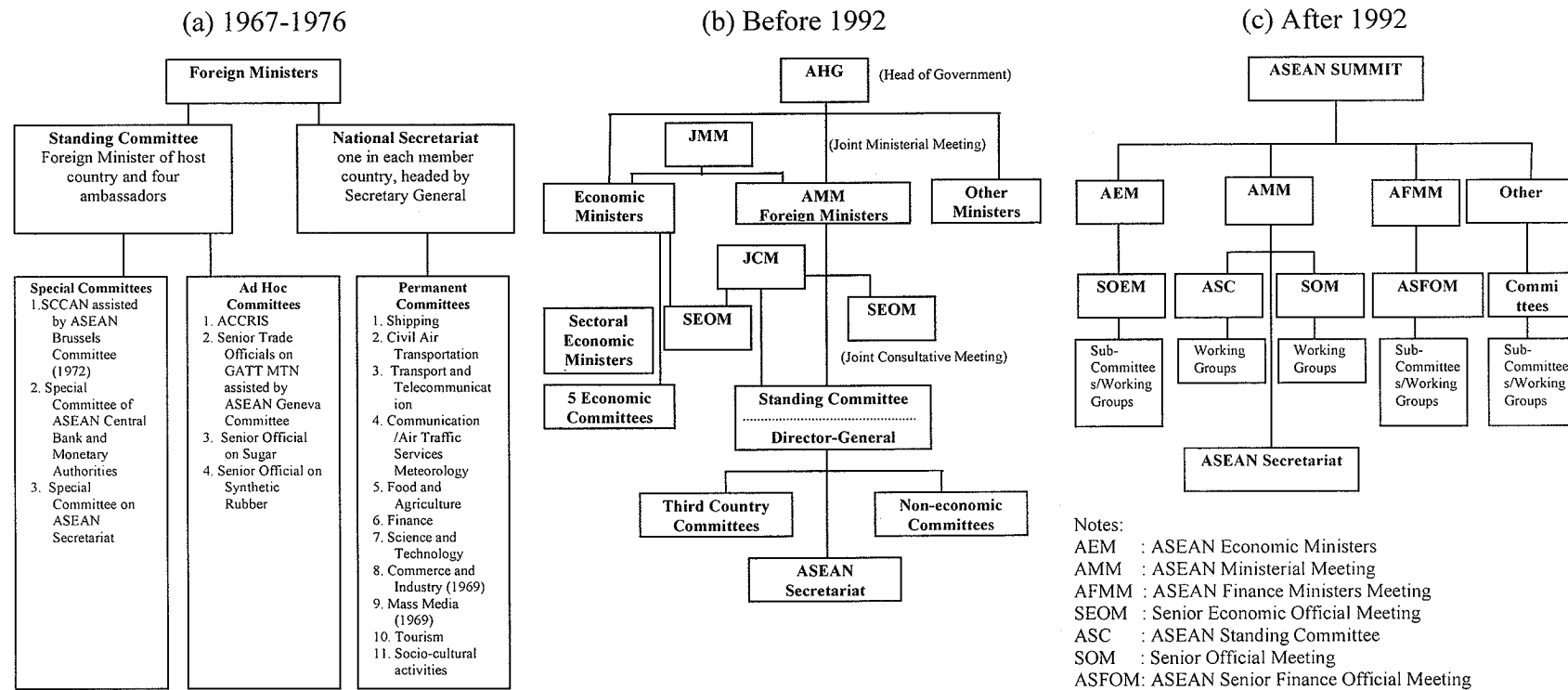


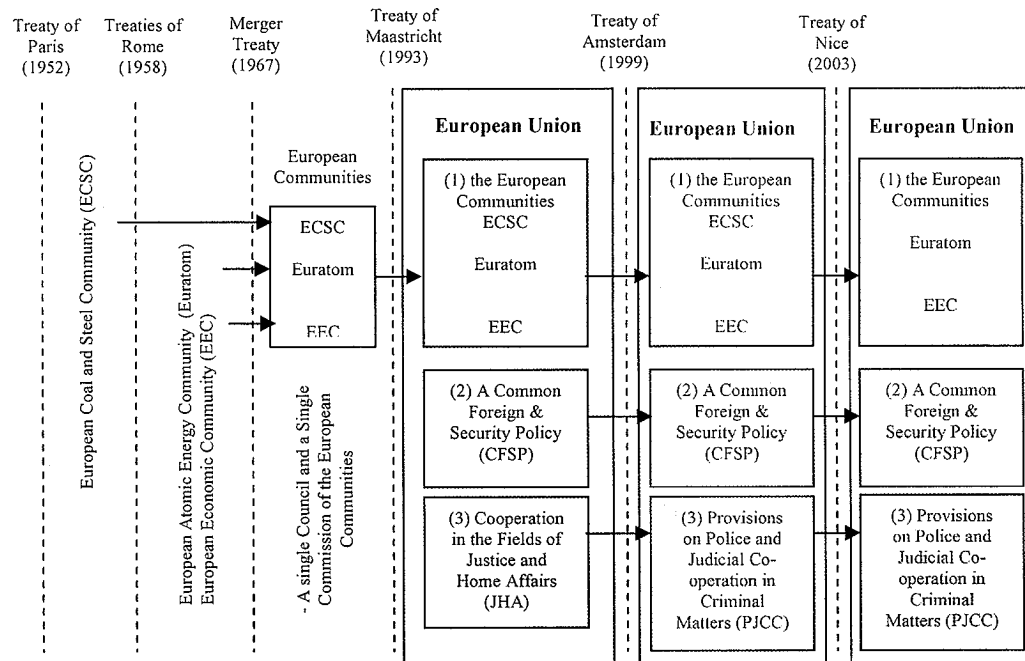
Figure 2.1 The Evolution in Institutional Structure of the ASEAN

2.4. The AFTA through the CEPT Scheme

Actually, economic regionalism proliferated during the period of aggressive trade liberalization in the 1980s and 1990s. Attempts for an organized regional cooperation between the South East Asian countries dated back to 1967 when the ASEAN was established⁶. As stated in the previous part, the ASEAN's initial concerns were political and security issues, unlike more established regionalism such as the European Union (EU), which was originally motivated by economic concerns, as depicted by Figure 2.2. The EU was established in 1992 by the Treaty on European Union (the Maastricht Treaty). However, it is a result of long integration process started from 1951. Currently, the EU has a common single market consisting of a customs union, a single currency managed by the European Central Bank, a Common Agricultural Policy, a common trade policy, and a Common Fisheries Policy. The earliest treaty in this context was the Treaty of Paris of 1951 (become effective in 1952), which established the European Coal and Steel Community (ECSC). The Treaty of Rome of 1957 established the European Economic Community (EEC) and the European Atomic Energy Community (Euratom) (came into operation in 1958). The European Free Trade Association (EFTA) came into effect in May 1960. Since the Merger Treaty signed in 1965 (took effect in 1967), the European Communities have shared common institutions, especially the Council, the European Parliament, the Commission and the Court of Justice. The Customs Union was completed in July 1968. There are three pillars of the EU, i.e. (1) The European

⁶ Some other regional initiatives involving countries from this part of the world are present including the South Asian Association for Regional Cooperation (SAARC), the SAARC PTA (SAPTA), Australia and New Zealand's Closer Economic Relation Agreement (CER) and the South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA). (See ADB (2002) for an overview)

Communities (ECSC, EC and Eurotom; ECSC ceased to exist in 2002 by the expiration of the founding treaty); (2) A Common Foreign and Security Policy (CFSP); and (3) Provisions on Police and Judicial Co-operation in Criminal Matter (PJCC).



Source: Summarized from McCarthy (2006), Nugent (2003) and others.

Figure 2.2 Evolution of the EU

It was not until the 1970s that the ASEAN countries tried to promote greater intra-regional trade and to coordinate industrialization policies (Elliott and Ikemoto, 2004). Park (1999) notes that these policy efforts were based on proposals made by the United Nations in its series of policy studies, which proposed regional import substitution. Subsequently, on 24 February 1977 the ASEAN Preferential Trading Arrangements (ASEAN-PTA) was established to promote intra-regional trade. The Protocol on Improvements on Extension of Tariff Preferences under the ASEAN-PTA was signed on 15 December 1987. However, (Tan, 1992), Toh and Low (1993), Ariff (1994) and Garnaut and Drysdale (1994), among others, find that this initiative of forming the

ASEAN-PTA was disappointing, because the coverage of the PTA was quite limited, the nature of intra-regional structure was competitive rather than complementary, and urgency of promoting tariff reductions was diminishing.

In the East Asian region, ideas of solid regional integration had little supports. Indeed, the idea of forming the East Asian Economic Caucus (EAEC) launched by the Prime Minister Mahathir of Malaysia in the early 1990s faded away gradually since it failed to get supports from the major players in the region, such as Singapore and Japan. The first concrete effort toward regionalism was the ASEAN Free Trade Area (AFTA) launched in 1992 by the ASEAN itself. The establishment of AFTA was encouraged by the changes in the global competitive environment during the 1980s and 1990s. European countries and the United States (US) have been the main ASEAN's trading partners. The establishment of the North America Free Trade Agreement (NAFTA) and the European Union (EU) raised problems against the ASEAN's exports access to the North America and the Europe.

The AFTA is aimed at encouraging further cooperation towards the region's economic growth by accelerating the liberalization of intra-ASEAN trade and investment, now that the ASEAN succeeded in maintaining international and political stability in the region. The AFTA will be realized by applying the Common Effective Preferential Tariff (CEPT) Scheme. Table 2.1 summarizes main documents relating to the AFTA. In fact, it was started by the signing of the Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area on January 28, 1992 in Singapore. Under the agreement, "CEPT" means the Common Effective Preferential Tariff, and it is an agreed effective tariff, preferential to the ASEAN, to be applied to goods originating from the

ASEAN member states (at least 40% of its contents originates from members of the ASEAN), and which have been identified for inclusion in the CEPT Scheme⁷. The agreement applies to all manufactured products, -including capital goods, processed agriculture products, and those products not included in the definition of agricultural products as set out in the Agreement. Agricultural products are excluded from the CEPT Scheme. The member states agree to make schedule of effective preferential tariff reductions as clearly stated in Article 4(1) of the Agreement, which stipulates hereunder:

- (a) The reduction from existing tariff rates to 20% shall be done within a time frame of 5 years to 8 years, from January 1993, subject to a programme of reduction to be decided by each Member State, which shall be announced at the start of the programme. Member States are encouraged to adopt an annual rate of reduction, which shall be $(X-20)\%/5$ or 8, where X equals the existing tariff rates of individual Member States
- (b) The subsequent reduction of tariff rates from 20% or below shall be done within a time frame of 7 years. The rate of reduction shall be at a minimum of 5% quantum per reduction. A programme of reduction to be decided by each Member State shall be announced at the start of the programme.
- (c) For products with existing tariff rates of 20% or below as at January 1993, Member State shall decide upon a programme of tariff reduction, and announce at the start, the schedule of tariff reductions. Two or more Member States may enter into arrangements for tariff reduction to 0%-5% on specific products at an accelerated pace to be announced at the start of the programme.

Table 2.2 shows the timetable for implementing the AFTA with the CEPT scheme.

There have been many amendments to the Agreement on the CEPT due to changes in international economic situations and acceptance of new members. The Protocol to Amend the Agreement on 15 December 1995 stipulates several amendments such as the product coverage (inclusion of unprocessed agricultural products) and accelerated schedule of tariff reduction. In response to proliferation of regionalism - such as the NAFTA and the EU – competition to attract foreign direct investment (FDI) has become stronger as China has emerged as a strong economic power and absorber of FDI, the

⁷ The approach of the CEPT is mainly reciprocal and sectoral, which makes it more encompassing and manageable than the product-by-product approach of PTAs (Pangestu *et al.*, 1992; Athukorala and Menon, 1997).

founding member countries of the ASEAN agreed to establish the ASEAN free trade area by the year 2008. This original target had been continuously moved forward and the AFTA was officially established among the original six countries at the beginning of 2002 (ASEAN Secretariat, 2002).

Table 2.1 The Documents relating to the AFTA

No.	Documents	Places and Dates	Notes
1.	Agreement on the Common Effective Preferential Tariff Schemes for The ASEAN Free Trade Area	Singapore, January 28 th , 1992	10 ARTICLES: Definitions; General Provisions; Product Coverage; Schedule of Tariff Reduction; Other Provisions; Emergency Measures; Institutional Arrangements; Consultation; General Exception; Final Provisions.
2.	Framework Agreement on Enhancing ASEAN Economic Cooperation	Singapore, January 28 th , 1992	15 ARTICLES: Principles; Areas of Cooperation; Other of Cooperation; Sub-regional Economic Arrangements; Extra-ASEAN Economic Cooperation; Private Sector Participation; Monitoring Body; Review of Progress; Settlement of Disputes; Supplementary Agreements or Arrangements; Other Agreements; General Exceptions; Amendments; Entry Into Force; Final Provision.
3.	Protocol to Amend the Agreement on ASEAN Preferential Trading Arrangement	Bangkok, December 15 th , 1995	Annex 1 of the Agreement on “Rules of origin for the ASEAN Preferential Trading Arrangements”, previously amended by the Protocol on Improvements on Extension of Tariff Preference under the ASEAN Preferential Trading Arrangements signed in Manila on 15 December 1987, and the “Operational Certification Procedures for the Rules of Origin of the ASEAN Preferential Trading Arrangements” shall be substituted with the “Rules of Origin for the Common Effective Preferential Tariff (CEPT)” Scheme for the ASEAN Free Trade Area and the “Operational Certification Procedures for the Rules of Origin of the ASEAN Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area” set out in ANNEX 1 and ANNEX 2 respectively which shall form an integral part of his Protocol.
4.	Protocol for the Accession of the Socialist Republic of Vietnam on Enhancing Economic Cooperation	Bangkok, December 15 th , 1995	The Government of the Socialist Republic of Vietnam hereby accedes to the Agreement and upon the entry into force of this Protocol on 1 January 1996 undertakes to immediately observe and carry out its obligation under the Agreement as amended.
5.	Protocol to Amend the Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area	Bangkok, December 15 th , 1995	5 ARTICLES: amend Articles 2, 3, 4 and 9 of the Agreement on the Common Effective Preferential Tariff Schemes for The ASEAN Free Trade Area
6.	Protocol for the Accession of the Socialist Republic of Vietnam to the Agreement on the Common Effective Preferential Tariff Scheme for the ASEAN Free Trade Area	Bangkok, December 15 th , 1995	The socialist Republic of Vietnam hereby accedes to the Agreement and upon the entry into force of this Protocol on January 1996 undertakes to immediately observe and carry out its obligation under the Agreement as amended.
7.	Protocol to Amend the Framework Agreement on Enhancing ASEAN Economic Cooperation	Bangkok, December 15 th , 1995	3 ARTICLES: amend Articles 1 of the Agreement on Enhancing ASEAN Economic Cooperation signed on 28 January 1992 at the Fourth Summit Meeting held in Singapore: replacing “15 years” with “10 years (beginning 1 January 1993)”; Accession of New Members.
8.	ASEAN Framework Agreement on the Facilitation of Goods in Transit	Hanoi, Vietnam, December 16 th , 1998	8 PARTS: General Provisions, Designation of transit transport route, General conditions for road transport, General conditions for rail transport, Custom control, sanitary and phytosanitary measures, Miscellaneous provisions, Institutional arrangements, and Final clauses 33 ARTICLES: Objectives, Principles, Definitions, Scope of application, Grant of rights, Designation of transit transport routes and facilities, Frontier facilities, Traffic regulations, Transit transport services, Road transport permits, Technical requirements of vehicles, Mutual recognition of inspection certificates, mutual recognition of driving licenses, Motor vehicle Third-Party insurance scheme, Charge and other financial obligations, Connecting and transit services, Harmonization and simplification of custom procedures, Establishment of a custom transit system, Establishment of sanitary and phytosanitary measures, Special provisions on transport of dangerous goods, Special provisions on transport of prohibited and/or restricted goods, Special provisions on transport of perishable goods, Provision of greater facilities, Provision of greater facilities, Domestic legislation, Working groups, Compliance with national laws, Transparency, Assistance for traffic accident, Institutional arrangements, Dispute settlement, Accession of new members, Other agreements in force, and Final provisions.
9.	Protocol on Notification Procedures	Makati, October 8 th , 1998	8 ARTICLES: General obligation to notify, Prior notification of intent, ASEAN bodies to be notified, Content of notification, Confidentiality of notification, Follow-up to notification, Role of the ASEAN secretariat/central registry of notifications and Final provisions
10.	Protocol on the Special Arrangement for Sensitive and Highly Sensitive Products	Singapore, September 30 th , 1999	9 ARTICLES: Definition, Time frame, Tariff reduction, Quantitative restrictions, Other non-tariff barriers, Preferential treatment by state trading enterprises, Safeguards, Reciprocity, Final provisions.
11.	Protocol Regarding the Implementation of the CEPT Scheme Temporary Exclusion List	Singapore, November 23 rd , 2000	12 ARTICLES: Objective and scope, Submission, Consideration by the CCCA, Consideration by SEOM and AFTA council, Most favored nation treatment, Non-agreement situation, Change of circumstances, Annual review, Applicable rate, Settlement of disputes, Amendments, Final provisions.
12.	Protocol to Amend the Agreement on the Common Effective Preferential Tariff (CEPT) Scheme for the ASEAN Free Trade Area (AFTA) for the Elimination of Import Duties	January 31 st , 2003	2 ARTICLES: Elimination of import duties and Final provisions. Import duties on products in the Inclusion List of Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore and Thailand shall be eliminated not later than 1 January 2010; Those of Cambodia, Lao PDR, Myanmar and Viet Nam shall be eliminated not later than 1 January 2015 with flexibility for some sensitive products to be eliminated not later than 1 January 2018.

Source: Documents from ASEAN Secretariat (2006), *summarized by the author*.

Table 2.2 The Timetable for Accelerating the AFTA (the CEPT Scheme)

	Definition	1992 Protocol (Signed in January 1992) (Begun on 1 January 1993)	1995 Protocol (Signed in December 1995) (Begun on 1 January 1996)	Some Progress after 1995 protocol including acceptance of new member	Coverage in 2001 CEPT Product List
Inclusion List (INL)	Immediate liberalization through reduction in intra regional (CEPT) tariff rates, removal of quantitative restrictions and other non tariff barriers	Covering all manufactured goods (not including unprocessed agricultural product) Fast Track Present rate < 20% to 0-5% by January 2000 Present rate = 20% to 0-5% by January 2003 Normal Track Present rate < 20% to 0-5% by January 2003 Present rate = 20% to 20% within 5-8 years to 0-5% by January 2008	Covering all manufactured goods (including unprocessed agricultural product) to 0-5% by 1 January 1998 to 0-5% by 1 January 2000 to 0-5% by January 2000 to 20% by 1 January 1998 to 0-5% by 1 January 2003	For original six countries, according to 1998 agreement: 85% of all INL: 0-5% by 1 January 2000 90% of all INL: 0-5% by 1 January 2001 100% of all INL: 0-5% by 1 January 2002 with flexibility For Viet Nam, reduced to 0-5% by 2006 For Lao and Myanmar by 2008 For Cambodia by 2010	55680 tariff lines representing 84.74% of all
Temporary Exclusion List (TEL)	Temporarily excluded from liberalization, but have to be transferred into Inclusion List	Tariff not removed until 31 December 2000, but to be reviewed	Gradually transferred to INL, for original six countries, since 1996	Gradually transferred to INL for Vietnam, since 1999 for Lao and Myanmar, since 2001 for Cambodia, beginning in 2003	8660 tariff lines representing about 13.4% of all
Sensitive List	The commitment to reduce tariff, remove quantitative restrictions and other non-tariff barriers is extended	Tariff not removed	Phased in CEPT, beginning 2001-03, reduced to 0-5% for original six countries by 2010	Phased in CEPT, reduced to 0-5% for Vietnam by 2013 for Lao and Myanmar by 2015 for Cambodia by 2017 (Note: remaining 'Highly Sensitive List' which needs special arrangement for liberalization)	360 tariff lines making up 0.55% of all tariff lines
General Exclusion List	Permanently excluded from FTA for reasons of national security, protection of human, animal or plant life and health and articles of artistic, historic and archaeological value	Tariff not removed			829 tariff lines representing about 1.28% of all tariff lines

Source: mainly from Elliot and Ikemoto (2004) and ASEAN Secretariat (2006)

2.5. Conclusions and Policy Implications

Historically, the ASEAN was established thinking of the regional stability and political issues. However, parallel with the worldwide proliferation of economic regionalism in the period of active trade liberalization in the 1980s and 1990s, the ASEAN has pushed forward economic cooperation. Its first effort in this direction was the establishment of the ASEAN Preferential Trading Arrangements (ASEAN-PTA). However, the initiative of forming the ASEAN-PTA was disappointing due to some factors such as the limited coverage of the PTA, the competitive nature of intra-regional structure and the diminishing urgency of pursuing the task. The further concrete effort toward regionalism was the ASEAN Free Trade Area (AFTA) launched in 1992 by the ASEAN itself. The AFTA has been almost completed through the Common Effective Preferential Tariff (CEPT) Scheme; however, it has still many years to go in some sensitive sectors, though the schedule is flexibly managed depending on the preferences of different countries over range of sectors.

The relative similarities in factor endowments of the ASEAN's members, to some extent, give positive and negative implications. Brunei Darussalam and Singapore are the richest members in terms of GDP per capita but they are not so rich in endowments of labors, natural resources, etc. In contrast, Indonesia is the biggest in terms of population, and is not so regarding human and monetary capital, infrastructure in transportation and communications and so on. As a result, there is no dominant country, which can be the 'core' steering member for the institution. The ASEAN, thus, has frequently been criticized as an indulgent institution directed by weak peer pressure. However, after all it

has proved to be a very successful model of economic cooperation and economic integration for developing countries.

The establishment of the AFTA at least shows the ideal spirit of economic integration for all the members. It also creates another economic power in the East Asian region and then, as a single entity, becomes as big as the other main players in the East Asia i.e. Japan, China and Korea. Therefore, as the first *de jure* economic integration in the East Asia, the ASEAN plays important roles in furthering economic integration such as the ASEAN-China Free Trade Agreement (ACFTA), the ASEAN-Korea Free Trade Agreement (AKFTA) and the ASEAN-Japan Comprehensive Economic Partnership (CEP). The latest comer does not only cover trade liberalization (tariff removal) but also services, investments, rules of origin, dispute settlement, sanitary and phyto-sanitary regulations, technical barriers to trade, economic cooperation and, on Japan's request, intellectual property rights.

However, we have to pay special attention to the bilateral characteristics of these FTAs – i.e. between ASEAN as a single entity or the individual member countries themselves and other non-member countries in the East Asia such as Japan, Korea and China. All these FTAs must be well managed regarding the problems of certificate of origin, etc.; otherwise, the 'noodle bawl' syndrome⁸ might come out. The networking of these bilateral trade agreements does not automatically mean regional economic integration. Baldwin (2006) argues that East Asian regionalism is fragile for the following three reasons: (1) each nation's industrial competitiveness depends on the smooth functioning of 'Factory Asia' – especially intra-regional trade, (2) the unilateral

⁸ This term is used by Baldwin (2006) to illustrate a messy situation due dozens if not hundreds of trade deals under discussion, under negotiations or already signed.

tariff-cutting that created 'Factory Asia' is not subject to WTO discipline (bindings), (3) there is no 'top level management' to substitute for WTO discipline. In addition, Fouquin *et al.* (2006) notes that the AFTA, the ACFTA, the AKFTA and the ASEAN-Japan CEP will give significant contributions to horizontal intra-industry trade, as long as they succeed in reducing tariffs. In fact, the large diversities of incomes and industrial stages have enhanced the de facto economic integration. Therefore, de jure East Asian economic integration will take some time to realize until the large diversities converge between countries.

Chapter 3

Major Trade Trends in the ASEAN Region

3.1. Introduction

The Agreement on the Common Effective Preferential Tariff (CEPT) Scheme for the ASEAN Free Trade Area signed in Singapore on 28 January 1992 aims to promote further cooperation among the ASEAN members in the region's economic growth by accelerating the liberalization in intra-ASEAN trade and investment. The CEPT is a system of agreed effective tariffs, preferential to the ASEAN members, to be applied for goods originating inside the ASEAN region¹. The article 1 of the Protocol to Amend the Agreement on the CEPT scheme for the AFTA for the elimination of Import Duties (2003) clearly stipulates:

1. Import duties on products in the Inclusion Lists of Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore and Thailand shall be eliminated not later than 1 January 2010.
2. Import duties on products in the Inclusion Lists of Cambodia, Lao PDR, Myanmar and Viet Nam shall be eliminated not later than 1 January 2015, with flexibility however allowed for import duties on some sensitive products to be eliminated not later than 1 January 2018.

A question on whether or not the establishment of the AFTA through the CEPT scheme has intensified the intra-ASEAN trade has emerged. Elliott and Ikemoto (2002) find that trade flows were not considerably affected in the years soon after the signing of the AFTA agreement. In addition, the outward-looking policies pursued by the ASEAN countries were also not much affected but rather encouraged by the AFTA process.

¹ In the Agreement on the CEPT for AFTA Article 2 point 4, it is clearly stated that a product shall be deemed to be originating from ASEAN member states, if at least 40 percent of its content originates from any member states.

Hence, examining major trade trends in the ASEAN region becomes an interesting research topic.

This chapter, therefore, is addressed to answer the following critical questions: (1) What are the geographic destinations of the ASEAN exports? (2) Does the country size matter in the intra-ASEAN trade? (3) Which countries are more dependent upon the intra-ASEAN trade? (4) How far have the geographic patterns of regional trade dependence changed? (5) How intense is the intra-ASEAN trade? The rest of this chapter is organized as follows. Section 3.2 describes intra regional trade in the ASEAN region. Section 3.3 shows the changes in geographic destinations of exports. Section 3.4 examines the relationship between the country size and intra-regional trade. Section 3.5 describes the dependence of the ASEAN countries upon intra-regional trade. Section 3.6 examines the intensity of intra-regional trade and section 3.7 examines the intensity of bilateral trade. Finally, conclusions are presented in section 3.8.

3.2. Intra-regional Trade in the ASEAN Region

Table 3.1 shows the values and growth rates of the intra-regional trade in the East Asia (including the ASEAN²), the European Union (EU) and the North American Free Trade Area (NAFTA) in 1995, 2000 and 2005. The values of intra-regional trade in those regions increased and that in the ASEAN region increased from US \$ 81,711 million in 1995 to US \$ 152,167 million in 2005. Meanwhile, the intra-regional trade in the

² In this chapter, the ASEAN consists of the all-10 members: Singapore, Malaysia, the Philippines, Thailand, Indonesia, Brunei Darussalam, Viet Nam, Lao PDR, Cambodia and Myanmar. Ng and Yeats (2003: 81) find that Singapore failed to report any trade with Indonesia after 1964, mainly due to a high volume of illicit trade (smuggling) between the countries. We also find that there is very big discrepancy between the export value of Singapore to Indonesia (US \$ 22,109 million) and the import value of Indonesia from Singapore (US \$ 9,471 million) in 2005. Therefore, we use the import value of Indonesia from Singapore to replace the export value of Singapore to Indonesia since the former is much more consistent with the total export value of Singapore in 2005. This also applies for years 1995 and 2000.

ASEAN+3 region increased from US \$ 367,872 million in 1995 to US \$ 792,955 million in 2005. During 1995-2000, the NAFTA had a relatively higher growth rate in the intra-regional trade since the NAFTA came into effect on 1 January 1994 compared with that of the East Asia and the EU. However, the growth rate of intra regional trade in the NAFTA became lower for 2000-2005. Similarly, the establishment of the AFTA among the six original ASEAN members in 2002 also increased the intra regional trade. The growth rate of intra regional trade increased almost double from 24.6 percent for 1995-2000 to 49.4 percent for 2000-2005. It strongly supports the argument of trade creation and trade diversion in the early stage of economic integration. However, in the case of the ASEAN region, Trung and Hashimoto (2005) find that the AFTA has only produced the trade creation among its members.

Table 3.1 Intra-regional Trade: Values and Growth

Regions	Value (Millions US \$)			Growth (%)	
	1995	2000	2005	1995-2000	2000-2005
1. East Asia	592,763.0	729,504.5	1,282,905.4	23.1	75.9
ASEAN	81,711	101,848	152,167	24.6	49.4
Japan, China, Korea	114,660	152,927	331,839	33.4	117.0
ASEAN+3	367,872	449,779	792,955	22.3	76.3
2. EU	1,259,700	1,618,920	2,653,180	28.5	63.9
3. NAFTA	394,472	676,142	824,550	71.4	21.9
World	5,068,200	6,386,400	10,334,700	26.0	61.8

Source: DOTS-IMF (1998, 2006), *author's calculation*.

Japan, Korea and China have been the dominant trade partners of the ASEAN countries. It is shown by the high values of intra-regional trade among them. In 2005, the intra-regional trade in the ASEAN region was US \$ 152,167 million, meanwhile intra-regional among Japan, China and Korea was US \$ 331,839 million. The intra-regional trade in the ASEAN+3 region was US \$ 792,955 million. It means there was US \$ 309,949 million additional intra-regional trade between the ASEAN and the three

(Japan, China and Korea). The three and other economies in the East Asia, especially Hong Kong and Taiwan, are very important trade partners for the ASEAN countries. Isogai *et al.* (2002) note three main features of trade in the East Asia. *First*, the East Asian economies are highly dependent on exports. Excepting Japan, the overall share of exports to Gross Domestic Product (GDP) was 41.1 percent over the period 1995-2000.

Second, the high export dependence of the East Asian economies is closely related to the increase of foreign direct investment flows into the region originating from Japan, the US and the other countries outside the region. While some investment may have been undertaken to serve domestic market in the region, the majority of investment appears to be export-oriented. Kojima (1995) finds that Japan's investment in the East Asian economies expanded and was generally of the pro-trade-oriented type. The East Asian countries have naturally become processing and production base for Japanese multinational corporations, for example, in the Information Technology (IT) sector through production sharing or production fragmentation (Athukorala, 2003; Athukorala and Yamashita, 2006; Ng and Yeats, 2003). *Third*, the increasing role of East Asia as production base requires imports of intermediate and capital goods largely supplied by Japan.

3.3. Geographic Destinations of Exports

An important question regarding the ASEAN's exports is whether the significant changes in the geographic destinations of exports have occurred. Hufbauer and O'Neill (1988) and Yeats (1990), among others, state that the need not only for ASEAN countries but also for other non-member countries to diversify the origins and destinations of their trade to avoid unfavorable monopoly effects associated with excessive concentration of

their exports. Table 3.2 shows changes in the geographic destinations of the ASEAN's exports for 1995, 2000 and 2005. The ASEAN's intra-regional trade is compared with four major geographic exports destinations i.e. the three (Japan, Korea and China), the EU, the United States (US) and the rest of the world. The figures indicate that the significant changes occurred in the general geographic direction of the ASEAN's exports for 1995-2000. Intra-regional trade within the ASEAN countries still covered a big portion on average about 24.5 percent of the ASEAN's total exports for 1995-2005. For years 1995 and 2000, the share of total exports destined for Japan, the EU and the US decreased from 12.4 percent to 11.6 percent, from 14.1 percent to 13.1 percent and from 18.5 percent to 14.8 percent, respectively. Meanwhile, the shares of total exports destined for China, Korea and the rest increased for the same years.

**Table 3.2 Geographic Destinations of the ASEAN's Exports:
1995, 2000 and 2005**

Year	Total Exports (US \$ Million)	Intra- ASEAN Trade	Share of Total Exports Destined for (%)							
			Japan	China			Korea	EU	USA	Rest
				Mainland	Hong Kong	Taiwan				
1995	322,602	25.3	14.4	2.7	6.1	2.7	3.2	14.1	18.5	13.0
2000	426,633	23.9	13.4	3.8	5.3	4.8	3.6	14.7	19.0	11.5
2005	629,091	24.2	11.6	8.3	6.6	3.3	4.0	13.1	14.8	14.1
Average (1995-2005)		24.5	13.1	5.0	6.0	3.6	3.6	14.0	17.4	12.9

Source: DOTS-IMF (1998, 2006), *author's calculation*.

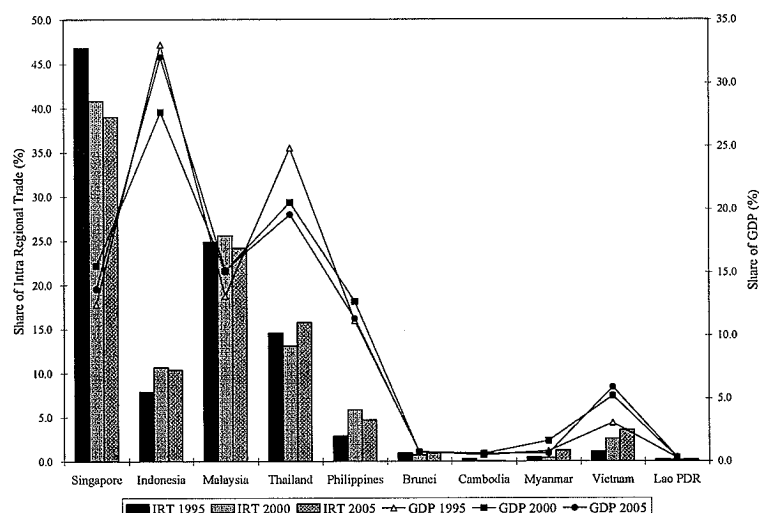
3.4. Intra-ASEAN Trade: Does the country size matter?

The ASEAN has big economic disparities among the members as depicted by the discrepancies in the GDP per capita. Theoretically, it might be argued that if countries engaged in regional trade vary significantly in their economic size, negative implications concerning the benefits of this exchange might rise. In such case, changes in international or macroeconomic (fiscal or monetary) policies of a dominant member will have major

adverse effects on the smaller members. Ng and Yeats (2003) give a very good example on the *Mercado Común del Sur* (MERCOSUR). Brazil is the dominant member of the original Latin American MERCOSUR agreement (other original members are Argentina, Paraguay and Uruguay) with GDP two and one-half times larger than that of the three smaller members combined, and population almost four times greater. Brazil's major devaluation of the Real in the late 1990s resulted in significant exports losses for Argentina. Another example, China's major devaluation of RMB in 1994 had influenced the economic stability in the East Asia, which to some extent also contributed to the Asian crisis. Some researchers might argue that significant differences in the size of intra-regional trade flows can potentially have negative effects for some partners if resources are drawn disproportionately to areas where production for exports is relatively high (Jabar, 1971). More recently, Michaely (1994) demonstrates the lack of similarities between member countries' major imports and exports played an important role in the failure of regional trade agreement.

Figure 3.1 describes the shares of intra-regional trade (IRT as shown by the bar chart) and Gross Domestic Product (GDP as shown by the line graph) of the ASEAN countries in 1995, 2000 and 2005. The intra-regional trade in the ASEAN region was dominated by Singapore, followed by Malaysia, Thailand, Indonesia and the Philippines. Around 40 percent of the intra-regional trade in the region was covered by Singapore. Meanwhile, the combined GDP was dominated by Indonesia. However, Indonesia's GDP per capita was relatively low if compared with Singapore, Malaysia and Thailand, due to large number of population. It is clearly shown that there is positive relationship between

the intra-regional trade and size of country (represented by the share of GDP). The bigger the country size becomes, the bigger shares of intra-regional trade the country obtains³.



Source: DOTS-IMF (1998, 2006) and ASEAN-Japan centre (2006), *author's calculation*.

Figure 3.1 The ASEAN Countries' Shares of Intra-regional Trade and GDP: 1995, 2000 and 2005

Table 3.3 shows the shares of intra-regional trade for the individual ASEAN member countries. It is clear that the ASEAN original members (Singapore, Malaysia, Thailand, Indonesia and the Philippines are commonly abbreviated as the ASEAN5) dominated the intra-regional trade in the ASEAN region. The original members all together covered more than 95 percent of the intra-regional trade.

³ The analysis of Pearson correlation using panel data (cross section: Singapore, Indonesia, Malaysia, Thailand, the Philippines, Brunei, Cambodia, Myanmar, Vietnam and Lao PDR; and time series: 1995, 2000, 2005) shows that the correlation coefficient between the share of intra regional trade (SHAREIRT) and the share of Gross Domestic Product (SHAREGDP) is 0.47. It is statistically significant at 1 percent level of significance. Here is the result of calculation:

		SHAREIRT	SHAREGDP
SHAREIRT	Pearson Correlation	1	.470(**)
	Sig. (2-tailed)		.009
	N	30	30
SHAREGDP	Pearson Correlation	.470(**)	1
	Sig. (2-tailed)	.009	
	N	30	30

** Correlation is significant at the 0.01 level (2-tailed).

Table 3.3 Shares of Intra-ASEAN Trade: 1995, 2000 and 2005 (in %)

(a) 1995

Importers Exporters	Singapore	Indonesia	Malaysia	Thailand	Philippines	Brunei	Cambodia	Myanmar	Vietnam	Lao PDR	Total
Singapore		2.90	27.74	8.35	2.36	1.79	0.61	0.78	2.19	0.05	46.77
Indonesia	4.61		1.21	0.86	0.72	0.00	0.10	0.07	0.35	0.00	7.92
Malaysia	18.31	1.19		3.51	0.80	0.35	0.10	0.28	0.33	0.00	24.86
Thailand	9.69	0.99	1.90		0.51	0.08	0.41	0.00	0.57	0.43	14.58
Philippines	1.22	0.15	0.38	0.98		0.00	0.00	0.00	0.15	0.00	2.89
Brunei	0.38	0.02	0.04	0.46	0.03		0.00	0.00	0.00	0.00	0.92
Cambodia	0.05	0.00	0.02	0.18	0.00	0.00		0.00	0.03	0.00	0.28
Myanmar	0.23	0.12	0.05	0.05	0.00	0.00	0.00		0.00	0.00	0.45
Vietnam	0.84	0.07	0.01	0.00	0.05	0.00	0.12	0.00		0.03	1.12
Lao PDR	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.11		0.21
Total	35.33	5.43	31.35	14.48	4.46	2.23	1.33	1.14	3.73	0.51	100.00

(b) 2000

Importers Exporters	Singapore	Indonesia	Malaysia	Thailand	Philippines	Brunei	Cambodia	Myanmar	Vietnam	Lao PDR	Total
Singapore		3.72	24.59	5.77	3.33	0.48	0.42	0.43	2.05	0.03	40.80
Indonesia	6.44		1.94	1.01	0.81	0.03	0.05	0.06	0.35	0.00	10.69
Malaysia	17.72	1.68		3.49	1.70	0.25	0.07	0.23	0.47	0.00	25.59
Thailand	5.89	1.31	2.76		1.06	0.04	0.34	0.49	0.82	0.37	13.10
Philippines	3.07	0.18	1.35	1.18		0.00	0.00	0.01	0.07	0.00	5.87
Brunei	0.23	0.03	0.01	0.45	0.00		0.00	0.00	0.00	0.00	0.72
Cambodia	0.02	0.00	0.01	0.02	0.00	0.00		0.00	0.02	0.00	0.07
Myanmar	0.10	0.02	0.06	0.23	0.00	0.00	0.00		0.00	0.00	0.41
Vietnam	0.87	0.24	0.41	0.37	0.47	0.00	0.14	0.01		0.07	2.57
Lao PDR	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.09		0.16
Total	34.34	7.18	31.12	12.58	7.36	0.80	1.02	1.23	3.89	0.48	100.00

(c) 2005

Importers Exporters	Singapore	Indonesia	Malaysia	Thailand	Philippines	Brunei	Cambodia	Myanmar	Vietnam	Lao PDR	Total
Singapore		6.22	19.98	6.20	2.75	0.33	0.20	0.39	2.91	0.03	39.00
Indonesia	5.15		2.25	1.48	0.93	0.03	0.06	0.05	0.45	0.00	10.40
Malaysia	14.46	2.18		4.98	1.30	0.23	0.07	0.16	0.76	0.00	24.16
Thailand	4.90	2.61	3.74		1.35	0.04	0.60	0.46	1.55	0.51	15.75
Philippines	1.78	0.31	1.61	0.77		0.01	0.01	0.01	0.21	0.00	4.70
Brunei	0.09	0.72	0.01	0.12	0.00		0.00	0.00	0.00	0.00	0.93
Cambodia	0.00	0.00	0.00	0.01	0.00	0.00		0.00	0.01	0.00	0.02
Myanmar	0.06	0.01	0.08	1.07	0.00	0.00	0.00		0.03	0.00	1.25
Vietnam	1.19	0.31	0.62	0.51	0.54	0.00	0.35	0.01		0.04	3.58
Lao PDR	0.00	0.00	0.01	0.13	0.00	0.00	0.00	0.00	0.06		0.20
Total	27.64	12.36	28.31	15.27	6.87	0.63	1.29	1.08	5.96	0.58	100.00

Source: DOTS-IMF (1998, 2006), *author's calculation*.

3.5. Dependence upon Intra-regional Trade

The previous section shows that the size of country has a positive relationship with the intra-regional trade in the ASEAN region. It might be commonly believed that larger countries are often able to export broader range of products that, in turn, help them enlarge the geographic direction of their trade. Khalaf (1974), Stanley and Bunnag (2001) and Ng and Yeats (2003), among others, find that smaller countries' exports are generally less diversified and often able to maintain relatively fewer trade contacts. In contrast, bigger countries have a larger trade base; therefore, they might have more capacity to develop required logistic infrastructure to maintain commercial relationship with a greater number of trading partners. If it is the case, it might be presumed that the smaller ASEAN countries might be more dependent on geographically nearer regional markets (intra-regional trade).

Table 3.4 shows the individual ASEAN country' exports destined for the other ASEAN countries, Japan, China (Mainland, Hong Kong and Taiwan), Korea, the EU, the US and the rest of the world. All countries had relatively high proportion of exports destined for the other ASEAN countries as intra-regional trade, excepting Cambodia. However, it decreased for some countries such as Singapore and Malaysia, which had relatively high dependence on intra-regional trade. In 2005, Myanmar and Lao PDR had relatively high proportion exports destined for the other ASEAN countries i.e. 51.4 percent and 43.8 percent, respectively.

Table 3.4 The ASEAN Countries' Shares of Exports by Geographic Destinations
(a) 1995

Country*	Total Exports (US \$ Million)	Share of Total Exports Destined for (%)								
		Intra-ASEAN Trade	Japan	China			Korea	EU	USA	Rest
				Mainland	Hong Kong	Taiwan				
Singapore (12.5)	45,428	32.3	7.8	2.3	8.6	3.3	2.7	13.4	18.3	11.3
Indonesia (33.0)	73,724	14.3	27.0	3.8	3.6	0.0	6.4	14.9	13.9	16.0
Malaysia (13.1)	57,201	27.6	12.5	2.6	5.3	3.1	2.7	14.2	20.8	11.3
Thailand (24.8)	17,370	20.8	16.6	2.9	5.1	2.4	1.4	14.9	17.6	18.4
Philippines (11.2)	3,388	13.6	15.8	1.2	4.7	3.3	2.5	17.6	35.8	5.5
Brunei (0.8)	357	22.2	55.6	0.0	0.1	2.5	15.7	0.8	2.0	1.2
Cambodia (0.5)	1,186	63.0	2.0	1.4	3.1	2.5	0.0	14.6	1.4	12.0
Myanmar (0.8)	5,450	30.7	7.3	11.5	4.9	3.2	0.0	6.1	6.7	29.8
Vietnam (3.1)	311	16.8	26.8	6.6	4.7	8.1	4.3	11.9	3.1	17.7
Lao PDR (0.3)	311	55.0	1.6	2.9	0.0	1.6	0.0	10.9	1.6	26.4

(b) 2000

Country*	Total Exports (US \$ Million)	Share of Total Exports Destined for (%)								
		Intra-ASEAN Trade	Japan	China			Korea	EU	USA	Rest
				Mainland	Hong Kong	Taiwan				
Singapore (15.5)	138,046	30.1	7.5	3.9	7.9	6.0	3.6	14.0	17.3	9.8
Indonesia (27.7)	62,118	17.5	23.2	4.5	2.5	3.8	7.0	12.8	13.7	15.0
Malaysia (15.1)	98,154	26.6	13.0	3.1	4.5	3.8	3.3	14.0	20.5	11.2
Thailand (20.5)	68,963	19.3	14.7	4.1	5.0	3.5	1.8	16.3	21.3	13.9
Philippines (12.7)	38,216	15.7	14.7	1.7	5.0	7.5	3.1	18.1	29.8	4.4
Brunei (0.7)	3,161	23.2	40.7	1.8	0.0	0.0	0.0	3.6	12.0	18.8
Cambodia (0.6)	1,123	6.8	1.0	2.1	0.7	0.9	0.0	20.6	65.9	2.1
Myanmar (1.6)	1,979	21.3	5.5	5.7	1.5	1.6	1.0	16.7	22.4	24.3
Vietnam (5.2)	14,482	18.1	17.8	10.6	2.2	5.2	2.4	20.5	5.1	18.1
Lao PDR (0.3)	391	42.7	2.8	1.5	0.1	0.7	0.1	26.2	2.3	23.6

(c) 2005

Country*	Total Exports (US \$ Million)	Share of Total Exports Destined for (%)								
		Intra-ASEAN Trade	Japan	China			Korea	EU	USA	Rest
				Mainland	Hong Kong	Taiwan				
Singapore (13.7)	207,338	28.6	6.0	9.5	10.4	4.3	3.9	13.3	11.5	12.3
Indonesia (32.0)	85,623	18.5	21.1	7.8	1.7	2.9	8.3	12.0	11.5	16.2
Malaysia (15.2)	140,977	26.1	9.3	6.6	5.8	2.8	3.4	11.7	19.7	14.5
Thailand (19.6)	110,104	21.8	13.7	8.3	5.6	2.4	2.0	13.5	15.5	17.3
Philippines (11.3)	41,215	17.3	17.5	9.9	8.1	4.6	3.4	17.0	18.0	4.2
Brunei (0.7)	5,633	25.2	36.8	3.4	0.0	0.0	12.7	1.1	9.5	11.3
Cambodia (0.6)	1,369	2.8	3.5	0.6	24.4	0.1	0.1	14.3	48.6	5.7
Myanmar (0.6)	3,696	51.4	5.0	6.8	1.2	1.3	1.4	8.5	0.0	24.6
Vietnam (5.9)	32,442	16.8	13.6	9.0	1.1	2.9	1.9	16.9	18.3	19.5
Lao PDR (0.3)	695	43.8	1.1	3.3	0.0	1.2	0.3	19.8	0.6	30.0

Note: *Statistics in parentheses represents 2005 share of each economy in the regional Gross Domestic Product (GDP).
Source: DOTS-IMF (1998, 2006), *author's calculation*.

3.6. The Intensity of Intra-regional Trade

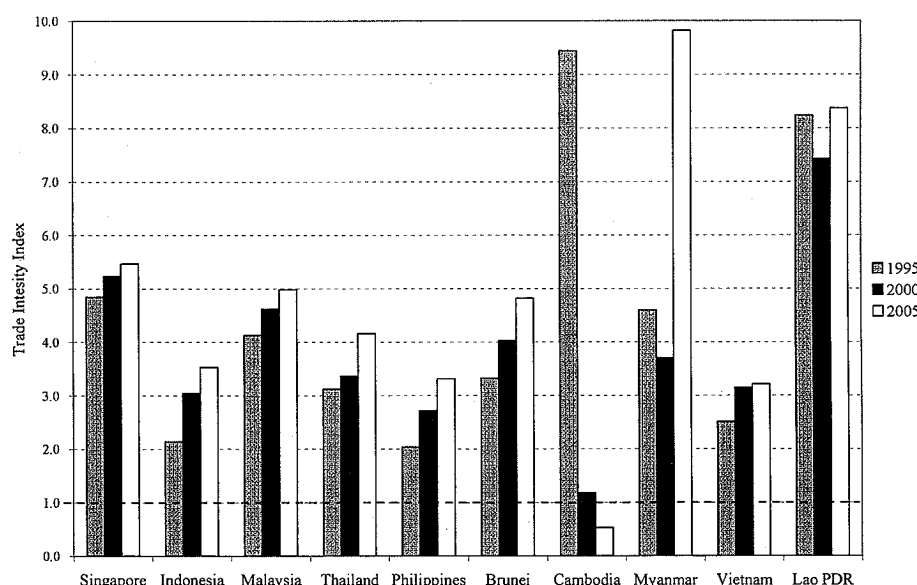
How ‘intense’ is the intra-regional trade in the ASEAN region is the crucial question since the dominance of the three (Japan, China, and Korea), the EU and the US as major trading partners of the ASEAN countries exists. This research applies a measure called trade intensity (TI) index to examine whether the value of trade between two countries is greater or smaller, than it might be expected, based on their relative importance in world trade. For example, IMF-DOTS (2006) data shows that approximately 28.6 percent of Singapore’s exports went to the other ASEAN countries in 2005. The question is whether this figure is above or below than what should be expected based on the partner’s relative size in the global trade. Trade intensity (TI) index is formulated as follows (Drysdale and Garnout, 1982):

$$TI_{jk} = \frac{\left[\frac{x_{jk}}{X_j} \right]}{\left[\frac{x_{wk}}{X_w} \right]_t} \quad (3.1)$$

where TI_{jk} is trade intensity index of country j for exports destination k , x_{jk} and x_{wk} country j ’s and world’s exports to k , respectively. X is total exports. Therefore, the index reflects the ratio of the share of country j ’s exports going to country j , relative to the share of world trade destined for county j (Drysdale and Garnout, 1982; Frankel, 1997). An index of more (less) than unity is interpreted as indicating a bilateral trade flow is larger (smaller) than expected, given the partner country’s importance in the world trade.

Many researches have combined both imports and exports statistics to calculate the index. These data could produce somewhat different results if a country’s trade (that is, exports versus imports) was seriously out of balance. In addition, some modified

versions of equation TI_{jk} have subtracted country j 's imports from the world trade total (X_{wk}) to account for the fact that a country cannot trade with itself (Ng and Yeats, 2003). However, given relatively small size of the ASEAN countries, this adjustment would have produced somewhat similar result.



Source: DOTS-IMF (1998, 2006), *author's calculation*.

**Figure 3.2 Trade Intensity Indices of the ASEAN Countries:
1995, 2000 and 2005**

Figure 3.2 shows the trade intensity index for each ASEAN countries in 1995, 2000 and 2005. In this figure, the index shows how 'intense' a specific ASEAN country's exports destined for the other ASEAN countries. In equation (1), k is the other ASEAN countries. It is clearly shown that the index is more than unity indicating that trade flow is larger than expected, given the ASEAN's importance in world trade, excepting Cambodia in 2005. In other words, all countries have relatively 'intense' exports destined to the ASEAN market for 1995, 2000 and 2005, excepting Cambodia in 2005. Comparing the index in 1995 and 2005, all the ASEAN members had positive trend in the index, except Cambodia. The original members and Viet Nam had a steady increase in the index.

Meanwhile, Myanmar and Lao PDR had similar pattern. Since two countries very much depend on the intra-regional trade, the Asian economic crisis had impacts on their exports destined to the ASEAN countries especially Indonesia, Thailand and Malaysia. As a result, the intensity index slightly decreased in 2000. However, it increased in 2005.

Cambodia is the only member of the ASEAN with decrease in the intensity index. In 1995, the index was still high; however, it decreased drastically in 2000 and 2005. The reason for it is the higher engagement in international relation between Cambodia and the US. In Table 2.6, it clearly shown that the share of Cambodian's exports destined for the US increased drastically from 1.4 percent in 1995 to 65.9 percent in 2000 and to 48.6 percent in 2005. The US is the largest overseas market for Cambodian products, mostly textiles and apparel. Cambodia's garment industry contributes one-third of the country's gross national product and 80 percent of its exports earnings. In 1996, the Clinton Administration signed a trade agreement with Cambodia, and the 104th Congress extended normal trade relations (NTR) status (Lum, 2005). In addition, in 1997 President Clinton designated Cambodia a Least Developed Country under the US Generalized System of Preferences (GSP). As a result, Cambodian exports to the US, mostly textiles and apparel, increased drastically from US \$ 3.7 million in 1996 US \$ 1.4 billion in 2004. With the end of quotas on textiles for WTO member states in 2005, the market for textile and apparel exports has become more competitive. India and China, has several comparative and competitive advantages compared with Cambodia and many other small textile-producing countries.

3.7. The Intensity of Bilateral Trade

There is one important shortcoming of the standard trade intensity index described in equation (3.1). It is that the index does not consider distances between individual countries. With all other things being equal, countries close to each other might be expected to have more ‘intense’ trade relations than those geographically far away. This consideration has been supported by the gravity model of international trade (Tinbergen, 1962). For example, IMF-DOTS (2006) reported that approximately 15.6 percent of Malaysia’s exports went to Singapore and 5.4 percent of her exports went to Thailand in 2005. The question is whether these figures are above or below than what should be expected based on the partner’s relative size in global trade and on the distance between Malaysia and Singapore, as well as Malaysia and Thailand.

In recognition of the geographic distances among countries in the ASEAN region, a modified application of the standard TI index is employed to analyze the intensity of bilateral trade. This research uses the research finding of Ng and Yeats (2003). Applying a simple regression model and bilateral statistics from randomly drawn sample of both East Asian countries and non-East Asian countries, they find significant negative relationship between trade intensity and geographic distance (Ng and Yeats, 2003:19):

$$\begin{aligned} \text{Log}(\text{TI}_{jk}) &= 0.6245 - 0.00015 (\text{Dist}) & (3.2) \\ & \quad (6.72) \quad (9.97) \\ & \quad R^2 = 0.672 \end{aligned}$$

where $\text{Log}(\text{TI}_{jk})$ is logarithm form of trade index of country j for exports destination k , Dist is distance between the capitals of exporting and importing countries (in miles). Figures in parentheses are critical t values (which are all statistically significant at 1 percent level of significance). Ng and Yeats (2003) then uses the

estimated equation to project the “expected” trade intensity (TI_{jk}^*) given the geographic distance between two countries. The ratio of the actual to expected trade intensity is expressed as:

$$R_{jk} = \frac{TI_{jk}}{TI_{jk}^*} \quad (3.3)$$

If the ratio is greater than unity, the bilateral trade intensity between the two countries is higher than expected given the distance that separates them. In contrast, if the ratio is less than unity, trade intensity is lower than expected. Finally, the actual value of the expected adjusted trade intensity index can be derived from:

$$TI_{jk}^* = \frac{TI_{jk}}{R_{jk}} \quad (3.4)$$

If the value of the traditional trade intensity (equation 3.1) index fails to exceed (TI_{jk}^*) (equation 3.4), the intensity of bilateral trade must be considered as lower than expected even if the former exceeds unity.

Table 3.5 Expected Trade Intensity Indices of Bilateral Trades in the ASEAN region: 1995-2005

Importers Exporters	Singapore	Indonesia	Malaysia	Thailand	Philippines	Brunei	Cambodia	Myanmar	Vietnam	Lao PDR
Singapore		3.5	3.9	3.1	2.5	3.2	3.3	2.8	2.6	2.8
Indonesia	3.5		3.3	2.6	2.3	3.0	2.8	2.3	2.2	2.3
Malaysia	3.9	3.3		3.3	2.5	3.1	3.4	3.0	2.7	3.0
Thailand	3.1	2.6	3.3		2.6	2.8	3.8	3.7	3.4	3.8
Philippines	2.5	2.3	2.5	2.6		3.2	2.9	2.4	2.9	2.7
Brunei	3.2	3.0	3.1	2.8	3.2		3.2	2.5	2.7	2.8
Cambodia	3.3	2.8	3.4	3.8	2.9	3.2		3.3	3.4	3.6
Myanmar	2.8	2.3	3.0	3.7	2.4	2.5	3.3		3.3	3.6
Vietnam	2.6	2.2	2.7	3.4	2.9	2.7	3.4	3.6		3.8
Lao PDR	2.8	2.3	3.0	3.8	2.7	2.8	3.6	3.6	3.8	

Source: estimated equation is from Ng and Yeats (2003), data on distance between countries is taken from CEPII (2005)

Table 3.6 Standard Trade Intensity Indices of Bilateral Trades in the ASEAN region: 1995-2005

Importers Exporters	Singapore		Indonesia		Malaysia		Thailand		Philippines		Brunei		Cambodia		Myanmar		Vietnam		Lao PDR	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
Singapore			2.8*	8.2	12.8	13.9	4.5	4.5	2.8	4.0	20.5	16.4	15.0	3.9	13.4	9.2	7.7	6.4	3.0	1.8*
Indonesia	3.7	5.4			1.4*	3.8	1.2*	2.6	2.3	3.3	0.0	3.1	6.2	2.9	3.3	2.9	3.2	2.4	0.0	0.2
Malaysia	9.0	9.3	1.8*	4.2			3.0*	5.4	1.5*	2.8	6.5	17.1	3.7	2.1*	7.7	5.6	1.9*	2.5*	0.1	0.4
Thailand	6.1	4.0	2.0*	6.5	1.8*	4.9			1.3*	3.7	1.8*	4.2	20.7	22.1	0.0	20.5	4.2	6.4	52.9	64.0
Philippines	2.5	3.9	1.0*	2.1*	1.2*	5.6	3.5	2.8			0.3	1.5*	0.0	0.5	0.3	0.7	3.6	2.3*	0.0	0.2
Brunei	4.1	1.4*	0.5	34.7	0.6	0.2	8.5	3.3	1.1*	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cambodia	4.7	0.3	1.6*	0.1	2.4*	0.3	31.6	0.6	0.0	0.1	0.0	0.1			0.0	0.1	30.0	4.0	71.8	0.3
Myanmar	7.2	1.6*	11.3	0.6	2.1*	3.1	2.4*	43.7	0.1	0.1	1.4*	0.3	0.0	0.0			0.0	3.4	0.0	0.0
Vietnam	5.6	3.3	1.4*	2.6	0.1	2.8	0.0	2.4*	1.3*	5.0	0.0	0.0	61.8	44.0	0.0	1.2*			32.9	18.9
Lao PDR	0.0	0.1	0.0	0.0	0.0	1.6*	20.6	29.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	144.4	37.6		

Note: *Although the standard trade intensity index exceeds unity, it is less than the expected distance adjusted index for the two trading partners. As such, the intensity to trade is lower than expected given the geographic distance between the two trading partners (Ng and Yeats 2003).

Source: IMF-DOTS (1999, 2006), *author's calculation*.

By using data on distance taken from CEPII (2005)⁴ and applying equation (3.2), we calculate the expected trade intensity for all the ASEAN members. Table 3.5 reports values for the expected distance adjusted trade intensity indices between the ASEAN countries in 2005. Since the distance remains constant, the expected trade intensity is also fixed. The value of indices can be considered as the criteria of trade intensity with geographic distance consideration. Therefore, the standard trade intensity index exceeding unity is only necessary condition for being said 'intense' in bilateral trade. The standard trade intensity index exceeding the expected trade intensity index is sufficient condition for being said 'intense' in bilateral trade with geographic distance consideration.

Table 3.6 shows the standard intensity index. In the case of the value of standard intensity index exceeding unity, but still falling below the critical value of the distance adjusted (expected index in Table 3.5), the value is marked with an asterisk. The purpose here is to quickly identify situations where the standard index might be improperly lead the conclusion that trade between two the ASEAN members was more intense than expected. For example, there were 11 bilateral trade flows where the standard trade intensity index exceeded unity, but which fell short of the expected distance adjusted index in 2005. In general, it can be stated that intra-trade in the ASEAN region might be classified as highly intense in 2005. It follows the fact that trade intensity indices for 48 (60 percent) out of 90 possible bilateral trade flows among the ASEAN countries exceed their critical expected value which is distance adjusted.

⁴ CEPII stands for the *Centre d'Etudes Prospectives et d'Informations Internationales*. The CEPII has calculated and made available different measures of bilateral distances (in km) for most countries across the world (225 countries in 2006). Data is available online: <http://www.cepii.fr/angalisgraph/bdd/distances.htm>

The intra-regional trade within the five original members of the ASEAN (Singapore, Indonesia, Malaysia, Thailand and Philippines, commonly abbreviated as ASEAN5) can be categorized as highly intense since there were 19 (95 percent) out of 20 possible bilateral trades exceed their critical expected value which is distance adjusted. Furthermore, the evidence strongly suggests that the intensity of trade between the ASEAN5 countries has been increased significantly for 1995-2005. In contrast, the intra-regional trade within the new members of the ASEAN was low in intensity. In addition, the intra-regional trade between the original and new members was also low in intensity. It seems that only Thailand and Viet Nam can raise their intensity of trade between original and new members of the ASEAN, because both countries have comparative advantage in agriculture products as will be elaborated in the next chapter.

3.8. Conclusions

The geographic destinations of the ASEAN's exports have slightly changed. Although Japan, the EU and the NAFTA are still dominant trade partners, the share of the ASEAN's exports to those trade partners decreased for 1995-2005. China (Mainland, Hong Kong and Taiwan) significantly has become important geographic destinations of ASEAN's exports.

The ASEAN5 countries have dominated the intra-regional trade in the ASEAN region. They covered more than 95 percent of the intra-regional trade. There is a positive relationship between the size of country and the share of intra-regional trade in the region. The intra-regional trade in the region has been larger (intense) than expected given the ASEAN's importance in world trade, except Cambodia, which is much engaged in the

US market. There have been positive trends in intensity of the intra-regional trade, which is mainly supported by the original members. In general, only Thailand and Viet Nam have increased intensity in trade with the new members of the ASEAN.

The value and growth rate of intra-regional trade in the ASEAN region are relatively low, compared with in the North-East Asia (Japan-Korea-China). The North-East Asian countries have increasingly become important as trade partners of the ASEAN countries. The ASEAN-China Free Trade Agreement (ACFTA), ASEAN-Korea Free Trade Agreement (AKFTA) and ASEAN-Japan Comprehensive Economic Partnership are expected to have greater impact on intra-regional trade.

Chapter 4

Shift in Pattern of Comparative Advantage

4.1. Introduction

Globalization, liberalization, economic integration, bilateral and multilateral agreements have encouraged international strategic alliances conducted by countries. Trade liberalization not only offers opportunities for the export development but also carries more competitive situation in the international, regional and domestic markets. Based on data from the Direction of Trade Statistics - International Monetary Fund (DOTS-IMF, 1999; 2006), the intra-regional trade of the ASEAN+3, the EU and the NAFTA grew at 112.7 percent, 110.6 percent and 109 percent for 1995-2005, respectively. The shares of their intra regional trades in the world exports grew at 4.3 percent, 3.3 percent and 2.5 percent for 1995-2005, respectively. Meanwhile, if all emerging countries in East Asia are included, as defined by Ng and Yeats (2003), the share of East Asian intra-regional trade in the world trade grew much higher at 6.1 percent for 1995-2005.

Japan has played important roles in the intra-regional trade. Following the 'flying geese' formation, Japan started to grow rapidly in the late 1950s and 1960s and was the head of the formation (Rao, 2001). Then, the geese in the second row were Korea, Taiwan and Singapore with the high growth in early 1970s. Finally, in the third row were

Indonesia, Malaysia, and Thailand, which grew at high rates in the 1980s and 1990s¹. Japan abandoned its import substitution policies by the early 1960s, while Korea and Taiwan shifted to export-promotion policies since the early 1970s. However, the Southeast Asian countries still pursued import until the middle of 1980s. Whether or not there have been systematical changes in comparative advantage and trade specialization in the East-Asian economies have been crucial issues in the liberalization and globalization era. It might be commonly believed that systematic shifts in comparative advantage of the most standardized, labor intensive manufactures from Japan to the old Newly Industrialized Economies (NIEs) and then to the new NIEs and so on.

Parallel with the integration process in the world market, a critical issue on the country specialization and the dynamic shifts in comparative advantage patterns emerges. Isogai *et al.* (2002), James and Movshuk (2003), Ng and Yeats (2003), Roland (2003), Hinloopen and Marrewijk (2004), Batra and Khan (2005), and Wörz (2005), among others, examined the issue in the East Asian economies. Economic theory argues that there is a relationship between the factor intensities for specific products and the location for their optimal production. Products using labor-intensive techniques in their productions should normally be produced in poorer, less developed countries where labor cost is relatively low. In contrast, products using capital-intensive techniques in their production should be produced in richer, developed countries where the cost of capital is relatively low. In other words, less developed countries should have comparative advantage in labor-intensive products; meanwhile more developed countries should have

¹ The Philippines was not a part of the eight high-performing Asian economies (World Bank, 1993), because of its decades-long sluggish economic performance.

comparative advantage in capital-intensive products. The East Asian region is an interesting object regarding the issue since it consists of relatively diverged economies.

This chapter focuses on the ASEAN (only the five formers: Singapore, Indonesia, Malaysia, Thailand and the Philippines)² as a single entity, Japan, Republic of Korea (hereafter Korea) and the People's Republic of China, Mainland (hereafter China), which are all commonly abbreviated as the ASEAN+3. The ASEAN is treated as a single entity for following three reasons. *First*, the ASEAN is the first *de jure* economic integration in the region. The ASEAN Free Trade Area (AFTA) agreement has also been established. Therefore, the ASEAN is sometimes referred to as the cornerstone for the future broader economic integration in the region. *Second*, it is stated that the long-term commitment of ASEAN is the establishment of Common Community (ASEAN Vision 2020). *Third*, many discussions have been made soon after the Asian economic crisis on the basis of the ASEAN as a single entity, such as ASEAN+3, ASEAN-EU, etc. For example, Demiri (2002) argues that the ASEAN-EU relations will be inter-regional ones rather than relations between the EU and the individual ASEAN countries.

It is important to note that after the opening of China in 1979 onward, especially after 1992³, Hong Kong and Taiwan have played very important roles as *entrepots* for goods exchanged between China and the other countries. Hong Kong and Taiwan are not included in this analysis for the following two reasons. *First*, it is taken to avoid a double

² The other ASEAN countries failed to report their official trade statistics to the United Nations, or data very late and on an irregular basis. For instance, Lao PDR has never reported statistics to the United Nations – Commodity Trade Statistics (UN-COMTRADE) which is the main source of data for this research. Vietnam stopped reporting trade statistics to the United Nations in 1989. Vietnam and Myanmar has no data in the UN-COMTRADE database. Brunei has been consistent but late reporter, for 1986-2003. Cambodia has data only for 2000-2004. The DOTS-IMF provides complete the long period data but in the very aggregate (import and export totals). Since this research requires the long period data and the same detailed commodity classifications for each country for comparison purposes, the other ASEAN countries are excluded in the analysis.

³ Deng Xioping's lectures in the southern inspection tour.

consideration in analyzing the comparative advantages of China due to only re-export activities conducted by Hong Kong (Feenstra *et al.*, 1999). Ng and Yeats (2003) find that the influence of major *entrepot* centers, particularly Hong Kong, in the region raises a serious problem complicating analyses of the composition and geographic direction. Hinloopen and Marrewijk (2004d) give a very clear example:

....In 1996, for example, China reported direct exports to the USA of \$ 14.2 billion and indirect exports to the USA via Hong Kong of \$ 12.5 billion, a total value of \$ 26.7 billion. The USA, however, reported an import value from China of \$ 51.5 billion in 1996, a discrepancy of \$ 24.8 billion. Although a substantial part of this discrepancy can be attributed to the value-added of the transshipped goods in Hong Kong, estimated by Feenstra et al. (1999) to be \$7.6 billion, most of the remainder reflects a failure of China's authorities to track the 'final destination' of its exports... (p.2)

Second, from the formal data source on trades namely The United Nations – Commodity Trade Statistics Database (UN-COMTRADE), Taiwan is not explicitly listed as a reporter country. Since this research requires a long period data taken from UN-COMTRADE and the same detailed commodity classifications for each country for comparison purposes, Taiwan is excluded in the analysis.

This chapter is addressed to answer some questions. *First*, what sorts of exported products do the ASEAN+3 have comparative advantage? *Second*, how far have comparative advantages of the ASEAN+3 shifted? *Third*, does the ASEAN's pattern of comparative advantages follow a sequence of changes similar to that of Japan, China, and Korea? The rest of this chapter is organized as follows. Section 4.2 represents the methodology. The results and analysis are presented in section 4.3. Finally, some conclusions and policy implications are presented in section 4.4.

4.2. Methodology

4.2.1. Data

We use data on exports published by the United Nations (UN) namely the United Nations Commodity Trade Statistics Database (UN-COMTRADE). Internationally traded products are classified according to some international standards of classification such as the Standard International Trade Classification (SITC), the Harmonized Commodity Description and Coding System (HS) and the Broad Economic Categories (BEC)⁴. This research uses the 3-digit SITC Revision 2 and focuses on 237 groups of products. There are still two groups (SITC) that are not covered in this chapter i.e. hoop and strip of iron or steel, hot-rolled or cold-rolled (SITC 675) and postal packages not classified according to kind (SITC 911)⁵. Under the SITC, products are classified according to (a) the materials used in production, (b) the processing stage, (c) market practice and uses of the products, (d) the importance of the commodities in terms of the world trade, and (e) technological changes. The structure of classification is: level 1 (one-digit code) for Sections, level 2 (2-digit codes) for Divisions, level 3 (3-digit codes) for Groups, level 4 (4-digit codes) for Subgroups and level 5 (5-digit codes) for Items (UN, 2004).

The 3-digit SITC Revision 2 is chosen for the following two reasons. *First*, the 3-digit will give more detailed and distinctive descriptions than the 1-digit or the 2-digit. It

⁴ The UN-COMTRADE provides us with the detailed data on trade (export, import, re-export and re-import) by countries of reporter, by countries of partner, by years, and by commodity classification systems i.e. the Standard International Trade Classification (SITC) Revision 1 (1961), SITC Revision 2 (1975), SITC Revision 3 (1986), the Harmonized Commodity Description and Coding System (HS) 1992, HS 1996, HS 2002 and the Broad Economic Categories (BEC). The HS was adopted in 1983 and entered into force on 1 January 1988. The BEC is designed to serve as a means for converting external trade data compiled by using the SITC into end-use categories that are meaningful within the System National Accounts (SNA) framework.

⁵ The two SITC have been not reported since 2001 in the world market. Technically, the Revealed Symmetric Comparative Advantage index, which is extensively employed in this research, is not defined when there is no trade in the world market. For 1976-2000, the average share of export of the two SITC in the world export was only 0.13 percent.

also avoids the massive information when the 4-digit or the 5-digit is used. *Second*, since this chapter aims to analyze the dynamic shifts in comparative advantages, it requires time series in the long-term sense. The SITC Revision 2 has been available since 1976 and has been used as the standard report in the International Trade Statistics Yearbook – the United Nations. It gives more detailed classification than the SITC Revision 1, which has 177 Groups, and has been available since 1962 (Ximing and Fukao, 1997). In term of the number of groups, there have been insignificant differences between the SITC Revision 2 and the SITC Revision 3. In addition, the SITC Revision 3 has been just available since 1988. This research identifies 239 Groups in the 3-digit SITC Revision 2 and 240 Groups in the 3-digit SITC Revision 3 (although the remark is 261)⁶. Therefore, the SITC Revision 2 is suitable for this research since it provides appropriately the detailed groups of commodities as well as the range of available data.

4.2.2. Revealed Comparative Advantage

In order to examine the pattern of comparative advantages, a measure of Revealed of Comparative Advantage (RCA) is commonly applied in the empirical analysis. The RCA index by Balassa (1965) - and Hoover (1936) and Liesner (1958) before him - calculates the relative representation of a country's export in one industry compared to the average representation of that industry in total world trade. The RCA index is sometimes called Balassa Index. The index is formulated as follows:

$$RCA_{ij} = (x_{ij} / x_{in}) / (x_{ij} / x_m) \quad (4.1)$$

⁶ See Empirical Trade Analysis (ETA) at <http://people.few.eur.nl/vanmarrewijk/eta/> for further information.

where RCA_{ij} denotes revealed comparative of country i for group of products (SITC) j and x_{ij} symbolizes total exports of country i in group of products (SITC) j . Subscript r denotes all countries without country i , and subscript n refers all groups of products (SITC) except group of product j . Peterson (1988), Ng and Yeats (2003), Crafts (1989), Porter (1990), Amiti (1999) and Isogai *et al.* (2002), among others, empirically applied this index. The index represents a comparison of national export structure (the numerator) with the world export structure (the denominator). By excluding the country and group of products under consideration, double counting is avoided and the nature of trade, which is always a bilateral exchange of goods between two countries, is nicely represented (Wörz, 2005; Vollrath, 1991). The values of the index range from 0 to infinity ($0 \leq RCA_{ij} \leq \infty$). RCA_{ij} greater than 1 implies that country i has comparative advantage in group of products j . In contrast, RCA_{ij} less than 1 means that country i has comparative disadvantage in product j . (The calculation results on RCA are presented in the Appendix A4.1).

Despite detailed discussion on RCA (Balassa) index, Kunimoto (1977), Hilman (1980), and Vollrath (1991), among others, noted that the distribution of the RCA could not be derived theoretically. Since the RCA_{ij} turns out to produce values that cannot be compared on both sides of 1, the index is made to be a symmetric index. The new index is called Revealed Symmetric Comparative Advantaged (RSCA), which is formulated as (Laursen, 1998):

$$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1) \quad (4.2)$$

The $RSCA_{ij}$ index ranges from -1 to +1 (or $-1 \leq RSCA_{ij} \leq 1$). The interpretation of RSCA is similar with that of RCA. $RSCA_{ij}$ greater than 0 imply that country i has

comparative advantage in good j . In contrast, $RSCA_{ij}$ less than 0 imply that country i has comparative disadvantage in product j . This research applies RSCA index instead of RCA index. (The calculation results on RSCA are presented in the Appendix A4.2).

4.2.3. Distribution of RSCA

The distribution of RSCA can be used to analyze the dynamics of comparative advantage. Laursen (1998), James and Movshuk (2003), Hinloopen and Marrewijk (2001; 2004a; 2004b; 2004c), among others, examined the distribution of RCA index relating to the dynamics of comparative advantage. Some descriptive statistics such as arithmetic mean, standard deviation and skewness are applied to examine the shift in comparative advantages in the ASEAN, Japan, Korea and China. *First*, the arithmetic mean is the sum of all the values divided by the total number of values. It is formulated as:

$$\bar{X}_{RSCA_{j,t}} = \frac{\sum_{i=1}^n RSCA_{ij,t}}{n} \quad (4.3)$$

where:

$\bar{X}_{RSCA_{j,t}}$ is the mean of RSCA for country j at time t

i is specific exported product (SITC)

j is country (the ASEAN, Japan, Korea or China)

t is time of observation (1976, 1985, 1995 or 2005)

n is number of product (i.e. 237 3-digit SITC)

The mean of RSCA for the ASEAN, Japan, Korea and China are calculated over time. It is expected that the means of RSCA increase over time. One might argue that median could be better measurement of central tendency than the mean since the distribution are non-symmetric (skewed) distribution (McClave *et al.*, 2001; Hinloopen

and Marrewijk, 2001). (The tests on whether RSCA is normally distributed or not are presented in the Appendix A4.3). Figure 4.1 shows possible shifts in means of $RSCA_{ij,t}$ for two years 1987 and 2005, for example. Panel (a) represents a decrease in the means (median) of comparative advantages, panel (b) represents no change in the means (median) of comparative advantages and panel (c) represents an increase in the means (median) of comparative advantages. Therefore, if the ASEAN, Japan, Korea and China have an increase in comparative advantage, the distribution of RSCA will follow as panel (c).

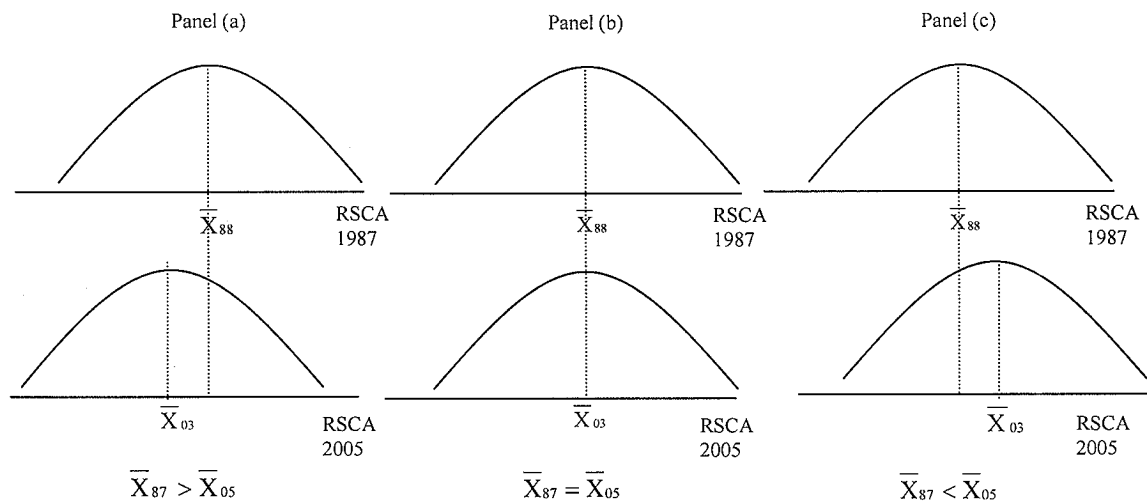


Figure 4.1 Possible Change in the means of Comparative Advantages

Second, standard deviation is the measure of statistical dispersion. It measures how the values of data set spreading out from the mean. If data points are all close to the mean, the standard deviation will be close to zero. If many data points are far from the mean, the standard deviation will be far from zero. If all the data values are equal, then the standard deviation is zero. Standard deviation for variable RSCA is formulated as:

$$\text{stdev}_{\text{RSCA}_{j,t}} = \sqrt{\frac{\sum_{i=1}^n (\text{RSCA}_{ij,t} - \bar{X}_{\text{RSCA}_{j,t}})^2}{n}} \quad (4.4)$$

Where:

$\text{stdev}_{\text{RSCA}_{j,t}}$ is standard deviation of RSCA country j (the ASEAN, Japan, Korea or China) at time t
n is number of observations (231 3-digit SITC)

This statistic is used to examine the dispersion of revealed comparative advantages. Balassa (1965) mentions:

Export performance indices provide an indication of relative advantages (and disadvantages) for individual countries but the dispersion of these indices – representing the “markedness” of comparative advantage- is likely to differ from country to country. In general, one would expect that large countries, as well as countries that occupy a middle position in terms of technological development, would produce a great variety of commodities and hence show relatively small differences in export performance indices. On the one hand, large countries usually possess a more balanced resource endowment and will have a home market sufficiently wide to permit the production of most industrial goods; on the other, countries that are in the middle of the range among industrial economies are likely to export technologically less developed products to economies at higher levels of industrialization and more sophisticated products to countries at lower level of industrial development. (p.107)

Third, skewness refers to the shape of distribution of RSCA. A variable is said to have symmetric distribution if the mean, median and mode are equal. The distribution has the same shape on either side of the center axis. As the distribution becoming asymmetrical (or skewed), the relationship between mean, median and mode might change. In a positive skewed distribution, the arithmetic is the highest of the mode and the median. In contrast, in a distribution that is negatively skewed, the mean is the lowest of the mean and the median. The three possible skewed distributions are depicted in Figure 4.2. The formula of (Karl Person) coefficient of skewness for variable RSCA is:

$$\text{Sk}_{\text{RSCA}_{j,t}} = \frac{3(\text{mean}_{\text{RSCA}_{j,t}} - \text{median}_{\text{RSCA}_{j,t}})}{\text{stdev}_{\text{RSCA}_{j,t}}} \quad (4.5)$$

Where:

Sk_{RSCA} is coefficient of skewness of variable RSCA

Stdev is standard deviation

j is country (the ASEAN, Japan, Korea or China)

t is time (1976, 1985, 1995 or 2005)

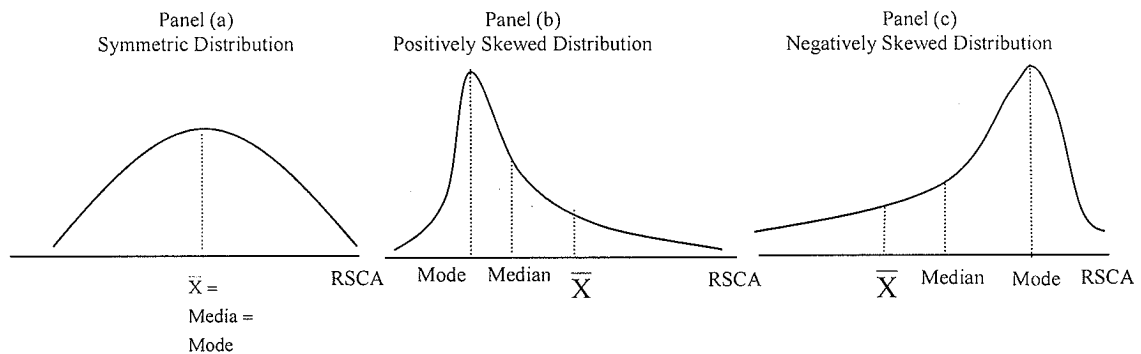


Figure 4.2 Skewness of RSCA

Positive value of skewness coefficient of RSCA for a specific country and a specific year indicates that the country is more concentrated (specialized) on products with low comparative advantages. In contrast, negative value skewness coefficient of RSCA for a specific country and a specific year implies that the country is more concentrated (specialized) on products with high comparative advantages. By looking at the value of skewness coefficient over time, we can analyze the direction of specialization or the shift in comparative advantages. Balassa (1977) examines three issues i.e. the ‘revealed’ comparative advantage of eleven industrial countries in research-intensive products, the structure of comparative advantage in the individual countries, and the extent of specialization and diversification in their manufactured exports. Relating to the third issue, Balassa (1977) clearly states:

Finally, it would appear that the extent of specialization and diversification of manufactured exports depends on a variety of factors, including the size of domestic markets, the level of technological development, natural resource endowments, and the effects of economic integration. Large countries tend to have more diversified exports and, if the explanation suggested are correct, it seems that increased industrial sophistication leads to export diversification, although the technologically leading country tends to specialize in research-intensive products; the availability of natural resources also seems to contribute to specialization.....(p. 339)

Then, we might make a hypothesis that the ASEAN, Japan, Korea or China have more specialized or more concentrated on products with higher comparative advantage over periods of observation (shown by higher value of means; smaller standard deviation and smaller value of skewness over time) as presented by Figure 4.3.

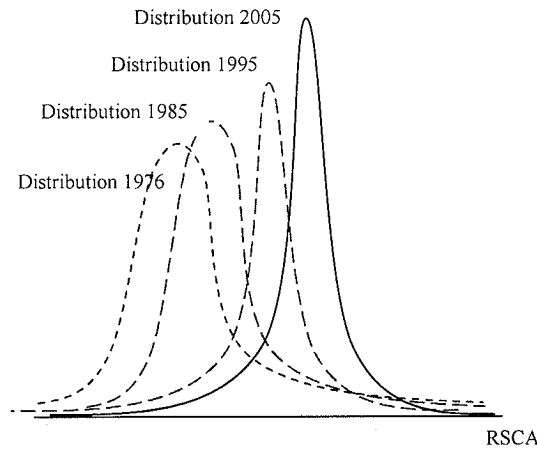


Figure 4.3 Shifts in Comparative Advantage

4.2.4. Rank Correlation

This chapter applies statistical hypothesis test procedure of correlation on the revealed symmetric comparative advantage (RSCA) index to examine the shifts in the pattern of comparative advantages. The degree of linear association between two series of RSCA can be compared by the Spearman's rank correlation coefficient, which is given as follows (Leu, 1998; James and Movshuk, 2003; Gujarati, 1995):

- Across periods (years):

$$\rho_{s, Ct_a, Ct_b} = 1 - 6 \left[\frac{\sum_{i=1}^n d_{R_n}^2}{n(n^2 - 1)} \right] \quad (4.6)$$

- Across countries:

$$\rho_{s,Ct_a,It_b} = 1 - 6 \left[\frac{\sum_{i=1}^n d_{R_{ji}}^2}{n(n^2 - 1)} \right] \quad (4.7)$$

Where:

ρ_{s,Ct_a,Ct_b} = 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).

ρ_{s,Ct_a,It_b} = the Spearman's rank correlation coefficient between country C's RSCA at time t_a (symbol: Ct_a) and country I's RSCA at time t_b (symbol: It_b).

$d_{R_{it}}^2 = (R_{RSCA_{jc,t_a}} - R_{RSCA_{jc,t_b}})^2$ for across periods (years).

$d_{R_{jt}}^2 = (R_{RSCA_{jc,t_a}} - R_{RSCA_{jl,t_b}})^2$ for across countries.

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

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

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

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

t_a and t_b are years

The values of Spearman's rank correlation coefficients range from -1 (a perfect negative relationship) and $+1$ (a perfect positive relationship). A value of 0 indicates no linear relationship. Within a specific country, it is applied across periods to analyze the dynamic shift in comparative advantage. If the correlation is closer to one (1), the shift in comparative advantage is less dynamic. In contrast, if it is closer to minus one (-1), the shift in comparative advantage is more dynamic. (The detailed calculation results on correlation across periods are presented in Appendix A4.4).

It is also applied across countries i.e. ASEAN, Japan, Korea and China to examine the linear association of the patterns of comparative advantage. Higher and

positive value of Spearman's rank correlation coefficient indicates stronger competition between two countries in the export market (more similar pattern of comparative advantage). Smaller and negative value of Spearman's rank correlation coefficient implies stronger complementary of these two countries in supplying products to the export market (more different pattern of comparative advantage). (The detailed calculation results on correlation across countries are presented in Appendix A4.5).

4.3. Analysis

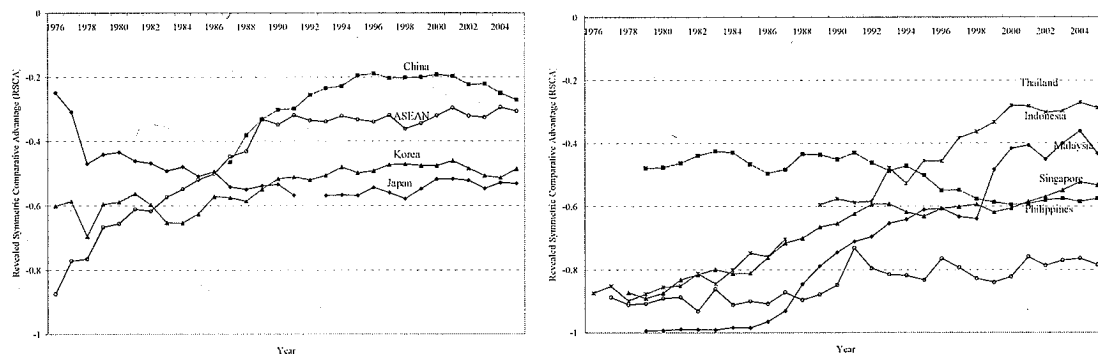
4.3.1. Trends of the overall comparative advantage

Figure 4.4 shows trends in the overall median⁷ of the Revealed Symmetric Comparative Advantage (RSCA) index for ASEAN, Japan, Korea and China (panel a) and 5 individual countries of the ASEAN (panel b) for 1976-2005. Japan as the leader in the 'flying geese' formation had relatively high comparative advantage until the late 1970s. However, Japan had a downward trend in comparative advantage for 1976-1995. The strong reason for this decrease is the foreign direct investment (FDI) by Japan. There was a slight increase in comparative advantage in 1996, but then followed by the decrease in comparative advantage during the Asian financial crisis 1997-1998. Since then, there has been an upward trend in comparative advantage. There were 153 SITC with decrease in their comparative advantage for 1976-1995. The SITC 714 (Engines and motors, non-electric; parts, nes; group 714, item 71888), 697 (Household equipment of base metal, nes), 282 (Waste and scrap metal of iron or steel), 692 (Metal containers for

⁷ Since the distribution of RSCA is skewed distribution, the median is better measurement than the mean.

storage and transport), 661 (Lime, cement, and fabricated construction materials), 562 (Fertilizers, manufactured), 598 (Miscellaneous chemical products, nes), 651 (Textile yarn), 847 (Clothing accessories, of textile fabrics, nes), 679 (Iron, steel casting, forging and stamping, in the rough state, nes), 074 (Tea and mate), 786 (Trailers, and other vehicles, not motorized, nes), 611 (Leather), 554 (Soap, cleansing and polishing preparations), 652 (Cotton fabrics, woven (not including narrow or special fabrics)), 691 (Structures and parts, nes, of iron, steel or aluminum) and 775 (Household type equipment, nes), among others, are SITC with decreases in comparative advantage.

Meanwhile, during 1998-2005 there were 170 SITC with increase in their comparative advantage. The SITC 677 (Iron or steel wire (excluding wire rod), not insulated), 764 (Telecommunication equipment, nes; parts and accessories, nes), 323 (Briquettes; coke and semi-coke; lignite or peat; retort carbon), 673 (Iron and steel bars, rods, shapes and sections), 533 (Pigments, paints, varnishes and related materials), 274 (Sulphur and unroasted iron pyrites), 653 (Fabrics, woven, of man-made fibres (not narrow or special fabrics)), 783 (Road motor vehicles, nes), 583 (Polymerization and copolymerization products), 514 (Nitrogen-function compounds), 751 (Office machines), 516 (Other organic chemicals), 657 (Special textile fabrics and related products), 771 (Electric power machinery, and parts thereof, nes), 716 (Rotating electric plant and parts thereof, nes), 741 (Heating and cooling equipment and parts thereof, nes), 621 (Materials of rubber), 512 (Alcohols, phenols etc, and their derivatives), and 678 (Tube, pipes and fittings, of iron or steel), among others, are the SITC with positive growth in their revealed comparative advantage for 1998-2005.



(a) the ASEAN+3

(b) 5 Countries of the ASEAN

Source: UN-COMTRADE, *author's calculation*.

Figure 4.4 Trends in Overall Median of Comparative Advantages, 1976-2005

The ASEAN had a significant upward trend in comparative advantage for 1976-1989. The SITC 634 (Veneers, plywood, improved" wood and other wood worked nes"), 075 (Spices), 846 (Under-garments, knitted or crocheted), 424 (Other fixed vegetable oils, fluid or solid, crude, refined), 074 (Tea and mate), 899 (Other miscellaneous manufactured articles, nes), 247 (Other wood in the rough or roughly squared), 842 (Men's and boys' outerwear, textile fabrics not knitted or crocheted), 431 (Animal and vegetable oils and fats, processed, and waxes), 848 (Articles of apparel, clothing accessories, non-textile, headgear), among others, had contributed the positive growth of comparative advantage. The comparative advantage decreased slightly during 1992-1997, but it has increased slowly since 1998. It seems that the Asian economic crisis has brought positive impacts on increase of the ASEAN comparative advantages. Elliot and Ikemoto (2004) examine the ASEAN intra- and extra-regional bias in bilateral trade flows and how these relationships have altered over time. They find that one effect of the Asian economic crisis was to generate a stronger desire to redirect imports from within region.

The trend in comparative advantage of the ASEAN for 1990 beyond is quite similar with that of Japan. Elliot and Ikemoto (2004) find that trade flows of the ASEAN were not significantly affected in the years immediately following the signing of the AFTA agreement. It might be argued that the openness and the dominance of the East Asian countries, especially Japan as an important trading partner, affected the ASEAN comparative advantage. Data from DOTS-IMF (1998; 2006) shows that the ASEAN's exports go to the intra-regional trade. Namely, Japan, China, Hong Kong, Taiwan, Korea covered 24.5 percent, 13.1 percent, 5 percent, 6 percent, 3.6 percent and 3.6 percent, respectively. The argument of interrelated activities between the ASEAN and Japan applies to the change in comparative advantage of the ASEAN *vis-à-vis* with other East Asian countries. Japan imports materials (raw or semi-manufactured) from the ASEAN and then processes them with higher technology, and finally exports the products to the ASEAN and rest of the world.

Figure 4.4 (b) shows trends of comparative advantages in each individual countries of ASEAN. Since 1978, Thailand has an upward trend in comparative advantage. Indonesia has also an upward trend in comparative advantage since the second oil crisis in 1982. Since the end of the World War II, the industrial and trade policies in the ASEAN countries will be distinguishable into three stages. *First*, the ASEAN countries adopted import-substitution policies with very high protection. *Second*, due to lack of government financial support and crisis of the balance of trade, the policies were replaced by more export-oriented policies, which were generally quite effective in stimulating economic growth through industrialization. Masuyama (1997) notes that the policies faced at least three challenges in pushing further liberalization i.e. the need to

attract more foreign direct investment (FDI), competition with other countries in the North American and European markets, and the necessity of more decentralized and market-oriented decision making. *Third*, realizing these challenges, the East Asian countries pursued more market-oriented policies, not only in industrial and trade policies but also in macroeconomic (fiscal and monetary) policies. The case of Indonesia will be reviewed in detailed in the Chapter 11.

China had a significant increase in comparative advantage for 1987-1993. However, the increase become relatively insignificant for 1993-2000 and it has shown a downward trend since 2000. The increase of comparative advantage was closely related with the early stage of liberalization process. China took the form of 'decentralization' of trade i.e. giving expansion of entities with independent right to export and import activities. Having initiated decentralization of trade, China considered three main instruments to limit the flow of imports (Panagariya, 2006). *First*, China adopted import-licensing system to control inflows of certain goods. At its peak in the late 1980s the share of all imports under licensing was 46 percent. *Second*, China distributed certain imported products to state agencies with exclusive trading rights. *Third*, tariffs were raised as decentralization made progress. The average statutory tariff rates in 1982 had already risen from negligible levels in the pre-reform era to 56 percent. Then, a major overhaul of the tariff regime was made in 1985 and the average tariff rate went down to 43 percent (Lardy, 2002).

Some policies were established following the decentralization of trade and in 1982 the Ministry of Foreign Economic Relation and Trade (MOFERT) was established by merging the MFT, Ministry of Economic Relations with Foreign Countries, Import

Export Commission, and Foreign Investment Control Commission. During the 1980s, China's merchandise liberalization gave overall impacts on the hold of the MOFERT on trade and resulted in significant increase of foreign trade companies and their autonomy in carrying foreign trade. The number of FTCs increased drastically from just 12 FTCs with monopoly rights on trade in 1978, to 800 in 1985 and to more than 5,000 with full authority in trade in 1988 (Panagariya, 2006). The number of manufacturing enterprises with trading rights also expanded, though it remained small compared with the total number of FTCs (Lardy, 2002). During 1978 and 1995, the Chinese government also devaluated the exchange rate more than 80 percent to encourage exports. China had a system of paying back the value added and custom duties paid on inputs, which were used in producing export goods. Partial rebate on value added tax was introduced in 1984. In 1994, the rebate was raised to 100 percent. Duty drawback was introduced initially for foreign-invested enterprises but was extended subsequently to domestic enterprises as well. In the Special Economic Zones (SEZs) and Open Cities, the policy regime was particularly liberal towards the enterprises with the rights to have 100 percent ownership of assets and to hire and fire workers (Das, 2006:62; Srinivasan, 2006). China also offered financial incentives unavailable elsewhere to the enterprises in these zones.

China has continued to liberalize domestic markets. The share of imports subject to licensing decreased to 18 percent. By the mid 1997, it had only 5 percent of the tariff lines left subject to import licensing. Toward the end of the decade, the proportion fell to 4 percent and the share of imports subject to licensing to 8.45 percent of all imports. As a part of its WTO entry condition, it agreed to eliminate all import quotas, licensing requirements and other non-tariff barriers by the end of 2005. The average tariff

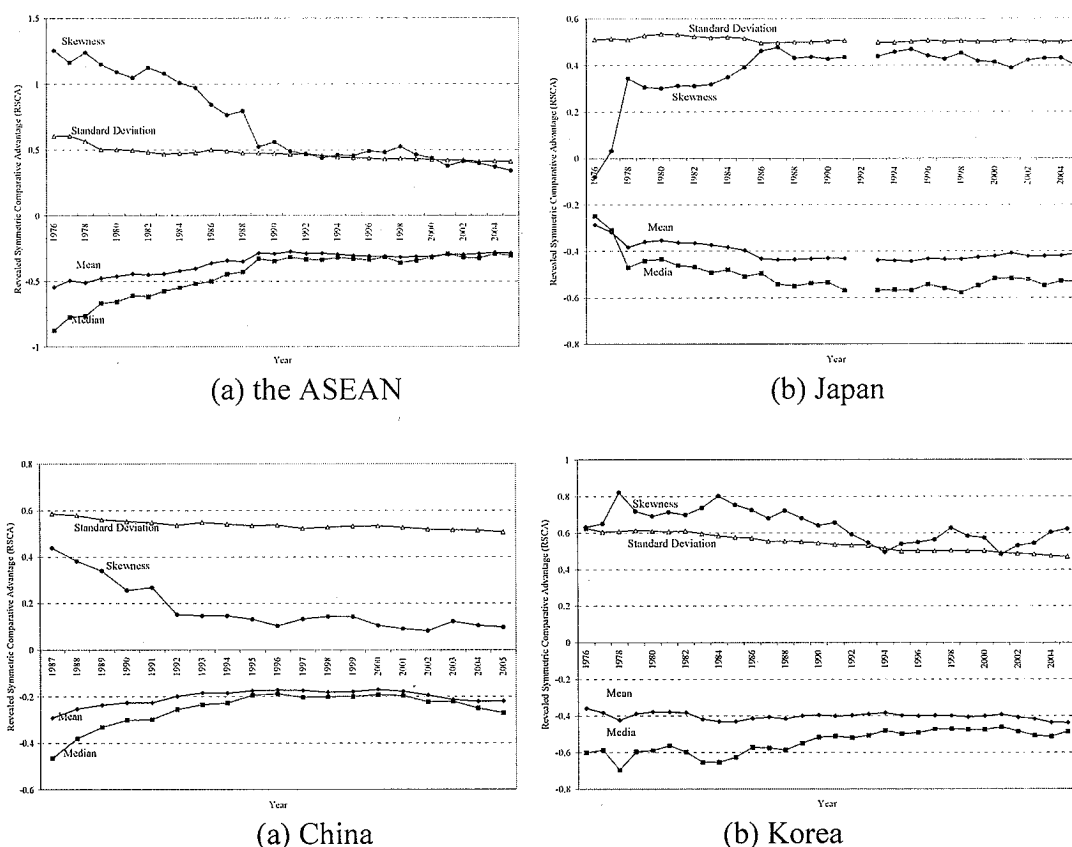
decreased drastically from about 43 percent at the end of the 1980s to 40 percent in 1993, 23 percent in 1996 and 15 percent in 2001. As a part of its WTO entry conditions, China agreed to lower the average industrial tariff to 9 percent (automobile tariff to 25 percent) and average agricultural tariff to 15 percent by 2005 and to provide all state trading enterprises with freedom in imports and export after three years (Woo, 2001). The limit of its agricultural subsidies decreased to 8.5 percent of the value of production.

The decrease of average comparative advantage has been caused by the export diversification. In the early stage of liberalization, it is common for countries to exploit their traditional exports. In the case of China, traditional products with high comparative advantage in 1985 were silk, explosives and pyrotechnic products, crude animal materials, tea and mate, vegetable textile fibres, cotton, vegetables, tin and among others. Moving from exporting resource-based products such as agricultural products to exporting standardized manufactured products decreased the comparative advantage. The domestic structural changes of exports (diversification) lowered the comparative advantage of traditional exported products; meanwhile the new exported products had still no comparative advantages in the international markets.

4.3.2. Increased comparative advantage with de-specialization

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, meanwhile the other products will relatively have smaller increase, constant or decrease in comparative advantage. If it is the case, there must be larger difference (dispersion) in comparative

advantages among products. Statistically, it will be shown by the larger standard deviation of the comparative advantages.



Source: UN-COMTRADE, *author's calculation.*

Figure 4.5 Trends in Mean, Media, Standard Deviation and Skewness of Comparative advantages, 1976-2005

Figure 4.5 shows trends in mean, median, standard deviation and skewness of RSCA of the ASEAN, Japan, China and Korea. Two general patterns of comparative advantage can be stated as follows. *First*, except Japan in 1976, all countries have a concentration on the products with low comparative advantages (shown by positive value of skewness coefficient). However, the concentration become on the product with higher comparative advantage over time (shown by decreasing value of skewness).

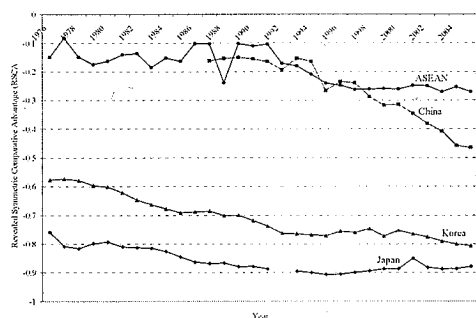
Second, the difference in comparative advantages among products tends gradually to become smaller overtime (shown by decreased values of standard deviation) for the ASEAN, Japan, China and Korea. In other words, all indicates despecialization. The increase of mean followed by the decrease of standard deviation implies that the increase of mean might be encouraged by the higher increase in comparative advantage of products, which had no or lower comparative advantage in the past.

Figure 4.6 (a)-(h) shows the trends of comparative advantages of the broad product groups i.e. Foods and feeds; Agricultural materials; Mineral fuels; Ores, minerals and metals; Chemicals; Machinery and transport; Other manufactures; and Miscellaneous manufactured goods⁸. In general, it is clearly indicated that China and the ASEAN had similar trend of comparative advantages, meanwhile Korea and Japan had relatively similar trend of comparative advantage. Almost in all products groups, China had relatively higher comparative advantage except in Machinery and transport. China and the ASEAN had relatively much higher comparative advantages in natural resources-based products i.e. Foods and feeds; Agricultural materials and Mineral fuels than those of Korea and Japan. However, the three product groups had downward trends in their comparative advantage. The similar positive trend in comparative advantage for the ASEAN, Japan and Korea happened in Ores and metal; Chemical; and Machinery and transport since the beginning of 1980s.

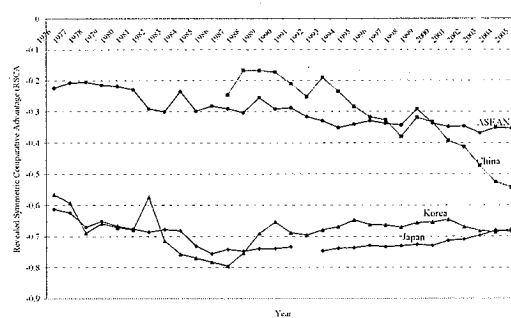
For all the ASEAN, Japan, Korea and China, we can say that increase in comparative advantage has been mainly encouraged by de-specialization. We can see

⁸ This broad product classification follows Ng and Yeats (2003). The products are classified by SITC Revision 2 as Foods and feeds (SITC 0+1+22+4); Agricultural materials (SITC 2-22-27-28); Mineral fuels (SITC 3); Ores, minerals and metals (SITC 27+28+67+68); Chemicals (SITC 5); Machinery and transport (SITC 7); Other manufactures (SITC 6-67-68+84); and Miscellaneous manufactured goods (SITC 8-84).

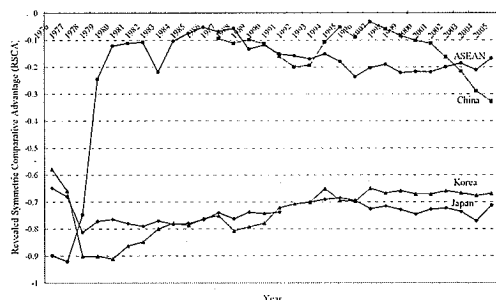
clearly if we analyze further in sectoral level. In the case of the ASEAN and China, the decreases of comparative advantages of Food and feeds; Agricultural materials; Mineral fuels, which had very high comparative advantage in the past has been covered by the increase of comparative advantages of Chemical; and Transport and machinery. In the case of Japan and Korea, the decreases of comparative advantages of Other Manufacture; and Miscellaneous manufacture had relatively high comparative advantage in the past has been covered by the increase of comparative advantages of Mineral and fuels; Ores and Metals; Chemicals; transports and equipment.



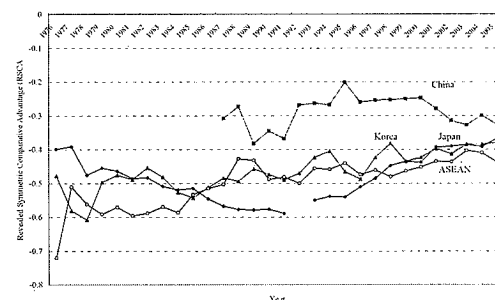
(a) Foods and Feeds



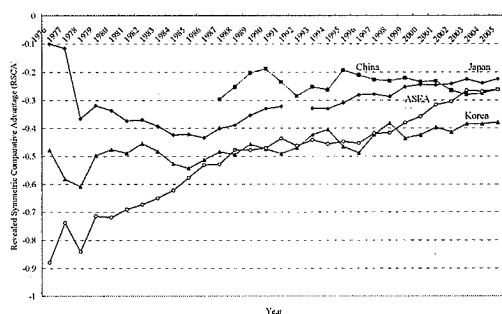
(b) Agricultural Materials



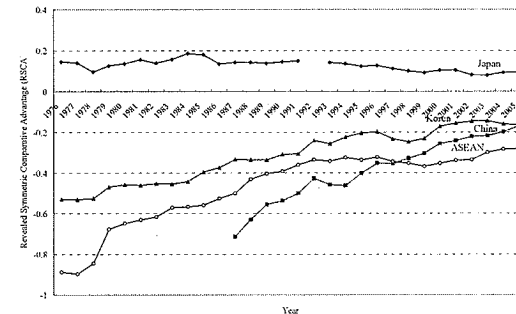
(c) Mineral Fuels



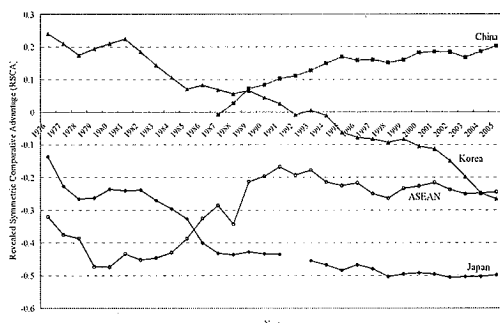
(d) Ores and Metal



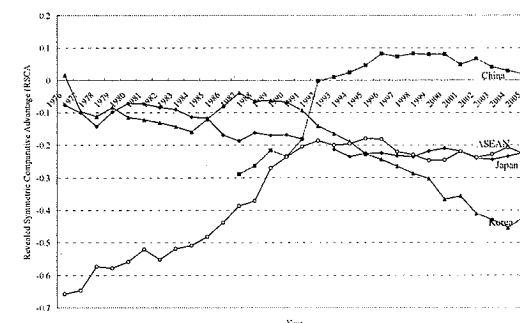
(e) Chemical



(f) Machinery and Transport



(g) Other Manufacture



(h) Miscellaneous Manufactured

Source: UN-COMTRADE, *author's calculation*.

Figure 4.6. Trends in Sectoral Average Comparative Advantages, 1976-2005

4.3.3. The structure of comparative advantage

The meaning of ‘leading exported products’ can be seen from two different points of view. *First*, from domestic point of view, leading exported products are meant as exported products, which can give bigger amount of foreign exchange for domestic economy. From this point of view, higher share of a specific product in the total domestic exports indicates more significant contributions to the domestic economy (as leading exported product). These products can be considered as foreign exchange earners for the domestic economy. *Second*, from international competition point of view, leading exported products are products, which have comparative advantages in the international market. A specific exported product becomes leading export if its share in the total world export is dominant. It might be possible that a specific product is not significant as foreign exchange earner even though it is competitive internationally. This subpart describes this kind of exports products.

Tables 4.1, 4.2, 4.3 and 4.4 represent the top-twenty SITC products with higher comparative advantages in the case of the ASEAN, Japan, Korea and China, respectively, for 1985 and 2005. In the case of the ASEAN, the top-twenty’s list in 1985 was dominated by SITC 0 (Food and live animal) and SITC 2 (Crude materials, inedible, except fuels); however, it was dominated by SITC 0 (Food and live animal) and SITC 7 (Machinery and transport equipment) in 2005. For the last twenty years (1985-2005), Natural rubber latex, rubber and gums (SITC 232), Other fixed vegetable oils, fluid or solid, crude, refined (SITC 424), Tin (SITC 687) had still remained in the top rank. There were 6 SITC products as the new comers in the top-twenty’s list in 2005 i.e. Natural abrasives, *nes* (SITC 277), Parts, *nes* of and accessories for machines of headings 751 or

752 (SITC 759), Automatic data processing machines and units thereof (SITC 752), Margarine and shortening (SITC 091), Electrical apparatus for making and breaking electrical circuits (SITC 772) and Petroleum products, refined (SITC 334).

In the cases of Japan and Korea, the top-twenty's list in 1985 was dominated by SITC 8 (Miscellaneous manufactured) and SITC 7 (Machinery and transport equipment). Korea showed more dynamic change in the pattern of comparative advantages within the top-twenty's list compared with that of Japan. In the case of Korea there were 17 new comers in the top-twenty's list in 2005, meanwhile Japan only noted 10 new comers in the top-twenty's list in 2005. Korea shows an interesting experience; the new comers in the top-twenty's list were not only from industrial sector but also from traditional sector such as Synthetic fibres suitable for spinning (SITC 266), Carboxylic acids, and their derivatives (SITC 513), Hydrocarbons, *nes*, and derivatives (SITC 511), Synthetic rubber, latex, etc; waste, scrap of unhardened rubber (SITC 233), Old clothing and other old textile articles; rags (SITC 269), Condensation, polycondensation and polyaddition products (SITC 285). This did not happen in Japan where the new comers in the top-twenty's list in 2005 were still from the manufacturing sector except Synthetic fibres suitable for spinning (SITC 266) and Hydrocarbons, *nes*, and derivatives (SITC 511).

China showed dynamic change in comparative advantage in the top-twenty's list. There were 16 new comers in the top-twenty's list in 2005. Most of them are from the manufacturing sector (SITC 6, 7, and 8), except Briquettes; coke and semi-coke; lignite or peat; retort carbon (SITC 323).

Table 4.1 Top-Twenty SITC in Comparative Advantage 1985 and 2005: ASEAN

1985				2005		
No	SITC	Commodity	RSCA	SITC	Commodity	RSCA
1	232	Natural rubber latex; rubber and gums	0.92	232	Natural rubber latex; rubber and gums	0.87
2	424	Other fixed vegetable oils, fluid or solid, crude, refined	0.89	424	Other fixed vegetable oils, fluid or solid, crude, refined	0.85
3	687	Tin	0.87	687	Tin	0.82
4	247 [#]	Other wood in the rough or roughly squared	0.78	431	Animal and vegetable oils and fats, processed, and waxes	0.72
5	634	Veneers, plywood, improved" wood and other wood worked nes"	0.78	776	Thermionic, microcircuits, transistors, valves, etc	0.69
6	245	Fuel wood and wood charcoal	0.77	042	Rice	0.65
7	075	Spices	0.75	277*	Natural abrasives, nes	0.56
8	042	Rice	0.75	037	Fish, crustaceans and molluscs, prepared or preserved, nes	0.55
9	431	Animal and vegetable oils and fats, processed, and waxes	0.71	762	Radio-broadcast receivers	0.53
10	341	Gas, natural and manufactured	0.62	036	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc	0.49
11	776	Thermionic, microcircuits, transistors, valves, etc	0.59	759*	Parts, nes of and accessories for machines of headings 751 or 752	0.48
12	036	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc	0.59	752*	Automatic data processing machines and units thereof	0.47
13	335 [#]	Residual petroleum products, nes and related materials	0.56	634	Veneers, plywood, improved" wood and other wood worked nes"	0.45
14	931 [#]	Special transactions, commodity not classified according to class	0.55	072	Cocoa	0.42
15	037	Fish, crustaceans and molluscs, prepared or preserved, nes	0.54	075	Spices	0.35
16	333 [#]	Crude petroleum and oils obtained from bituminous minerals	0.53	341	Gas, natural and manufactured	0.34
17	289 [#]	Ores and concentrates of precious metals, waste, scrap	0.50	091*	Margarine and shortening	0.31
18	061 [#]	Sugar and honey	0.49	772*	Electrical apparatus for making and breaking electrical circuits	0.29
19	762	Radio-broadcast receivers	0.48	334*	Petroleum products, refined	0.28
20	072	Cocoa	0.47	245	Fuel wood and wood charcoal	0.26

Note: [#] not listed in the top twenty in comparative advantage 2005; * not listed in the top twenty in comparative advantage 1985

Source: UN-COMTRADE, *author's calculation*.

Table 4.2 Top-Twenty SITC in Comparative Advantage 1985 and 2005: Japan

No	1985			2005		
	SITC	Commodity	RSCA	SITC	Commodity	RSCA
1	763	Gramophones, dictating machines and other sound recorders	0.76	712*	Steam engines, turbines	0.66
2	785	Cycles, scooters, motorized or not; invalid carriages	0.72	881	Photographic apparatus and equipment, nes	0.64
3	751 [#]	Office machines	0.67	785	Cycles, scooters, motorized or not; invalid carriages	0.63
4	762 [#]	Radio-broadcast receivers	0.63	884	Optical goods nes	0.61
5	761 [#]	Television receivers	0.62	882*	Photographic and cinematographic supplies	0.59
6	881	Photographic apparatus and equipment, nes	0.62	736	Metalworking machine-tools, parts and accessories thereof, nes	0.58
7	782 [#]	Lorries and special purposes motor vehicles	0.53	763	Gramophones, dictating machines and other sound recorders	0.52
8	898 [#]	Musical instruments, parts and accessories thereof	0.52	728*	Other machinery, equipment, for specialized industries; parts nes	0.51
9	711	Steam boilers and auxiliary plant; and parts thereof, nes	0.52	781	Passenger motor vehicles (excluding buses)	0.49
10	781	Passenger motor vehicles (excluding buses)	0.51	793	Ships, boats and floating structures	0.49
11	793	Ships, boats and floating structures	0.49	711	Steam boilers and auxiliary plant; and parts thereof, nes	0.47
12	764 [#]	Telecommunication equipment, nes; parts and accessories, nes	0.47	266*	Synthetic fibres suitable for spinning	0.42
13	678 [#]	Tube, pipes and fittings, of iron or steel	0.46	723*	Civil engineering, contractors' plant and equipment and parts, nes	0.39
14	884	Optical goods nes	0.45	737*	Metalworking machinery (other than machine-tools), and parts, nes	0.38
15	674	Universals, plates, and sheets, of iron or steel	0.44	778*	Electrical machinery and apparatus, nes	0.37
16	871	Optical instruments and apparatus	0.41	713*	Internal combustion piston engines, and parts thereof, nes	0.37
17	885 [#]	Watches and clocks	0.41	871	Optical instruments and apparatus	0.35
18	666 [#]	Pottery	0.41	511*	Hydrocarbons, nes, and derivatives	0.35
19	676 [#]	Rails and railway track construction materials, of iron or steel	0.37	674	Universals, plates, and sheets, of iron or steel	0.34
20	736	Metalworking machine-tools, parts and accessories thereof, nes	0.35	724*	Textile and leather machinery, and parts thereof, nes	0.34

Note: [#] not listed in the top twenty in comparative advantage 2005; * not listed in the top twenty in comparative advantage 1985

Source: UN-COMTRADE, *author's calculation*.

Table 4.3 Top-Twenty SITC in Comparative Advantage 1985 and 2005: Korea

No	1985			2005		
	SITC	Commodity	RSCA	SITC	Commodity	RSCA
1	793	Ships, boats and floating structures	0.89	793	Ships, boats and floating structures	0.80
2	848 [#]	Articles of apparel, clothing accessories, non-textile, headgear	0.83	871*	Optical instruments and apparatus	0.80
3	844 [#]	Under garments of textile fabrics, not knitted or crocheted	0.82	266*	Synthetic fibres suitable for spinning	0.72
4	831 [#]	Travel goods, handbags etc, of leather, plastics, textile, others	0.81	655*	Knitted or crocheted fabrics (including tubular, etc, fabrics)	0.68
5	851 [#]	Footwear	0.76	764*	Telecommunication equipment, nes; parts and accessories, nes	0.57
6	842 [#]	Men's and boys' outerwear, textile fabrics not knitted or crocheted	0.74	513*	Carboxylic acids, and their derivatives	0.56
7	691 [#]	Structures and parts, nes, of iron, steel or aluminium	0.73	511*	Hydrocarbons, nes, and derivatives	0.54
8	653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)	0.72	656*	Tulle, lace, embroidery, ribbons, trimmings and other small wares	0.52
9	786 [#]	Trailers, and other vehicles, not motorized, nes	0.72	776*	Thermionic, microcircuits, transistors, valves, etc	0.50
10	846 [#]	Under-garments, knitted or crocheted	0.71	653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)	0.49
11	845 [#]	Outerwear knitted or crocheted, not elastic nor rubberized	0.69	677*	Iron or steel wire (excluding wire rod), not insulated	0.48
12	941 [#]	Animals, live, nes, (including zoo animals, pets, insects, etc)	0.68	711*	Steam boilers and auxiliary plant; and parts thereof, nes	0.47
13	761 [#]	Television receivers	0.68	233*	Synthetic rubber, latex, etc; waste, scrap of unhardened rubber	0.46
14	762 [#]	Radio-broadcast receivers	0.66	674*	Universals, plates, and sheets, of iron or steel	0.41
15	847 [#]	Clothing accessories, of textile fabrics, nes	0.65	686*	Zinc	0.40
16	894 [#]	Baby carriages, toys, games and sporting goods	0.64	269*	Old clothing and other old textile articles; rags	0.40
17	693	Wire products (excluding insulated electrical wire); fencing grills	0.64	693	Wire products (excluding insulated electrical wire); fencing grills	0.36
18	696 [#]	Cutlery	0.63	724*	Textile and leather machinery, and parts thereof, nes	0.35
19	843 [#]	Womens, girls, infants outerwear, textile, not knitted or crocheted	0.61	657*	Special textile fabrics and related products	0.34
20	034 [#]	Fish, fresh, chilled or frozen	0.58	582*	Condensation, polycondensation and polyaddition products	0.34

Note: [#] not listed in the top twenty in comparative advantage 2005; * not listed in the top twenty in comparative advantage 1985

Source: UN-COMTRADE, *author's calculation*.

Table 4.4 Top-Twenty SITC in Comparative Advantage 1987 and 2005: China

No	1987			2005		
	SITC	Commodity	RSCA	SITC	Commodity	RSCA
1	261	Silk	0.95	261	Silk	0.83
2	572 [#]	Explosives and pyrotechnic products	0.84	848*	Articles of apparel, clothing accessories, non-textile, headgear	0.67
3	291 [#]	Crude animal materials, nes	0.84	666*	Pottery	0.66
4	074 [#]	Tea and mate	0.81	323*	Briquettes; coke and semi-coke; lignite or peat; retort carbon	0.66
5	265 [#]	Vegetable textile fibres, excluding cotton, jute, and waste	0.81	871*	Optical instruments and apparatus	0.63
6	263 [#]	Cotton	0.80	658	Made-up articles, wholly or chiefly of textile materials, nes	0.63
7	658	Made-up articles, wholly or chiefly of textile materials, nes	0.79	763*	Gramophones, dictating machines and other sound recorders	0.62
8	689 [#]	Miscellaneous non-ferrous base metals, employed in metallurgy	0.77	851*	Footwear	0.62
9	652 [#]	Cotton fabrics, woven (not including narrow or special fabrics)	0.77	894*	Baby carriages, toys, games and sporting goods	0.61
10	264 [#]	Jute, other textile bast fibres, nes, raw, processed but not spun	0.73	751*	Office machines	0.61
11	654 [#]	Textile fabrics, woven, other than cotton or man-made fibres	0.73	845	Outerwear knitted or crocheted, not elastic nor rubberized	0.61
12	847	Clothing accessories, of textile fabrics, nes	0.73	831*	Travel goods, handbags etc, of leather, plastics, textile, others	0.60
13	845	Outerwear knitted or crocheted, not elastic nor rubberized	0.71	786*	Trailers, and other vehicles, not motorized, nes	0.60
14	056 [#]	Vegetables, roots and tubers, prepared or preserved, nes	0.70	752*	Automatic data processing machines and units thereof	0.59
15	687 [#]	Tin	0.67	696*	Cutlery	0.58
16	844	Under garments of textile fabrics, not knitted or crocheted	0.66	844	Under garments of textile fabrics, not knitted or crocheted	0.58
17	222 [#]	Seeds and oleaginous fruit, whole or broken, for 'soft' fixed oil	0.59	842*	Men's and boys' outerwear, textile fabrics not knitted or crocheted	0.56
18	894	Baby carriages, toys, games and sporting goods	0.59	847*	Clothing accessories, of textile fabrics, nes	0.55
19	671 [#]	Pig and sponge iron, spiegeleisen, etc, and ferro-alloys	0.59	653*	Fabrics, woven, of man-made fibres (not narrow or special fabrics)	0.55
20	899v	Other miscellaneous manufactured articles, nes	0.59	697*	Household equipment of base metal, nes	0.54

Note: [#] not listed in the top twenty in comparative advantage 2005; * not listed in the top twenty in comparative advantage 1985

Source: UN-COMTRADE, *author's calculation*.

4.3.4. Shift in the pattern of comparative advantage

Tables 4.1 – 4.4 only show the structural changes in comparative advantage within the top-twenty products. The next question is how are the general structural changes in comparative advantages? We cannot conclude that there were structural changes in comparative advantages by only looking at the change in comparative advantages within the top-twenty products. This research calculates Spearman's rank correlations on RSCA across periods i.e. 1976⁹, 1985, 1995 and 2005 to examine separately the structural changes of comparative advantages in the ASEAN, Japan, Korea, and China¹⁰. The 10 years are chosen as the time lag for some reasons. *First*, it follows Hinlloopen and Marrewijk (2004d) who apply the Galtonian regressions to estimate the most appropriate time lag for analyzing dynamic comparative advantage. In the case of China, Taiwan and Hong Kong, Hinlloopen and Marrewijk (2004d) find that the goodness-of-fit for the first 5 or 10 year is most important. *Second*, this research considers the Asian financial crisis, which might have brought significantly irregular impacts on trade data.

The coefficient equals minus one (-1) if there is perfect structural change in comparative advantages, in contrast, it equals plus one (+1) if there is no structural change in comparative advantages during the period of analysis. Table 4.5 represents Spearman's rank correlation coefficients, which are all statistically significant at 1

⁹ The data are available only after 1976 onward. And, the latest data available are for the year 2005.

¹⁰ Discussion with Jeroen Hinlloopen (Department of Economics, University of Amsterdam) results that the Spearman rank correlation can be used to examine the shift in pattern of comparative advantage. However, we will face some difficulties in inference statistics. The Spearman rank correlation gives indicator that closer to 1 less dynamic change in the pattern of comparative advantage will be. In contrast, closer to -1 more dynamic change in the pattern of comparative advantage will be. In some papers of Jeroen Hinlloopen proposed some supplemental quantitative measures other than common used statistical methods i.e. mobility indicator associated with Markov transition matrices, Galtonian regressions, probability-probability (p-p) plots and the Harmonic Mass index. However, these measures are also still lag of inference statistics.

percent level of significance. The ASEAN, Japan, Korea, and China showed the changes in the pattern of comparative advantages in the different degree. It is clearly shown that the ASEAN had smaller coefficient of the Spearman's rank correlation than that of Japan, Korea and China. It means that there were more dynamic changes in the pattern of comparative advantages in the ASEAN than in Japan, Korea or China. Japan had the slowest changes in the pattern of comparative advantages.

Table 4.5 Spearman's Rank Correlation Coefficients across Periods

		ASEAN			
		Comparative Advantage			
		1976	1985	1995	2005
ASEAN Comparative Advantage	1976	1.00	0.54*	0.40*	0.24*
	1985	0.54*	1.00	0.76*	0.61*
	1995	0.40*	0.76*	1.00	0.83*
	2005	0.24*	0.61*	0.83*	1.00

(a)

		Japan			
		Comparative Advantage			
		1976	1985	1995	2005
Japan Comparative Advantage	1976	1.00	0.92*	0.86*	0.82*
	1985	0.92*	1.00	0.92*	0.84*
	1995	0.86*	0.92*	1.00	0.95*
	2005	0.82*	0.84*	0.95*	1.00

(b)

		Korea			
		Comparative Advantage			
		1976	1985	1995	2005
Korea Comparative Advantage	1976	1.00	0.78*	0.56*	0.34*
	1985	0.78*	1.00	0.78*	0.57*
	1995	0.56*	0.78*	1.00	0.82*
	2005	0.34*	0.57*	0.82*	1.00

(c)

		China			
		Comparative Advantage			
		1987	1995	2005	
China Comparative Advantage	1987	1.00	0.68*	0.48*	
	1995	0.68*	1.00	0.81*	
	2005	0.48*	0.81*	1.00	

(d)

Note: * significant at 1 percent level of significance
Source: UN-COMTRADE, *author's calculation*.

All countries have slower rate of change in the pattern of comparative advantage. For example, the ASEAN had the coefficient of 0.54 for 1976-1985; 0.76 for 1985-1995 and 0.83 for 1995-2005. Japan had the coefficient 0.92 for 1976-1985, 0.92 for 1985-1995, and 0.95 for 1995-2005. This indicates that in the some stage of economic development the structural change in comparative advantage becomes less likely. Hollis

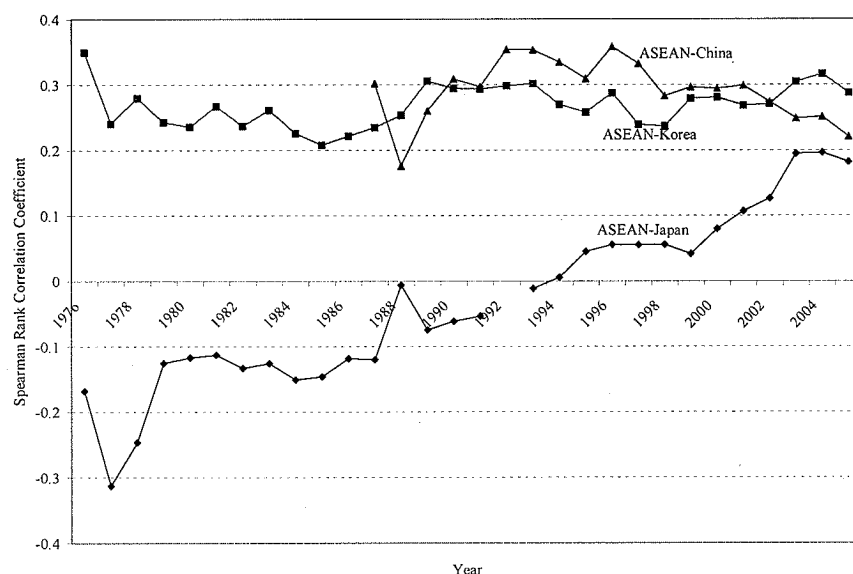
Chenery's patterns of development approach gives the empirical analysis of the "sequential process" through, which the economic, industrial and institutional structure of an underdeveloped economy is transformed over time to permit new industries to replace traditional agriculture as the engine of economic growth (Todaro and Smith, 2006). That might be the case of the ASEAN. The high comparative advantages of the ASEAN in traditional products (agricultural and natural resource based ones) have been replaced by manufacture products. The transformation from agriculture to manufacture has been spurred by foreign direct investment. After manufacture products, what comes next? As is seen in the case of Japan, there come manufacture products based on higher technological contents. During the period 1967-1983 Japan shifted its specialization from *unskilled labor*-intensive products to *human capital*- and *research and development (R&D)*-intensive products (Balassa and Noland, 1989). In this stage, the change in the pattern of comparative advantage is less likely to happen.

4.3.5. Relations of the patterns of comparative advantage: substitute or complementary?

It might be believed that there is systematic shift in the pattern of comparative advantage for the most standardized, labor-intensive manufactures from Japan to other East Asian countries, especially the ASEAN countries. This sub-part examines the trend in similarity of the pattern of comparative advantage between the ASEAN and Japan, the ASEAN and China, as well as the ASEAN and Korea. The Spearman's rank correlation is applied. The higher and positive value of the coefficient indicates more similar pattern of comparative advantage. It also indicates stronger competition between two countries in

the export market. In contrast, the smaller and negative value of the coefficient reflects more different pattern of comparative advantage. It also indicates stronger complementary of the two countries in supplying products to the export market.

Figure 4.7 shows trends of the Spearman's rank correlation coefficient between the ASEAN and Japan, Korea as well as China. The coefficients for the ASEAN-China and the ASEAN-Korea were positive during the periods of observation. They ranged from around 0.17 to 0.37 and were statistically significant. In the case of the ASEAN-Japan, up to 1994 there had been negative value of the correlation, which implied complementary relationship in the pattern of comparative advantage. Sharp decrease in the correlation in the late 1970-s was mainly caused by oil-price shocks (or 'oil-boom' according to Booth (1998)) in the international market. However, since 1995 the coefficient has become positive and approached 0.2 (statistically significant) in 2003.



Source: UN-COMTRADE, author's calculation.

Figure 4.7 Trends in Spearman's Rank Correlation Coefficient ASEAN+3

The pattern of comparative advantage of the ASEAN has become similar with that of Japan. There at least three reasons for this. *First*, the ASEAN have missed its

comparative advantage in the traditional groups of products (agriculture, natural resource ones). The SITC 264 (Jute, other textile bast fibres, nes, raw, processed but not spun), 034 (Fish, fresh, chilled or frozen), 081 (Feeding stuff for animals (not including unmilled cereals)), 044 (Maize, unmilled), 261 (Silk), 291 (Crude animal materials, nes), 121 (Tobacco unmanufactured; tobacco refuse), 683 (Nickel), and 046 (Meal and flour of wheat and flour of meslin), among others, are SITC with decrease in their comparative advantage for 1980-2005. There were 35 groups of products - dominated by 1-digit SITC heading 0 and 2- with decrease in comparative advantage for 1980-2005.

Second, the main potential reason for this is the foreign direct investment (FDI) from Japan to the ASEAN countries. Following a 'flying geese' formation Japanese companies have invested heavily in the region since 1960s. Balassa and Noland (1989) find that during the period 1967-1983 Japan's pattern of specialization in manufactures changed dramatically from *unskilled labor*-intensive goods to *human capital* and *R&D*-intensive products. The *unskilled labor*-intensive industries have been reallocated to the ASEAN countries. There are two types of Japan's FDI i.e. pro-trade-oriented and anti-trade-oriented. Kojima (1995) finds that Japan's investment in East Asian economies has also expanded and been generally of the pro-trade-oriented type. The increase in comparative advantage of the ASEAN was supported by the increase of comparative advantage in manufacture sector in which Japan put greatly her investment. The SITC 842 (Men's and boys' outerwear, textile fabrics not knitted or crocheted), 843 (Womens, girls, infants outerwear, textile, not knitted or crocheted), 635 (Wood manufactures, nes), 761 (Television receivers), 772 (Electrical apparatus for making and breaking electrical circuits), 653 (Fabrics, woven, of man-made fibres (not narrow or special fabrics)), 845

(Outerwear knitted or crocheted, not elastic nor rubberized), 661 (Lime, cement, and fabricated construction materials), 848 (Articles of apparel, clothing accessories, non-textile, headgear), 846 (Under-garments, knitted or crocheted), 844 (Under garments of textile fabrics, not knitted or crocheted), 246 (Pulpwood (including chips and wood waste)), 821 (Furniture and parts thereof), 851 (Footwear), 847 (Clothing accessories, of textile fabrics, nes), and 658 (Made-up articles, wholly or chiefly of textile materials, nes), among others, were the SITC with increase in their comparative advantage for 1980-2005.

Third, Japan has to some extent lost its export comparative advantage due to its foreign direct investment in the advanced economies. Kojima (1995) finds that there has been a large outward shift of Japan's FDI toward the advanced economies in the 1980s. The FDI is generally not of the pro-trade-oriented type but rather of the anti-trade-oriented one. When Japan did foreign direct investment in advanced economies, the Japan's exports of the related products to the advanced countries decreased because of the decrease in those products. Theoretically, when the composition of industries with lower and higher labor productivities differs between countries, trade is promoted between these complementary partners. The degree of complementarities of comparative advantage between Japan and her export partners has been declining, and has led to the stagnation of Japanese export after the 1990s. Balassa and Noland (1989) finds that Japan and the United States have similar comparative advantage i.e. *human capital*- and *R&D*-intensive products.

Japanese products - capital and intermediate goods, which had once high comparative advantage and were very competitive internationally for a long time- have

almost lost their comparative advantage. Several markets have been taken over by East Asian countries, including the ASEAN, where much of Japan's (pro-trade-oriented) investment has been allocated. Meanwhile, the complementarities of comparative advantage between Japan and the advanced countries declined due to Japan's (anti-trade-oriented) foreign direct investment. Those have spurred the catching-up by the ASEAN countries to Japan.

4.3.6. Convergence in the pattern of comparative advantage

An interesting issue regarding the relationship of comparative advantage pattern between the ASEAN and Japan; the ASEAN and China; or the ASEAN and Korea is whether a long term equilibrium relationship exists or not. In other words, do they have a certain level of similarity in the pattern of comparative advantage in the long run? There might be similarity (convergence) in the pattern of comparative advantage. Theoretically, specialization based on comparative advantage under free trade changes the (endogenous) rate of productivity growth in sectors in the economies. Productivity levels determine comparative advantage and affect the allocation of labor (resources) between sectors in the economies. This sequentially determines relative rates of productivity growth, and thereby feeds back to shape the evolution of productivity levels over time. In this way, current comparative advantage is endogenously determined. The endogeneity of comparative advantage in models of growth and trade has led a number of authors to speak in term of 'dynamic comparative advantage' (Nelson, 1977; Proudman and Redding, 2000; Redding, 2002; Barnes *et al.*, 2004; among others). From Figure 4.6, for example, the correlation coefficients of comparative advantage pattern between the

ASEAN and Korea has fluctuated around 0.2-0.3. Could we say that there is similarity in the pattern of comparative advantage between the ASEAN and Korea in the long run? In contrast, the coefficient correlation of comparative advantage pattern between ASEAN and Japan had upward trend overtime. Could we say that there is no similarity in the pattern of comparative advantage between ASEAN and Japan in the long run?

This research applies a stationary test on the correlation series, namely Augmented Dickey-Fuller (ADF) test. The ADF test constructs a parametric correction of the typical Dickey-Fuller test for highest-order correlation by assuming that the series (in this research the Spearman rank correlation coefficients, ρ) follows autoregressive with order p -denoted as AR(p)- process and adding lagged difference terms of the dependent variable ρ_t to the right hand side of original test regression (Enders, 1995; Gujarati, 1995). The general equation of the ADF is (Please see to the supplements in pages 337-348):

$$\Delta\rho_t = \beta_0 + \beta_1\rho_{t-1} + \sum_{i=1}^p \alpha_i \Delta\rho_{t-i} + \delta t + \varepsilon_t \quad (4.8)$$

where t and ε_t are time and the error term, respectively. The ρ_t is non-stationary if we accept the hypothesis (H_0) saying that $\beta_1=0$. In contrast, the ρ_t is stationary if we reject the hypothesis (H_0) saying that $\beta_1=0$. For testing the hypothesis, we follow conventional

Student's t-distribution $t_{\beta_1} = \frac{\beta_1}{se(\beta_1)}$ and it is compared with MacKinnon (1996) critical value.

Table 4.6 represents results of the ADF stationary tests on the correlation of comparative advantage between the ASEAN and Japan; the ASEAN and Korea; as well as the ASEAN and China. Since the ADF test statistic higher than the chosen critical values (1 percent, 5 percent, and 10 percent), we accept the hypothesis (H_0) saying that

the correlation coefficient series (the ASEAN-Japan; the ASEAN-Korea and the ASEAN-China) are non stationary series. In other words, our data indicate that there is no long run equilibrium of the correlation of comparative patterns the ASEAN-Japan; the ASEAN-Korea, and the ASEAN-China.

Table 4.6 Stationary Test on Pattern of Comparative Advantage

Pattern of Comparative Advantage	ADF Test Statistic	Level of Significance	Critical Value	Conclusions
ASEAN-Japan	-3.11	1%	-4.37	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		5%	-3.60	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		10%	-3.24	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
ASEAN-Korea	-2.36	1%	-4.36	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		5%	-3.59	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		10%	-3.23	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
ASEAN-China	-2.80	1%	-4.73	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		5%	-3.76	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)
		10%	-3.32	Non-stationary (No long run equilibrium in the correlation of comparative advantage pattern)

Source: UN-COMTRADE, *author's calculation*.

This research, therefore, indicates that the comparative advantage pattern might be seen in dynamic sense. Redding (2002) notes that comparative advantage is endogenously determined by past technological change, while simultaneously shaping current rates of innovation. The dynamics of comparative advantage might caused by the role of input trade (Jones, 2000), friction in international trade and investment flows due to geography, institutions, transport, and information cost (Venables, 2001), the transmission of knowledge across borders (Grossman and Helpman, 1991), technological differences across border (Trefler, 1995), and monopolistic competition in differentiated products with increasing return to scale (Krugman, 1979).

4.4. Conclusions and Policy Implications

The increase in overall comparative advantage together with the decrease in the standard deviation implies that the increase in overall comparative advantage is encouraged by the higher increase in comparative advantage of products, which had no or lower comparative advantage in the past. The ASEAN, China and Korea may have a trade-off between specialization in the goods with comparative advantage (in low technological groups of products) and specialization in the other products with much potentiality for comparative advantage in the future as the result of high productivity growth as seen in the case of Japan.

There have been changes in the pattern of comparative advantage. The ASEAN has shown the biggest change followed by China, Korea and Japan. However, the rate of change decreased since the comparative advantage become more concentrated on the manufacture products. The comparative advantage pattern of the ASEAN has become similar to that of Japan. The catching up process has been spurred by the change in the pattern of comparative advantage in both the ASEAN and Japan due to the latter's foreign direct investment in the former, which is more pro-trade-oriented type and in the advanced countries, which is more anti-trade-oriented one. There is no long run equilibrium in the similarities of comparative advantage pattern between the ASEAN and Japan, the ASEAN and Korea, as well as the ASEAN and China. Therefore, it suggests that the comparative advantage must be considered in the dynamic sense instead of static one.

Chapter 5

Factor Endowments and Comparative Advantage

5.1. Introduction

Theoretically, factor endowments affect the capacity of a country in producing goods and services as depicted by its production possibility frontier (PPF). The effect of factor endowments on international trade then becomes a critical issue since it also determines comparative advantage. Countries with a great quantity of factor endowments have more opportunities to attain economies of scale in production of goods and services. Elli Heckscher (1919) and Bertil Ohlin (1933) examine the effect of factor endowments on international trade. The trade model of theirs is often referred to as the Heckscher-Ohlin (H-O) model.

In the H-O model, there are nine strict assumptions (Appleyard and Field, 2001). *First*, there are two countries (let us say A and B), two homogenous goods (let us say x and y), and two homogenous factors of production (let us say labor L and capital K) whose initial levels are fixed and assumed to be relatively different for each country. This assumption is frequently presented as the 2x2x2 model. *Second*, technology is identical in both countries; that is, production functions are the same in both countries. *Third*, production functions are characterized by constant return to scale (CRS) for both commodities x and y, in both countries A and B. This means that when each factor of production is increased by n times, output will also increase by n times. *Fourth*, the two commodities have different factor intensities, and there will be no reversal of factor

intensities for any factor price ratio. *Fifth*, tastes and preferences (utility functions) are the same in both countries. In addition, there are homothetic¹ tastes and preferences. *Sixth*, markets are under perfect competition in both countries. *Seventh*, factors of production are perfectly mobile within each country and immobile between two countries. *Eighth*, transportation costs are zero. *Ninth*, there is no trade barrier and no policy restriction on the movements of goods between the two countries. Two conclusions of the H-O model commonly referred to as the Heckscher-Ohlin theorems in wider sense are stated as follows:

A country will export the commodity uses relatively intensively its relatively abundant factor of production, and it will imports the good that uses relatively intensively its relatively scarce factor of production. (Appleyard and Field, 2001, pp. 125)

In equilibrium, with both countries facing the same relative (and absolute) product prices, with both having the same technology, and with constant returns to scale, relative (and absolute) cost will be equalized. The only way this can happen is if, in fact, factor prices are equalized. (Appleyard and Field, 2001, pp. 126)

This chapter is addressed to examine the two important assumptions, mentioned above, on production (second one) and consumption (fifth one). Those two assumptions are used to derive the production possibility frontier (PPF) and community indifference curve (CIC). They are the central analytical tools in the neoclassical theory on gains from trade. If the production functions are different in two countries, does the H-O theorem still necessarily hold? If the utility (tastes and preferences) functions are different in both countries, does the H-O theorem still necessarily hold? Countries in the East Asia region have large discrepancies in the factor endowments. China and Indonesia, for example, have a huge number of unskilled labors and natural resources. Meanwhile, Japan and Singapore have lots of capitals but are lack of natural resources. The East Asia region

¹ A function is homothetic if it is a monotonic transformation of some homogeneous function (see Hoy *et al.* (1996) for detailed explanation)

becomes an interesting object for research on comparative advantage of industries based on factor intensities. This chapter, therefore, takes East Asian region as a target for case study on industries or products in which the East Asian countries have specialized.

The rest of this chapter is organized as follows. Section 5.2 describes the H-O model in General Equilibrium (GE) framework. Section 5.3 describes the consequences of violations of the H-O assumptions by using numerical examples. Section 5.4 represents the analysis of comparative advantage in East Asian countries. Finally, some conclusions are presented in section 5.5.

5.2. The H-O model in the General Equilibrium Framework

This section briefly discusses the basic theory of the H-O model in the General Equilibrium (GE) framework. We hope that it can give clear understanding in examining violations of the H-O assumptions using numerical examples presented in the next section. Figure 5.1 shows the H-O model in the GE framework². Suppose, there are two countries A and B engaging in trade each other. Country A's factor endowments labor (L) and capital (K) are Le_A and Ke_A , respectively. Similarly, Le_B and Ke_B are for country B. In our case, if $(Ke_A / Le_A) > (Ke_B / Le_B)$ then country A is referred to as the capital-rich country and country B is referred to as the labor-rich one. Both countries, A and B, produce two goods y (sector 1) and x (sector 2), which require two inputs labor (L) and capital (K). Let us assume that commodity x (sector 2) is labor-intensive and commodity y (sector 1) is capital-intensive, such that $(K_1 / L_1) > (K_2 / L_2)$.

² We represent the four common diagrams in one figure to show the clear relationships between production and consumption equilibriums.

In Figure 5.1, panels (a.A) and (a.B) show the general equilibriums in production (inputs allocation) in country A and B, respectively. Producers (in both sectors 1 and 2) want to minimize cost with respect to certain output level of production (least cost combination). Pareto set of factors allocation (as depicted by curves $0_1E_A0_2$ for country A and $0_1E_B0_2$ for country B) is the locus where marginal rate of technical substitution (MRTS) K for L sector 1 equals that of sector 2, and simultaneously equals factor price ratio:

$$\begin{aligned} \text{MRTS}_{\text{KforL}}^1 &= \text{MRTS}_{\text{KforL}}^2 = -\frac{wK}{wL} \\ -\frac{\text{MP}_K^1}{\text{MP}_L^1} &= -\frac{\text{MP}_K^2}{\text{MP}_L^2} = -\frac{wK}{wL} \end{aligned} \quad (5.1)$$

where MP denotes marginal product; wK and wL represent price of capital and labor, respectively. The optimal factor allocations are in point E_A and E_B for countries A and B, respectively.

These pareto sets of factors allocations determine the shape of the production possibility frontiers (PPF) depicted in panels (b.A) and (b.B). Since E_A and E_B are the optimal factor allocations for countries A and B, these determine the number of production x and y which then will be optimally distributed to consumers (households) in the economies. Suppose, in both countries A and B there are two kinds of households i.e. capital-owner household with utility function $u_K(x,y)$ and labor-owner household with utility function $u_L(x,y)$. Income of capital-owner household is $m=wK*KeA$, while that of labor-owner household is $m=wL*LeA$ in country A.

The same logic applies in country B. Each household wants to maximize the utility with respect to budget constraint. The pareto set of goods distribution (as depicted by $0_{LH}F_A0_{KH}$ for country A and $0_{LH}F_B0_{KH}$ for country B) is the locus where marginal rate

of substitution (MRS) x for y of the labor-owner household equals that of the capital-owner household, and simultaneously equals the good price ratio:

$$\begin{aligned} MRS_{xfory}^{LH} &= MRS_{xfory}^{KH} = -\frac{p_x}{p_y} \\ -\frac{MU_x^{LH}}{MU_y^{LH}} &= -\frac{MU_x^{KH}}{MU_y^{KH}} = -\frac{p_x}{p_y} \end{aligned} \tag{5.2}$$

Where MU denotes marginal utility, p_x and p_y denote prices of goods x and y, respectively. Suppose, the optimal factor allocations are in point F_A and F_B for countries A and B, respectively.

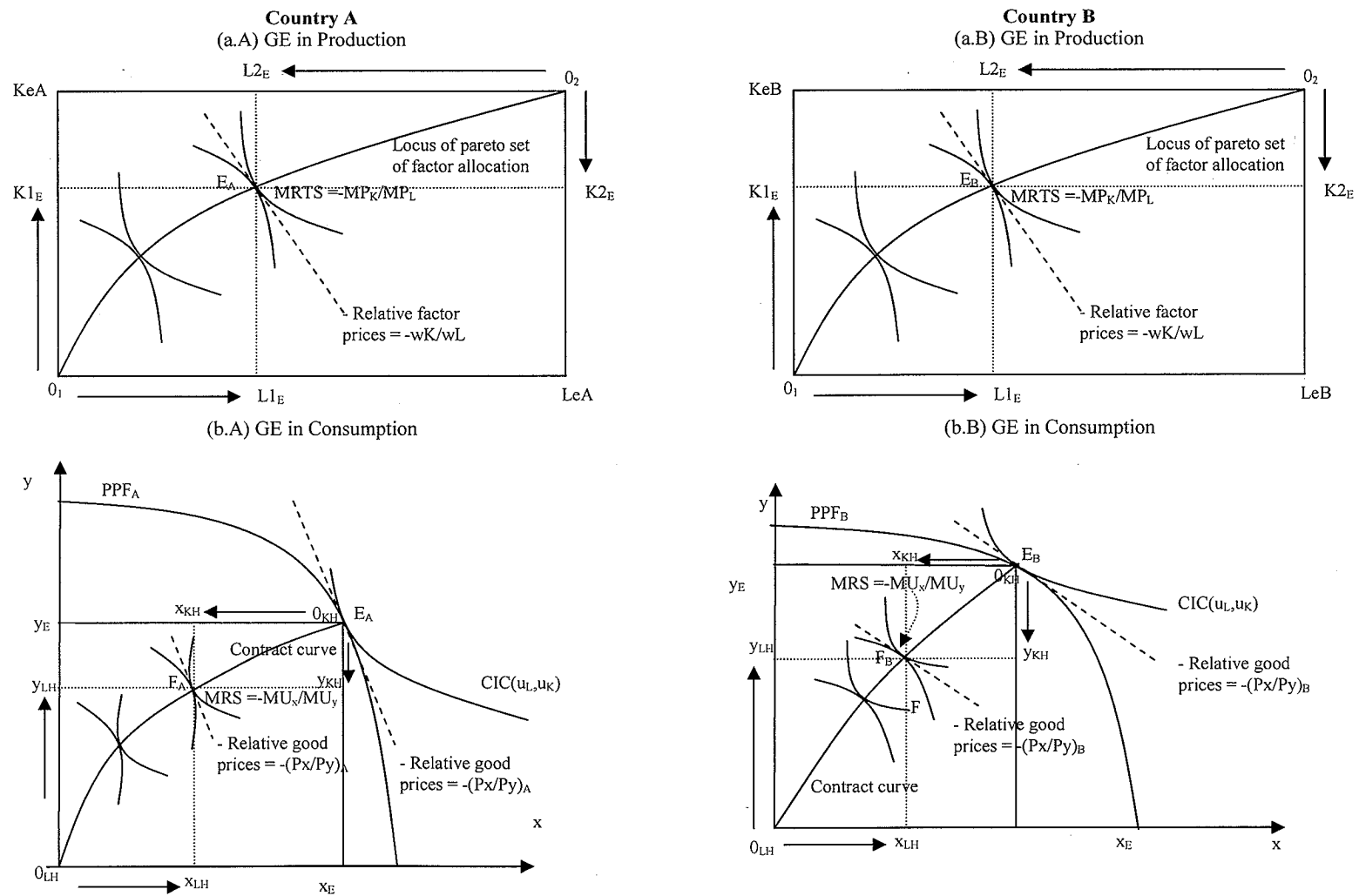


Figure 5.1 The H-O Model in General Equilibrium Framework

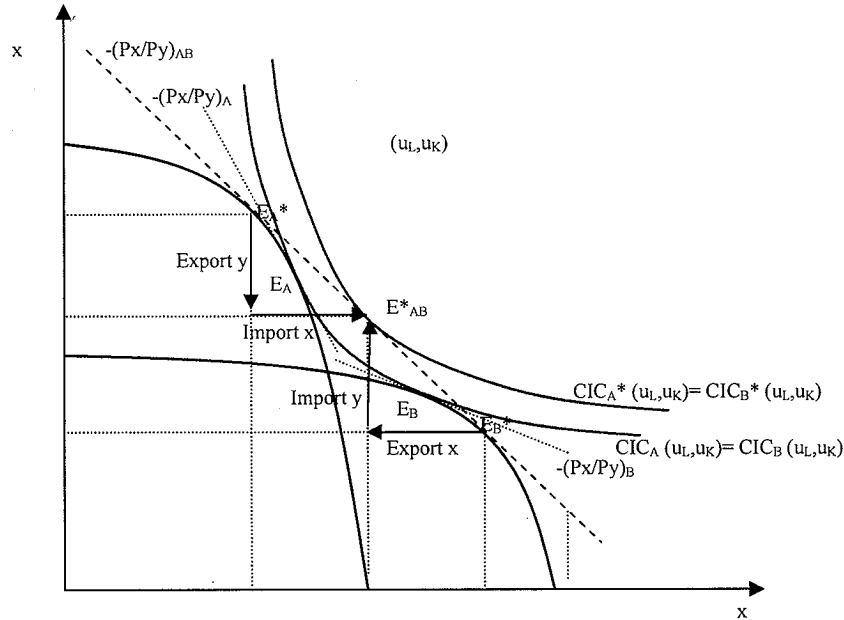


Figure 5.2 Gains from Trade

The combination of utility functions of labor-owner household (u_L) and capital-owner household (u_K) is represented by community indifference curve ³ $\{CIC(u_L(x,y), u_K(x,y))\}$. Since, CIC tangent with PPF at E_A for country A and at E_B for country B, it shows the optimal CIC with respect to the existing PPF and price ratio $(px/py)_A$ in country A and $(px/py)_B$ in country B. In this case, $(px/py)_A > (px/py)_B$ ⁴ according to the H-O theorem country A will export commodity y and import commodity x. In contrast, country B will export commodity x and import commodity y (as depicted

³ Community utility function is the aggregate individuals' utilities into social utilities. There are some examples such as purely Utilitarian type, $CIC = u_L + u_K$; non-symmetric Utilitarian type, $CIC = \beta_1 u_L + \beta_2 u_K$; Maximin or Rawlsian type, $CIC = \min\{u_L, u_K\}$; Generalized utilitarian type; $CIC = f_1(u_L) + f_2(u_K)$, where f_1 and f_2 are concave functions; Constant elasticity type, $CIC = (u_L^{1-\rho} + u_K^{1-\rho})^{\frac{1}{1-\rho}}$ for $\rho \neq 1$ and $CIC = \ln(u_L) + \ln(u_K)$ for $\rho = 1$ (see Mas-Colell *et al.* (1995) for detailed explanation)

⁴ This price ratio also represents individual country's comparative advantage. The H-O assumption on perfect competition markets implies that price equals marginal cost (MC). Therefore, the expression $(px/py)_A > (px/py)_B$ can also be presented as:

$$(MC_x / MC_y)_A > (MC_x / MC_y)_B \text{ or}$$

$$((w_L * MP_L^x + w_K * MP_K^x) / (w_L * MP_L^y + w_K * MP_K^y))_A > ((w_L * MP_L^x + w_K * MP_K^x) / (w_L * MP_L^y + w_K * MP_K^y))_B.$$

Country A has comparative advantage in product y and country B has comparative advantage in product x.

in Figure 5.2). The equilibrium price ratio in both countries A and B are the same $(p_x/p_y)_{AB}$. The number of y exported by country A equals the number of y imported by B, and the number of x exported by country B equals the number of x imported by A. Countries A and B will have higher community utility function (CIC).

Table 5.1 Numerical Examples: Violations of the H-O Assumptions

Equations	Case 1 (all assumption fulfilled)		Case 2 (different utility function)		Case 3 (different production function)	
	Country A	Country B	Country A	Country B	Country A	Country B
1. Factor Endowments:						
- Labor (LeA and LeB)	95	100	95	100	95	100
- Capital (KeA and KeB)	100	95	100	95	100	95
2. Production Function:						
- Good y (sector 1)	$y = L^{2/5}K^{3/5}$	$y = L^{2/5}K^{3/5}$	$y = L^{2/5}K^{3/5}$	$y = L^{2/5}K^{3/5}$	$y = L^{2/5}K^{3/5}$	$y = L^{2/3}K^{1/3}$
- Good x (sector 2)	$x = L^{3/5}K^{2/5}$	$x = L^{3/5}K^{2/5}$	$x = L^{3/5}K^{2/5}$	$x = L^{3/5}K^{2/5}$	$x = L^{3/5}K^{2/5}$	$x = L^{2/7}K^{5/7}$
3. Utility functions:						
- Labor-owner household	$uL = x^{1/2}y^{1/2}$	$uL = x^{1/2}y^{1/2}$	$uL = x^{1/2}y^{1/2}$	$uL = xy^{1/5}$	$uL = x^{1/2}y^{1/2}$	$uL = x^{1/2}y^{1/2}$
- Capital-owner household	$uK = x^{1/2}y^{1/2}$	$uK = x^{1/2}y^{1/2}$	$uK = x^{1/2}y^{1/2}$	$uK = xy^{1/5}$	$uK = x^{1/2}y^{1/2}$	$uK = x^{1/2}y^{1/2}$

5.3. Violations of the H-O Assumptions: Numerical Examples

This section provides numerical examples of three cases i.e. (a) all the H-O assumptions are fulfilled (case 1), (b) utility functions are different between the two countries (case 2), and (c) production functions are different between the two countries (case 3). Table 5.1 represents all equations used in the three cases. (All calculation results using *Mathematica* computer program are presented in the Appendix A.5.1).

5.3.1. Case 1: where all assumptions are fulfilled

In this sub-section, the production functions for two countries are assumed to be Cobb-Douglas type. The production functions for first sector (y) is $y = L^{2/5}K^{3/5}$ and for the second sector (x) is $x = L^{3/5}K^{2/5}$. It is also assumed that country A's factor endowments labor and capital are $LeA = 95$ and $KeA=100$, respectively; and those of country B are $LeB = 100$ and $KeB=95$, respectively. The pareto set of factors allocations for sector 1 (good y) in country A and B is presented in Figure 5.3 panels (a) and (b), respectively.

Since K_L is a concave function of L_L , the first sector (good y) is capital-intensive. The second one (good x) is labor-intensive. Given that $(K_A/L_A) > (K_B/L_B)$, country A is the capital-rich country and country B is the labor-rich country. Accordingly, the H-O theorem postulates: “Country A will export commodity y and import commodity x , meanwhile country B will export commodity x and import commodity y ”.

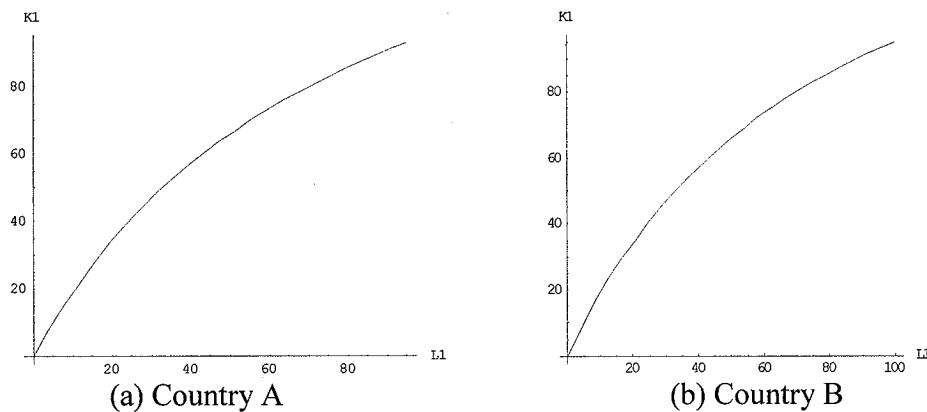


Figure 5.3 The Pareto Set of Factor Allocation for Sector 1 (good y)

In this GE framework, there are eight markets (2 countries \times 2 commodities \times 2 factors of production). There are eight prices to be determined in equilibrium: commodity prices in each country p_{xA} , p_{yA} , p_{xB} , p_{yB} and input prices in each country w_{LA} , w_{KA} , w_{LB} , w_{KB} . Due to the assumption of constant return to scale (CRS) in each sector, only input prices need to be determined in equilibrium. The assumption of identity of factors of production for the two countries results in factor-price-equalization⁵ i.e. $w_{LA} = w_{LB}$, and $w_{KA} = w_{KB}$. Therefore, only the factor prices in one country need to be computed in equilibrium. By using the *Mathematica* command function “solve” with respect to the

⁵ There are two important theorems relating to factor prices and factor endowments. *First*, Stolper-Samuelson theorem says that “In the 2x2 production model with the factor intensity assumption, if p_j increases, then the equilibrium price of the factor more intensively used in the production of good j increases, while the price of the other factor decreases (assuming interior equilibria both before and after the price change). *Second*, Rybczynski theorem says that “In the 2x2 production model with the factor intensity assumption, if the endowment of a factor increases, then the production of the good that uses this factor relatively more intensively increases and the production of the other good decreases (assuming interior equilibria both before and after the change of endowment) (Mas-Colell *et al.*, 1995).

general equilibrium restrictions (demand for factors equals factors endowment for both countries, value of export equals value of import), we find that country A will export 6.37712 good y and import 6.37712 good x (see Appendix A.5.1 for the calculation). In this case, the H-O theorem holds.

5.3.2. Case 2: where utility functions are different

In case 2, all H-O assumptions are fulfilled excepting the assumption on similarity of preferences and tastes (utility function) between the two countries. In this case, it is assumed that both labor-owner household and capital owner household have the same utility functions represented by $u_L = x^{1/2}y^{1/2}$ and $u_K = x^{1/2}y^{1/2}$ in country A, respectively. Those in country B are $u_L = xy^{1/5}$ for labor-owner household and $u_K = xy^{1/5}$ for capital-owner household. By using *Mathematica* command function “solve” with respect to the general equilibrium restrictions (demand for factors equals to factors endowment for both countries, value of export equals value of import), we find that country A will import 10.3928 good y and export 10.1184 good x (see Appendix A.5.1 for the calculation). In this case, the H-O theorem does not hold.

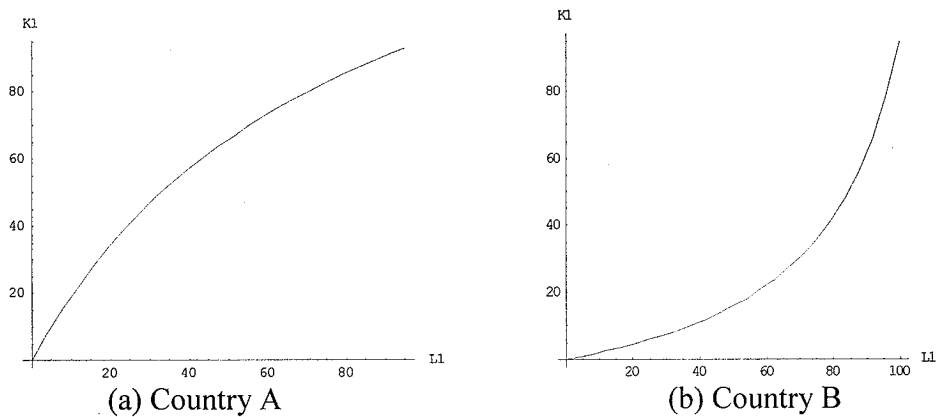


Figure 5.4 The Pareto Set of Factor Allocation for Sector 1 (good y)

5.3.3. Case 3: where production functions are different

In case 3, all H-O assumptions are fulfilled excepting the assumption on similarity of technology (production function) between the two countries. In this case, it assumed that both sectors 1 (good y) and sector 2 (good x) have production functions $y = L^{2/5}K^{3/5}$ and $x = L^{3/5}K^{2/5}$ in country A, and $y = L^{2/3}K^{1/3}$ for sector 1 (good y) and $x = L^{2/7}K^{5/7}$ in country B, respectively. The pareto sets of factor allocations for sector 1 (good y) in country A and B are presented in Figure 5.4 panel (a) and (b), respectively. Since $K1$ is a concave function of $L1$, the first sector (good y) is capital-intensive in country A. In contrast, since $K1$ is convex function of $L1$, the first sector (good y) is labor intensive and the second sector (good x) is capital intensive. By using *Mathematica* command function “FindRoot”⁶, we find that country A will import 1.03298 good y and export 1.02074 good x (see Appendix A.5.1 for the calculation). In this case, the H-O theorem does not hold.

Cases 2 and 3 support the Leontief paradox saying that a country with abundant in capital might export capital-intensive goods and import labor-intensive ones. In Cases 2 and 3, although country A is the rich-capital country, country A is an exporter of capital-intensive good (y) and an importer of labor-intensive good (x). By using simulation 10,000 pairs of random parameters on production and utility functions, Fukiharu (2004) finds that the H-O theorem is observed for approximately 70 percent of the solutions where production functions in two countries are identical and utility functions can be different. In addition, the H-O theorem is observed for approximately 50 percent of the solutions where utility functions in two countries are identical and production functions

⁶ It is nothing but Newton method.

can be different. Therefore, the Leontief paradox should not be necessarily seen as a great contradiction of the H-O theorem since the H-O assumptions are difficult to fulfill in the real world.

5.4. Comparative Advantage of East Asian Countries

This section examines comparative advantage of the East Asian countries. The following paragraphs discuss the data, measurement of comparative advantage, definition of industries, classification of industries, results and analysis.

5.4.1. Data

Similar with Chapter 4, this chapter also applies data on export published by the United Nations (UN) namely the United Nations Commodity Trade Statistics Database (UN-COMTRADE).

5.4.2. Measurement of comparative advantage

We use the RSCA index on 3-digit SITC Revision 2 that has been calculated in Chapter 4. Basically, the $RSCA_{ij}$ index ranges from -1 to +1 (or $-1 \leq RSCA_{ij} \leq 1$). $RSCA_{ij}$ greater than 0 imply that country i has comparative advantage in good j . In contrast, $RSCA_{ij}$ less than 0 imply that country i has comparative disadvantage in product j . The difference between this chapter and the previous Chapter 4 is on the classification of products (SITC) or industries explained in the following sub-section.

5.4.3. Definition of industries

This chapter deals with products or industries classified by factor intensity. Heckscher-Ohlin (H-O) model uses the term industry as an agglomeration of firms,

which produce a perfectly homogenous commodity, such as ‘cloth’ or ‘wear’. This definition of industry is sufficient to explain the existence of international trade. However, most empirical studies have a problem in the identification of goods. For analytical and statistical purposes, it is necessary to classify the production, trade and consumption of goods into sets of goods (groups). The criteria of classification used in the compilation of international trade statistic are the extent of commodities’ substitutability in consumption and the similarity of input requirements in production. Most empirical studies concentrate on the 3-digit level of trade statistics, which corresponds closely to the conventional definition of an industry as a set of producers competing in the production of the same set of products⁷ (Grubel and Lloyd, 1975). For this reason, we use 3-digit SITC.

5.4.4. Classifications of industries

We apply classifications groups of products (industries) by Empirical Trade Analysis (ETA)⁸. Based on the SITC Rev. 3 classification from the United Nations Conference on Trade and Development (UNCTAD) and World Trade Organization (WTO), the ETA distinguished the following six main groups of products: (a) *primary* products (83 SITC), (b) *natural resource*-intensive products (21 SITC), (c) *unskilled labor*-intensive products (26 SITC), (d) *technology*-intensive products (62 SITC), (e) *human capital*-intensive products (43 SITC), (f) Others (5 SITC). The five SITC under the heading ‘Others’ consist of ‘Postal packages not classified according to kind’ (SITC 911), ‘Special transaction and commodities not classified to kind’ (SITC 931), ‘Coin (other than gold) not being legal tender’ (SITC 961), ‘Gold, non-monetary’ (SITC 971), and ‘Non-identified products’ (SITC 999). These five products SITC are excluded from

⁷ For this reason also, the terms industries and products are interchangeable in this chapter.

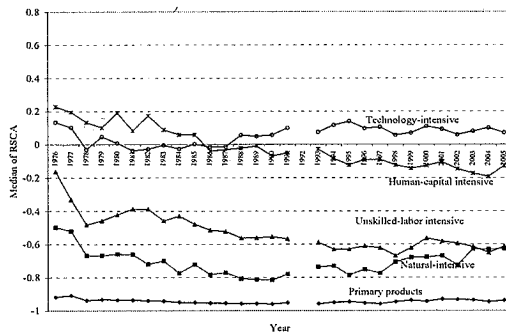
⁸ See Empirical Trade Analysis (ETA) at <http://people.few.eur.nl/vanmarrewijk/eta/> for further information.

the analysis since they are not classified by factor intensities. (see Appendix A.5.2 for the ETA classification)

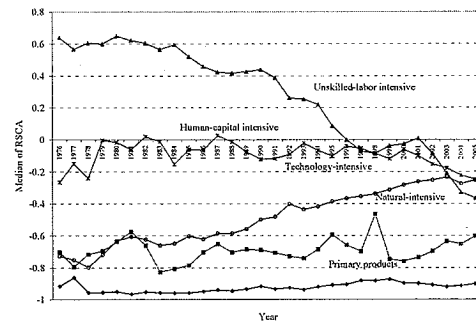
5.4.5. Results and analysis

Figure 5.5 describes trends in countries' comparative advantage (median in RSCA) for each industry. It seems that Japan and Singapore have flatter trends in comparative advantage compared with other East Asian countries. Decrease in comparative advantage in *unskilled labor*-intensive industries has continued. Japan has higher comparative advantage in *technology*-intensive industries. Korea has shown a sharp downward trend in comparative advantage in *unskilled labor*-intensive industries but represented an upward trend in *technology*-intensive industries. China has very high comparative advantage in *unskilled labor*-intensive industries. Indonesia, Malaysia and Thailand have similar trends in comparative advantage. Indonesia recently has higher comparative advantage in *unskilled labor*-intensive industries compare with other ASEAN4 countries.

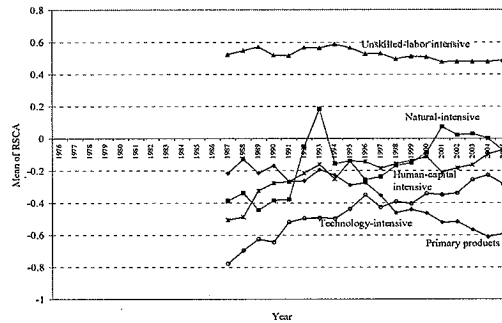
Table 5.2 describes the (median) revealed symmetric comparative advantage (RSCA) index for each industry in each country in 1995, 1995 and 2005. Negative value indicates comparative disadvantage and positive one indicates comparative advantage. Countries have been ranked based on the value of the index in 2005. Indonesia and Japan in 2005 had highest values of the index in primary products and *technology*-intensive industries, respectively. Meanwhile, China had highest comparative advantage in *natural resource*-intensive industries, *unskilled labor*-intensive industries and *human capital*-intensive industries.



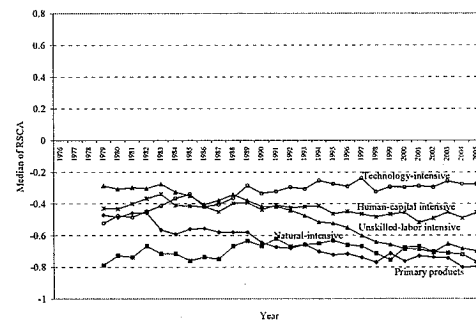
(a) Japan



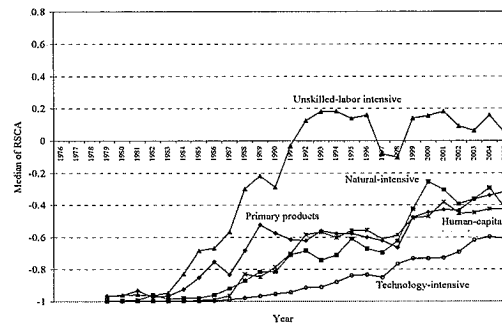
(b) Korea



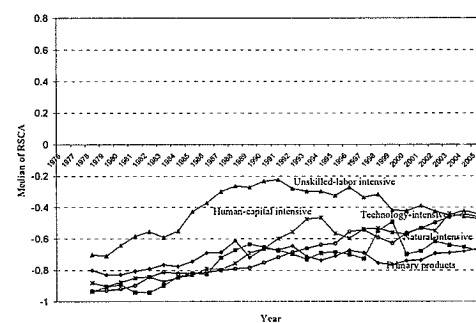
(c) China



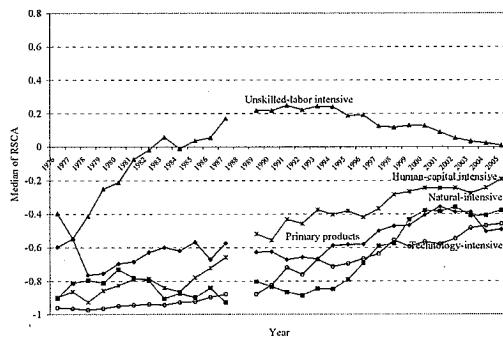
(d) Singapore



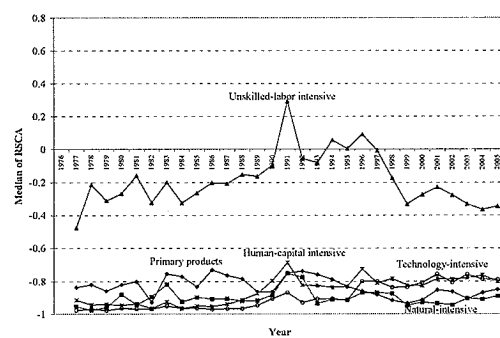
(e) Indonesia



(f) Malaysia



(g) Thailand



(h) Philippines

Source: UN-COMTRADE, author's calculation.

Figure 5.5 Trends in Revealed Comparative Advantage: Factor Intensity

**Table 5.2 Revealed Symmetric Comparative Advantage by Factor Intensity
1985, 1995 and 2005**

Product Classification/Countries	1985	1995	2005
<i>1. Primary Products</i>			
- Indonesia	-0.85	-0.58	-0.32
- Thailand	-0.57	-0.58	-0.49
- China	-0.22*	-0.29	-0.59
- Malaysia	-0.74	-0.71	-0.66
- Singapore	-0.56	-0.72	-0.80
- the Philippines	-0.83	-0.83	-0.85
- Korea	-0.96	-0.91	-0.90
- Japan	-0.95	-0.95	-0.94
<i>2. Natural resource-intensive Products</i>			
- China	-0.39*	-0.14	-0.08
- Thailand	-0.90	-0.79	-0.38
- Indonesia	-0.98	-0.61	-0.42
- Korea	-0.79	-0.59	-0.60
- Japan	-0.72	-0.79	-0.63
- Malaysia	-0.82	-0.69	-0.68
- Singapore	-0.76	-0.63	-0.77
- the Philippines	-0.90	-0.91	-0.89
<i>3. Unskilled labor-intensive products</i>			
- China	0.52*	0.56	0.49
- Indonesia	-0.69	0.14	0.05
- Thailand	0.04	0.19	0.01
- the Philippines	-0.27	0.00	-0.35
- Korea	0.52	0.08	-0.37
- Malaysia	-0.43	-0.33	-0.44
- Japan	-0.48	-0.63	-0.61
- Singapore	-0.35	-0.53	-0.70
<i>4. Technology-intensive products</i>			
- Japan	0.00	0.14	0.07
- Korea	-0.60	-0.39	-0.25
- Singapore	-0.34	-0.28	-0.28
- China	-0.78*	-0.44	-0.28
- Thailand	-0.92	-0.70	-0.46
- Malaysia	-0.82	-0.63	-0.46
- Indonesia	-1.00	-0.84	-0.61
- the Philippines	-0.96	-0.92	-0.79
<i>5. Human capital-intensive products</i>			
- China	-0.51*	-0.14	-0.07
- Japan	0.06	-0.12	-0.13
- Thailand	-0.78	-0.38	-0.19
- Korea	-0.06	-0.10	-0.25
- Indonesia	-0.99	-0.56	-0.43
- Singapore	-0.42	-0.47	-0.46
- Malaysia	-0.83	-0.57	-0.47
- the Philippines	-0.95	-0.83	-0.80

Note: * in 1987. Source: UN-COMTRADE, author's calculation.

In primary products, it is understandable that Indonesia, Thailand, China and Malaysia have higher the index of comparative advantage compared with those of Singapore, Korea and Japan. For the last 20 years, Indonesia had positive trend in the comparative advantage in primary products, from -0.85 in 1985 to -0.32 in 2005. Table 5.3 lists the products (SITC), which have positive index. In the case of Indonesia, the traditional agricultural products such as fish, sugar, coffee, tea and mate, spices, margarine, tobacco, natural rubber, latex, fuel wood, pulpwood, ores, coal, crude petroleum, gas, animal and vegetable oil have comparative advantage. Thailand and Malaysia had relatively stable comparative advantage in primary products.

Compared with the other industries, *unskilled labor*-intensive industries have shown most dynamic changes. In 1985 Korea still had high comparative advantage in this industries but she had lost comparative advantage in 2005. In contrast, China, Indonesia and Thailand had gained comparative advantage in the industries in 2005. It might strongly support the “flying geese” paradigm in East Asian region. Table 5.3 shows Chinese products in these industries, which have comparative advantage. They include textile, cotton fabric, floor covering, garment, glass, glassware, pottery, sanitary, furniture, toys, baby carriage, office and stationary supplies, etc.

Japan is the only country with high comparative advantage in *technology*-intensive industries. However, for the other counties, there are upward trends in the comparative advantage during the last two decades. Although, the other countries have still comparative disadvantage in these industries, they have shown very fast catching up process. Especially, China had the comparative index -0.78 in 1985 and -0.28 in 2005 just below those of Korea and Singapore. Table 5.3 shows Japanese products in the *technology*-intensive industries that have comparative advantage in 2005. They include

hydrocarbons, carbolic acids, condensation products, regenerated cellulose, steam boiler, steam engine, internal combustion piston engines, rotating electric plant, tractors, textile and leather machinery, etc.

Table 5.3 Countries' Comparative Advantage in 2005

Primary Products: Indonesia		Natural Resource-Intensive Products: China		Unskilled Labor-Intensive Products: China		Human capital-Intensive Products: China		Technology-Intensive Products: Japan	
SITC	Commodity Description	SITC	Commodity Description	SITC	Commodity Description	SITC	Commodity Description	SITC	Commodity Description
034	Fish, fresh, chilled or frozen	612	Manufactures of leather or of composition leather, nes; etc	651	Textile yarn	531	Synthetic dye, natural indigo, lakes	511	Hydrocarbons, nes, and derivatives
035	Fish, dried, salted or in brine; smoked fish	613	Furskins, tanned or dressed; pieces of furskin, tanned or dressed	652	Cotton fabrics, woven (not including narrow or special fabrics)	625	Rubber tires, tire cases, inner and flaps, for wheels of all kinds	513	Carboxylic acids, and their derivatives
036	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc	634	Veneers, plywood, improved* wood and other wood worked nes*	653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)	679	Iron, steel casting, forging and stamping, in the rough state, nes	582	Condensation, polycondensation and polyaddition products
037	Fish, crustaceans and molluscs, prepared or preserved, nes	635	Wood manufactures, nes	654	Textile fabrics, woven, other than cotton or man-made fibres	691	Structures and parts, nes, of iron, steel or aluminium	584	Regenerated cellulose; derivatives of cellulose; vulcanized fibre
062	Sugar confectionery and preparations, non-chocolate	661	Lime, cement, and fabricated construction materials	655	Knitted or crocheted fabrics (including tubular, etc, fabrics)	693	Wire products (excluding insulated electrical wire); fencing grills	598	Miscellaneous chemical products, nes
071	Coffee and coffee substitutes	662	Clay and refractory construction materials	656	Tulle, lace, embroidery, ribbons, trimmings and other small wares	694	Nails, screws, nuts, bolts, rivets, etc, of iron, steel or copper	711	Steam boilers and auxiliary plant; and parts thereof, nes
072	Cocoa	671	Pig and sponge iron, spiegel Eisen, etc, and ferro-alloys	657	Special textile fabrics and related products	695	Tools for use in the hand or in machines	712	Steam engines, turbines
074	Tea and mate	685	Lead	658	Made-up articles, wholly or chiefly of textile materials, nes	696	Cutlery	713	Internal combustion piston engines, and parts thereof, nes
075	Spices	689	Miscellaneous non-ferrous base metals, employed in metallurgy	659	Floor coverings, etc	697	Household equipment of base metal, nes	716	Rotating electric plant and parts thereof, nes
091	Margarine and shortening			664	Glass	699	Manufactures of base metal, nes	718	Other power generating machinery and parts thereof, nes
122	Tobacco, manufactured			665	Glassware	761	Television receivers	722	Tractors (other than those falling in heading 74411 and 7832)
223	Seeds and oleaginous fruit, whole or broken, for other fixed oils			666	Pottery	762	Radio-broadcast receivers	723	Civil engineering, contractors' plant and equipment and parts, nes
232	Natural rubber latex; rubber and gums			812	Sanitary, plumbing, heating, lighting fixtures and fittings, nes	763	Gramophones, dictating machines and other sound recorders	724	Textile and leather machinery, and parts thereof, nes
245	Fuel wood and wood charcoal			821	Furniture and parts thereof	785	Cycles, scooters, motorized or not; invalid carriages	726	Printing, bookbinding machinery, and parts thereof, nes
246	Pulpwood (including chips and wood waste)			831	Travel goods, handbags etc, of leather, plastics, textile, others	786	Trailers, and other vehicles, not motorized, nes	728	Other machinery, equipment, for specialized industries; parts nes
248	Wood, simply worked, and railway sleepers of wood			842	Men's and boys' outerwear, textile fabrics not knitted or crocheted	885	Watches and clocks	736	Metalworking machine-tools, parts and accessories thereof, nes
251	Pulp and waste paper			843	Womens, girls, infants outerwear, textile, not knitted or crocheted	899	Other miscellaneous manufactured articles, nes	737	Metalworking machinery (other than machine-tools), and parts, nes
267	Other man-made fibres suitable for spinning, and waste			844	Under garments of textile fabrics, not knitted or crocheted			741	Heating and cooling equipment and parts thereof, nes
273	Stone, sand and gravel			845	Outerwear knitted or crocheted, not elastic nor rubberized			742	Pumps for liquids; liquid elevators; and parts thereof, nes
277	Natural abrasives, nes			846	Under-garments, knitted or crocheted			743	Pumps, compressors; centrifuges; filtering apparatus; etc, parts
287	Ores and concentrates of base metals, nes			847	Clothing accessories, of textile fabrics, nes			744	Mechanical handling equipment, and parts thereof, nes
322	Coal, lignite and peat			848	Articles of apparel, clothing accessories, non-textile, headgear			749	Non-electric parts and accessories of machinery, nes
333	Crude petroleum and oils obtained from bituminous minerals			851	Footwear			759	Parts, nes of and accessories for machines of headings 751 or 752
335	Residual petroleum products, nes and related materials			894	Baby carriages, toys, games and sporting goods			772	Electrical apparatus for making and breaking electrical circuits
341	Gas, natural and manufactured			895	Office and stationary supplies, nes			774	Electro-medical and radiological equipment
424	Other fixed vegetable oils, fluid or solid, crude, refined							776	Thermionic, microcircuits, transistors, valves, etc
431	Animal and vegetable oils and fats, processed, and waxes							778	Electrical machinery and apparatus, nes
								871	Optical instruments and apparatus
								874	Measuring, checking, analysis, controlling instruments, nes, parts
								881	Photographic apparatus and equipment, nes
								882	Photographic and cinematographic supplies
								884	Optical goods nes

Source: UN-COMTRADE, *author's calculation.*

5.5. Conclusions

This chapter examines the role of factor endowments in international trade. The H-O theory is constructed under strict assumptions. This chapter examines two crucial assumptions in the Heckscher-Ohlin (H-O) theory i.e. those on similarities in production (technology) and utility (taste and preference) functions. By using numerical examples, this chapter shows that the H-O theorem does not necessarily hold when assumptions on production and consumption are violated. Therefore, the Leontief paradox should not be necessarily seen as a great contradiction of the H-O theorem since the H-O assumptions are difficult to fulfill in the real world.

Countries in the East Asia region have large discrepancies in the factor endowments. By applying Revealed Symmetric Comparative (RSCA) index, this chapter shows that China, Indonesia and Thailand have comparative advantage in *unskilled labor*-intensive industries, meanwhile only Japan has comparative advantage in *technology*-intensive industries for the last two decades. The governments should encourage the development of *unskilled labor*- and *technology*-intensive industries since these two industries have comparative advantage in the current and future periods. These industries are analyzed further in the flying geese pattern presented in Chapter 7.

Chapter 6

Dynamic Specialization and Convergence in Trade Pattern

6.1. Introduction

Exports structure as well as the path and prospects of economic development in a country are likely to be closely related. The country might have linear structural change in the economic development starting from agricultural sector basis to manufacturing sector basis and even further service sector basis, subsequently (Todaro and Smith, 2006). Chapter 4 has shown that the pattern of comparative advantage of the ASEAN has become gradually similar with that of China, Korea or even Japan. Nevertheless, there are no long-term equilibriums (steady states) in the similarity of the patterns of comparative advantage.

As far as the patterns of comparative advantage is concerned, it might be argued that the advanced countries will have a less dynamic structural change in their comparative advantage due to the domestic full employment if it is compared with that of the less developed countries. Hence, the comparative advantage and steadiness of the pattern seem to be in the parallel direction with the prosperous development (Wörz, 2005). Advanced countries are more likely to export manufactured products; meanwhile less developed countries export primary products. Chapter 4 also provides a supportive empirical evidence for this matter. Japan and Korea, which have relatively higher level of the economic development than that of China and ASEAN, have concentrated their

exports on manufacture products and become less dynamics in their comparative advantage. Therefore, the patterns of comparative advantage and structural changes are important issues in the context of economic development.

This chapter aims to analyze the dynamic specialization and convergence of trade patterns in the eight selected East Asian countries i.e. Japan, Korea, China, Singapore, Indonesia, Malaysia, Thailand and the Philippines. The rest of this chapter is organized as follows. Section 6.2 describes briefly the literature review. Section 6.3 represents the methodology, which consists of the data, econometric models and the Spearman's rank correlation. This chapter applies econometric models to analyze the differences in dynamic specialization across countries and industries. Meanwhile, the Spearman's rank correlation is employed to examine the convergence in the pattern of comparative advantage among the East Asian countries. Section 6.4 shows the results and analysis. Finally, some concluding remarks are presented in section 6.5.

6.2. Literature Review

Both economic integration and globalization have currently reshaped countries' specialization and structure of industries. The issue of specialization and concentration is important to economic policy and to the countries' competitiveness for at least two reasons (Aiginger, 1999). *First*, as far as the diversity of exported products is concerned, specializing only in limited groups of products might increase risks for the economy. If a country merely specializes in a limited numbers of exported products, the country might have some domestic problems when there are any international shocks in those products.

For example, Indonesia had fiscal problems in the early 1980s when the price of oil declined sharply since the revenue from the oil sector was the main government revenue. *Second*, economic integration can enhance efficiency and competitiveness as a result of the searching of countries' specialization, taking advantage of scale economies, deepening the division of labors, decreasing in the transport costs, etc. There are many researches analyzing the specialization and convergence of industrial structure. For example, Krugman (1991) finds that manufacturing is more regionally concentrated in the US than in Europe. Several other researches are summarized in 6.1.

Related to the issue of structural convergences across countries and in parallel direction with the integration process in the East Asian region, a crucial question on the dynamics of countries-specific specialization is arising: how far have the specialization and convergence of comparative advantage of the East Asian countries been going on? With many countries and industries, as well as the different initial distributions of exports and imports across countries and industries, different outcomes might be possible. Aiginger (1999) and Wörz (2005) note four possible combinations between the trade specialization and convergence in the trade patterns. All of which are depicted in Figure 1- i.e. more-specialized together with diverging in the trade patterns (Case 1); less-specialized together with converging in the trade patterns (Case 2); more-specialized together with converging in the trade patterns (Case 3); and less-specialized together with diverging in the trade patterns (Case 4).

Table 6.1 Some Researches on Specialization and Convergence of Industrial Structure

Author, Year	Variable	Indicator	Analysis	Time	Country /Region	Data Source	Aggregate	Result
Krugman, 1991	Employment	Sum of absolute difference	Specialization	1947-1985	USA	US census	3 digit SIC	In 4 regions decreasing
Bruehlhart, 1995	Employment	Gini	Concentration	1980-1990	EU	EU	2 digit NACE	In 14 out of 18 sector increasing
Dollar, Wolff, 1995	Exports	Variation of export specialization (Balassa)	Concentration	1970-1986	9 countries	OECD	2 digits SITC	Increasing in 6, decreasing in 6 sectors
Molle, 1997	Employment	Sum of absolute difference Location coefficient	Concentration, specialization	1950-1990	EU, NUTS2	EU	17 sectors	Deconcentration up to 80s, despecialization
Amiti, 1998	Production	Gini	Concentration, specialization	1976-1989	EU (10 countries)	EU, UNIDO	27 industries	Concentration increases in 6 of 10 countries, in 17 of 27 industries
Dalumn et al, 1998	Exports	Standard deviation of export specialization (Balassa)	Specialization	1956-1992	20 countries	OECD	20 countries	In 16 out of 20 countries decreasing
	Exports	Standard deviation of export specialization (Balassa)	Concentration	1956-1992	20 countries	OECD	60 industries	In 55 out of 60 industries decreasing
Laursen, 1998	Export, R&D	beta	Concentration, specialization	1971-1991	19 countries	OECD	19 sectors	Stronger decreasing in exports than in patents
Haaland et al., 1999	Production	Absolute, relative shares	Concentration	1985-1993	EU (13 countries)	OECD	35 sectors	11.4 increase in average industry
Knarvik et al., 1999	Production, trade	Absolute, relative, locational	Concentration	1970-1992	EU	OECD, UNIDO	22/27 sector 104 includes	Tentative result: Europe tends to concentrate
Wörz, 2005	Export	Simple regressions beta	Specialization	1981-1997	6 Regions	UNIDO	4 groups of industries	Despecialization

Source: mainly from Aiginger (1995) and some additional sources.

First, Case 1 takes place if countries in the region increasingly exploit their comparative advantages, and then reinforce their patterns of specialization accordingly. This likely happens if the specializations are induced mainly by the absolute advantages. For example, one country in the region exploits its oil as the main exported products; in contrast, the neighbor countries have no oil. Then, this country will increase its specialization and have more divergence in the trade patterns. Case 2 occurs in a parallel direction with the rising importance of intra-industry trade (IIT)¹, and it is often observed for the homogenous trading partners at an advanced stage of development.

Specialization	Increasing	Case 1: Increasing Specialization Diverging trade pattern across countries	Case 3: Increasing Specialization Converging trade pattern across countries
	Decreasing	Case 4: Decreasing Specialization Diverging trade pattern across countries	Case 2: Decreasing Specialization Converging trade pattern across countries
		Diverging	Converging
		Trade-Pattern Convergence	

Figure 6.1 Four Possible Combinations: Specialization and Convergence

Third, an example for Case 3 is that a dramatic increase in demand for computer equipments might cause specialization in the production of these products by countries that initially showed weak specialization in different industries such as textiles, food, furniture, etc. Fourth, Case 4 may happen, for example, if one furniture-producing country immediately shifts part of its production into the information and communications technologies sector, while another electronic producer moves toward

¹ IIT occurs when a country is both exporting and importing items in the same product classification category. In contrast, inter-industry trade happens when a country's exports and imports are in different classification category. Grubel and Lloyd (1975) mentioned several possible explanations for the occurrence of IIT, such as: product differentiation, transport costs, dynamic economies of scale, degree of product aggregation, differing income distribution in countries, and differing factor endowments and product variety.

transportation sector. The East-Asian region consists of diverse economies. Accordingly, one main question intended to answer is: Which cases do the East-Asian countries lie in- Cases 1, 2, 3 or 4? In other words, this chapter is addressed to answer the questions: (1) whether the specializations of the East Asian countries become increasing (more specialized) or decreasing (less specialized / despecialized) (2) whether the patterns of comparative advantage becomes more similar (convergent) or more different (divergent) across countries in the East Asia region. Chapter 4 has discussed to some extent this issue in the case of the ASEAN as one entity. In this chapter, the individual countries i.e. Japan, Korea, China, Singapore, Indonesia, Malaysia, Thailand and the Philippines are considered.

6.3. Methodology

6.3.1. Data

This chapter uses data on Revealed Symmetric Comparative Advantage (RSCA) index previously presented in Chapter 4 (Appendix 4.2). The index is calculated by using exports database taken from the United Nations Commodity Trade Statistics Database (UN-COMTRADE). As in Chapter 5, we focus on 234 groups of products SITC (3 digit level) classified by the factor intensities which have been made by the Empirical Trade Analysis (ETA) i.e. *primary* products (83 SITC), *natural resource*-intensive products (21

SITC), *unskilled labor*-intensive products (26 SITC), *technology*-intensive products (62 SITC), and *human capital*-intensive products (43 SITC)².

6.3.2. Econometric model ³

An econometric model (6.1) is commonly used to examine the dynamics of comparative advantage across countries and across products⁴ (Laursen, 1998; Wörz, 2005):

$$RSCA_{ij,T} = \alpha + \beta RSCA_{ij,0} + \varepsilon_{ij} \quad (6.1)$$

where $RSCA_{ij,T}$ and $RSCA_{ij,0}$ are Revealed Symmetric Comparative Advantage of country i in product j for years T and 0 , respectively. ε_{ij} denotes white noise error term⁵. The coefficient β indicates whether the existing comparative advantage or specialization patterns have been reinforced or not during the observation. The simple regression model can be used to detect the dynamics in specialization. For the illustration, Figure 6.2 represents RSCAs for SITC 001 and SITC 002 in 1995 (horizontal axis) and 2005 (vertical axis), respectively. If β is not significantly different from one ($\beta=1$), there is no change in the overall degree of specialization. The difference between $RSCA_{001,1995}$ and $RSCA_{002,1995}$ (AB) equals the difference between $RSCA_{001,2005}$ and $RSCA_{002,2005}$ (DE).

² Following the same arguments of Grubel and Lloyd (1975), terms products and industries are interchangeable in this chapter.

³ This preliminary analytical tool applied in the cases of India and China has been presented by the author in the 10th International Conference Society for Global Business & Economic Development (SGBED) “Creativity & Innovation: Imperative for Global Business and Development”, Kyoto, Japan August 8-11, 2007. The author would like to thank Glenville Rawlins, Ph.D and Dr. Xu Ming (Dong Hua University, China) who suggested the author to cluster the analysis based on industries/products and countries.

⁴ See Aiginger (1999) for very good discussion on the indicators of specialization and concentration.

⁵ White noise means that the error terms fulfill all the classical regression assumptions. Error terms are normally independently distributed (NID) with zero mean (0) and constant variance (σ^2) i.e. $\varepsilon_{ij} \sim NID(0, \sigma^2)$.

$\beta > 1$ indicates increased specialization of the respective country. The difference between $RSCA_{001,1995}$ and $RSCA_{002,1995}$ (AB) is smaller than the difference between $RSCA_{001,2005}$ and $RSCA_{002,2005}$ (EF). Finally, $0 < \beta < 1$ indicates despecialization – that is, a country has gained comparative advantage in industries where it did not specialize and has lost competitiveness in those industries where it was initially heavily specialized (Wörz, 2005). In the event of $\beta \leq 0$, no reliable conclusion can be drawn on purely statistical grounds; the specialization pattern is either random, or it has been reversed.

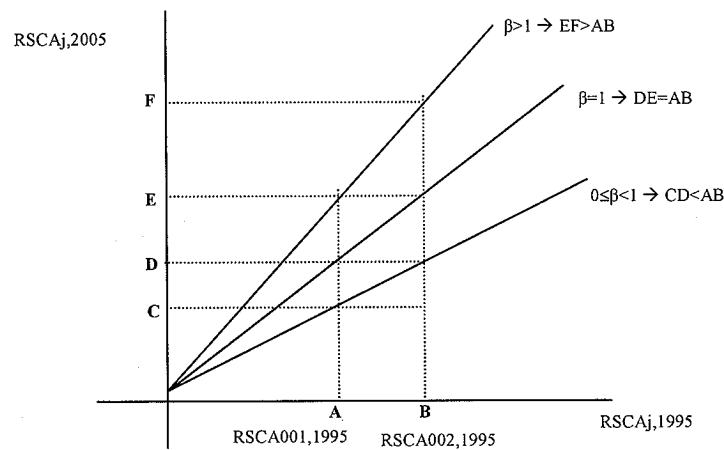


Figure 6.2 Illustration of Dynamic Changes in Comparative Advantage

6.3.3. Hypothesis testing

- Different dynamics in the specialization across countries

It might be believed that the dynamics in specialization across countries and across industries are different. There are many researches analyzing the specialization and convergence of industrial structure. Krugman (1991) finds that manufacturing is more regionally concentrated in the US than in Europe. Wörz (2005) compares revealed comparative advantage for six regions i.e. the Organization for Economic Cooperation

and Development (OECD) north and south, the South and East Asia, the Latin America, the Central and Eastern Europe. Wörz finds that the dynamic of RCA across group and overtime shows a global tendency toward decreases in the intensity of specialization. To examine this issue in the East Asian countries, we add dummy variables for countries (D_i^c) into equation (6.1)⁶:

$$RSCA_{ij,t} = \alpha + \beta RSCA_{ij,0} + \sum_{i=1}^7 \gamma_i (D_i^c RSCA_{ij,0}) + \omega_{ij} \quad (6.2)$$

where ω_{ij} denotes white noise error terms. α, β, γ_i are constants, parameters estimated and D_i^c are dummy variables for countries, respectively. Since, there are eight countries to be compared, there must be seven country-dummy variables:

$$\begin{aligned} D_1^c &= \begin{cases} 1 & \text{Korea} \\ 0 & \text{Otherwise} \end{cases} \\ D_2^c &= \begin{cases} 1 & \text{China} \\ 0 & \text{Otherwise} \end{cases} \\ D_3^c &= \begin{cases} 1 & \text{Singapore} \\ 0 & \text{Otherwise} \end{cases} \\ D_4^c &= \begin{cases} 1 & \text{Indonesia} \\ 0 & \text{Otherwise} \end{cases} \\ D_5^c &= \begin{cases} 1 & \text{Malaysia} \\ 0 & \text{Otherwise} \end{cases} \\ D_6^c &= \begin{cases} 1 & \text{Thailand} \\ 0 & \text{Otherwise} \end{cases} \\ D_7^c &= \begin{cases} 1 & \text{Philippine} \\ 0 & \text{Otherwise} \end{cases} \end{aligned}$$

⁶ This chapter uses RSCA instead of RCA for several reasons as mentioned by Volrath (1991), Laursen (1998) Aiginger (1999) and Wörz (2005), among others. *First*, RCA is basically not comparable on the both sides of unity since the index ranges from zero to infinity. A country is said not to be specialized in a given product if the index ranges from zero to one. In contrast, a country is said to be specialized in a given product if the index ranges from one to infinity. *Second*, if RCA is applied in estimating the econometric model, one might obtain biased estimates. RCA has disadvantage of an inherent risk of lack of normality. A skewed distribution violates the assumption of normality of the error term in regression analysis, thus not providing reliable inferential statistic. *Third*, the use of RCA in regression analysis gives much more weight to values above one, when compared with observation below one. Please see also to the supplements in pages 337-365.

From the econometric model (6.2), the estimated coefficients of specialization for each country can be determined as presented in in Table 6.1 (column 2). The coefficient of specialization for Japan is β since Japan has zero for all country-dummy variables. Hence, Japan is as the basis of evaluation. The coefficients of specialization for Korea, China, Singapore, Indonesia, Malaysia, Thailand and Philippine are given by $\beta+\gamma_1$, $\beta+\gamma_2$, $\beta+\gamma_3$, $\beta+\gamma_4$, $\beta+\gamma_5$, $\beta+\gamma_6$, and $\beta+\gamma_7$, respectively. The significance of a specific country-dummy variable (D_i^C) implies the difference between dynamic specializations of the country and that of Japan.

**Table 6.2 The Coefficients of Specialization and Hypothesis Testing:
across Countries**

Countries	Coefficient of Specialization	Hypothesis Testing (H_0)							
		Japan	Korea	China	Singapore	Indonesia	Malaysia	Thailand	Philippine
Japan	β								
Korea	$\beta+\gamma_1$	$\beta=\beta+\gamma_1$							
China	$\beta+\gamma_2$	$\beta=\beta+\gamma_2$	$\beta+\gamma_1=\beta+\gamma_2$						
Singapore	$\beta+\gamma_3$	$\beta=\beta+\gamma_3$	$\beta+\gamma_1=\beta+\gamma_3$	$\beta+\gamma_2=\beta+\gamma_3$					
Indonesia	$\beta+\gamma_4$	$\beta=\beta+\gamma_4$	$\beta+\gamma_1=\beta+\gamma_4$	$\beta+\gamma_2=\beta+\gamma_4$	$\beta+\gamma_3=\beta+\gamma_4$				
Malaysia	$\beta+\gamma_5$	$\beta=\beta+\gamma_5$	$\beta+\gamma_1=\beta+\gamma_5$	$\beta+\gamma_2=\beta+\gamma_5$	$\beta+\gamma_3=\beta+\gamma_5$	$\beta+\gamma_4=\beta+\gamma_5$			
Thailand	$\beta+\gamma_6$	$\beta=\beta+\gamma_6$	$\beta+\gamma_1=\beta+\gamma_6$	$\beta+\gamma_2=\beta+\gamma_6$	$\beta+\gamma_3=\beta+\gamma_6$	$\beta+\gamma_4=\beta+\gamma_6$	$\beta+\gamma_5=\beta+\gamma_6$		
Philippine	$\beta+\gamma_7$	$\beta=\beta+\gamma_7$	$\beta+\gamma_1=\beta+\gamma_7$	$\beta+\gamma_2=\beta+\gamma_7$	$\beta+\gamma_3=\beta+\gamma_7$	$\beta+\gamma_4=\beta+\gamma_7$	$\beta+\gamma_5=\beta+\gamma_7$	$\beta+\gamma_6=\beta+\gamma_7$	

Table 6.2 (column 3-10) also represents the hypothesis testing. For example, to examine the whether Japan and Korea show a statistically significant difference in their dynamic specializations or not, this chapter constructs the null hypothesis (H_0): $\beta=\beta+\gamma_1$, and the alternative hypothesis (H_0): $\beta\neq\beta+\gamma_1$. For Japan and China, the null hypothesis is (H_0): $\beta=\beta+\gamma_2$, and the alternative hypothesis is (H_0): $\beta\neq\beta+\gamma_1$. Finally, for Thailand and the Philippines the null hypothesis is (H_0): $\beta+\gamma_6=\beta+\gamma_7$, and the alternative hypothesis is (H_0): $\beta+\gamma_6\neq\beta+\gamma_7$.

This chapter does the hypothesis testing by using the Wald test⁷. In general, the statistic of Wald test is given as follows⁸:

$$F = \frac{(R_{UR}^2 - R_R^2) \frac{n-k}{m}}{(1 - R_{UR}^2)} \sim F(m, n-k) \quad (6.3)$$

where R_{UR}^2 and R_R^2 are the coefficients of determination of the unrestricted regression and the restricted regression, respectively; n is the number of observations (data); k is the number of coefficients (including constant), and m is the number of restrictions. The statistic (ratio) is distributed following the F distribution with m and $n-k$ degree of freedom. If the ratio defined in (6.3) exceeds the critical value $F(m, n-k)$ for a specific level of significance (say, α is 1%, 5% or 10%), the null hypothesis is rejected. In our case, the number of restriction (m) is 1 and, the number of coefficients (including constant) k are 9 and the number of observations (n) is $(234 \times 8) = 1872$. Therefore, the critical values are 6.63, 3.84 and 2.37 for the level of significances 1%, 5% and 10%, respectively.

⁷ See Intriligator *et al.* (1996) for detail explanation about Wald coefficient restrictions test. Basically, the Wald test calculates the test statistic by estimating the unrestricted regression and the restricted regression- without and with imposing the coefficient restrictions specified by the null hypothesis, H_0 . The Wald statistic measures how close the unrestricted estimates come to satisfying the restriction under the null hypothesis. If the restrictions are in fact true, then the unrestricted estimates should come close to satisfying the restrictions.

⁸ The other formula:

$F = \frac{(RSS_R - RSS_{UR})/m}{RSS_{UR}/(n-k)}$ where RSS_R and RSS_{UR} are the residual sum of squares from the restricted regression and unrestricted regression, respectively.

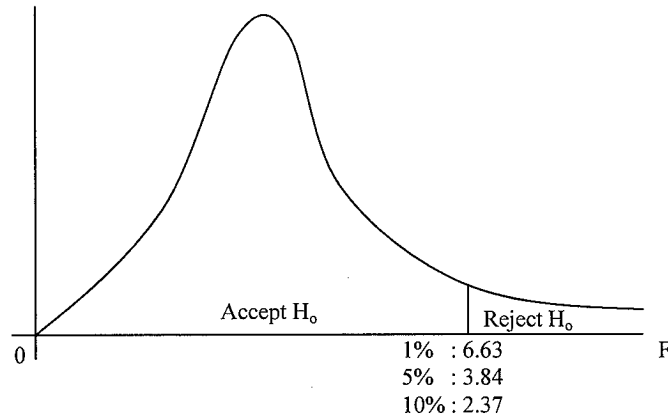


Figure 6.3 F-Critical Values

- Different dynamics in the specialization across industries

The dynamic specializations might differ across industries. It might be generally believed that the comparative advantage in the *primary* and *natural resource*-intensive industries changes very little if compared with the *unskilled labor*-intensive, *technology*-intensive and *human capital*-intensive industries. To deal with this matter, a little modification of the econometric model (6.1) is formulated by adding dummy variables for industries D_i^P as follows:

$$RSCA_{j,T} = \phi + \eta RSCA_{j,0} + \sum_{k=1}^4 \delta_k (D_k^P RSCA_{j,0}) + \varepsilon_j \quad (6.4)$$

where $RSCA_{j,T}$ and $RSCA_{j,0}$ are Revealed Symmetric Comparative Advantage for product j in years T and 0 , respectively; ε_j are white noise error terms, α, β, δ_k are constants and parameters estimated; and D_k^P is dummy variables for industries. Since there are five categories of industries, the four industry-dummy variables are set:

$$D_1^p = \begin{cases} 1 & \text{Natural – resource intensive industries} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_2^p = \begin{cases} 1 & \text{Unskilled – labor intensive industries} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_3^p = \begin{cases} 1 & \text{Technology intensive industries} \\ 0 & \text{Otherwise} \end{cases}$$

$$D_4^p = \begin{cases} 1 & \text{Human – capital intensive industries} \\ 0 & \text{Otherwise} \end{cases}$$

From the econometric model (6.4), the estimated coefficients of specialization for each industry are presented as in Table 6.3. The coefficient of specialization for the *primary* industries is η , since it has zero for all industry-dummy variables. The coefficients of specialization for the *natural resource*-intensive, *unskilled labor*-intensive, *technology*-intensive and *human capital*-intensive industries then are defined as $\eta+\delta_1$, $\eta+\delta_2$, $\eta+\delta_3$ and $\eta+\delta_4$, respectively. The significance of industry-dummy variable (D_k^p) implies the difference between dynamic specialization of specific industries and that of the *primary* industries.

**Table 6.3 The Coefficients of Specialization and Hypothesis Tests:
across Industries**

Products	Coefficient of Specialization	Hypothesis Testing (H_0)				
		<i>Primary</i>	<i>Natural resource</i>	<i>Unskilled labor</i>	<i>Technology</i>	<i>Human capital</i>
<i>Primary</i>	η					
<i>Natural resource</i>	$\eta+\delta_1$	$\eta=\eta+\delta_1$				
<i>Unskilled labor</i>	$\eta+\delta_2$	$\eta=\eta+\delta_2$	$\eta+\delta_1=\eta+\delta_2$			
<i>Technology</i>	$\eta+\delta_3$	$\eta=\eta+\delta_3$	$\eta+\delta_1=\eta+\delta_3$	$\eta+\delta_2=\eta+\delta_3$		
<i>Human capital</i>	$\eta+\delta_4$	$\eta=\eta+\delta_4$	$\eta+\delta_1=\eta+\delta_4$	$\eta+\delta_2=\eta+\delta_4$	$\eta+\delta_3=\eta+\delta_4$	

Table 6.3 also shows other kinds of hypothesis testing. For example, to examine the whether the *primary* and *natural resource*-intensive industries show statistically significant different in their dynamic specialization, this research constructs null hypothesis (H_0): $\eta=\eta+\delta_1$, and alternative hypothesis (H_a): $\eta \neq \eta+\delta_1$. For the *primary* and

unskilled labor-intensive industries, the null hypothesis is (H_0): $\eta = \eta + \delta_2$, and the alternative hypothesis is (H_0): $\eta \neq \eta + \delta_1$. Finally, for *human capital*-intensive and *technology*-intensive industries the null hypothesis is (H_0): $\eta + \delta_3 = \eta + \delta_4$, and the alternative hypothesis is (H_0): $\eta + \delta_3 \neq \eta + \delta_4$. This research does hypothesis testing using Wald test:

$$F = \frac{(R_{UR}^2 - R_R^2) \frac{n-k}{m}}{(1 - R_{UR}^2)} \sim F(m, n-k) \quad (6.5)$$

If the ratio defined in (6.5) exceeds the critical value $F(m, n-k)$ for level of confidence, the null hypothesis is rejected. In this case, the number of restriction (m) is 1 and, the number of coefficient (including constant) k is 6 and number of observation (n) is $(234 \times 8) = 1872$. Therefore the critical values are 6.63, 3.84 and 2.37 for the level of significance 1%, 5% and 10%, respectively.

- *Different dynamics in the specialization across products within country*

This research also examines whether the difference in dynamic specializations across products also happen in each country. The econometric model (6.6) is applied for each country as indicated by i :

$$RSCA_{j,T}^i = \phi^i + \eta^i RSCA_{j,0}^i + \sum_{k=1}^4 \delta_k^i (D_k^p RSCA_{j,0}^i) + \varepsilon_j^i \quad (6.6)$$

6.3.4. Estimation⁹

Since the data used in this chapter is cross sectional one, we might have to deal with the assumptions of the classical regression model. Conventional wisdom says that

⁹ This sub-section mainly relies on the EViews 4 User's Guide.

the problem of autocorrelation is a feature of time series data and heteroscedasticity is a feature of cross-sectional data (Gudjarati, 1995). Therefore, we can expect that heteroscedasticity might be in our case. Wörz (2005) also finds that heteroscedasticity was initially a problem; therefore, the robust standard errors computed using the White/sandwich estimator of variance was then employed.

The existence of autocorrelation also might be possible. When the form of heteroscedasticity is not known, it might not be possible to get efficient estimates of the parameter using weighted least squares (WLS). The ordinary least squares (OLS) gives consistent parameter estimates in the presence of heteroscedasticity but the usual OLS standard errors will be incorrect and should not be used for the inference purposes.

Therefore, this research applies Heteroscedasticity and Autocorrelation Consistent Covariance (HAC) when the usual OLS have violated the homoscedasticity or no-autocorrelation assumptions¹⁰. There are two possible approaches i.e. Heteroscedasticity Consistent Covariance (White) and HAC Consistent Covariances (Newey-West). White (1980) formulated a heteroscedasticity consistent covariance matrix estimator which provides correct estimates of the coefficient covariances in the presence of heteroscedasticity of unknown form. The White covariance matrix is given by

$$\hat{\Sigma}_w = \frac{T}{T-k} (X'X)^{-1} \left(\sum_{i=1}^T u_i^2 x_i x_i' \right) (X'X)^{-1} \quad (6.7)$$

where T is number of observations, k is the number of regressors, and u_t is the least squares residual. The White covariance matrix assumes that the residuals of the

¹⁰ It is important to note that HAC (either the White Heteroscedasticity consistent or the Newey-West HAC consistent covariance estimates does not change the point estimates of the parameters, only the estimated standard errors.

estimated equation are serially uncorrelated. Newey and West (1987) derived a more general estimator that is consistent in the presence of both heteroscedasticity and autocorrelation of unknown form:

$$\hat{\Sigma}_{NW} = \frac{T}{T-k} (X'X)^{-1} \hat{\Omega} (X'X)^{-1} \quad (6.8)$$

where:

$$\hat{\Omega} = \frac{T}{T-k} \left\{ \sum_{t=1}^T u_t^2 x_t x_t' + \sum_{v=1}^q \left(\left(1 - \frac{v}{q+1} \right) \sum_{t=v+1}^T x_t u_t u_{t-v} x_{t-v}' + x_{t-v} u_{t-v} u_t x_t' \right) \right\}$$

q , the truncation lag, is a parameter representing the number of autocorrelations used in evaluating the dynamics of the OLS residuals u_t . Following the suggestion of Newey and West, Eviews set the q to $q = \text{floor}(4(T/100)^{2/9})$.

To determine which approach is suitable for a specific model, we follow some stages. *First*, the OLS is applied and then the residual testing on heteroscedasticity and autocorrelation are conducted. If the test shows that there are no autocorrelation and heteroscedasticity simultaneously, then we apply the OLS. *Second*, if only heteroscedasticity exists, we use the White Heteroscedasticity Consistent Covariance. *Third*, if the autocorrelation and heteroscedasticity exist, we apply the HAC Consistent Covariance (Newey-West).

6.2.5. The Spearman's rank correlation

As far as the flying geese formation is concerned, it might be believed that there will be dynamic change in the pattern of comparative advantage. Japan is the leader in the

formation. The other East Asian countries' pattern of comparative advantage might become similar to that of Japan as the head in the formation. In other words, there will be convergence in the pattern of comparative advantage. Similar with Chapter 4, this chapter applies statistical hypothesis test procedure of correlation on Revealed Symmetric Comparative Advantage (RSCA) in examining the convergence in pattern of comparative advantage.

6.4. Results and Analysis

6.4.1. Dynamic specialization across countries

Table 6.4 represents the estimation results of econometric model (6.2) for two periods of observation 1985-1995 and 1995-2005. The coefficients of specialization β (Japan) are positive and ranges from zero and one (i.e. 0.903 and 0.871) indicates that Japan showed despecialization for the periods 1985-1995 and 1995-2005. The coefficients of specialization for other countries can be got by adding up the coefficient of specialization of Japan and the corresponding coefficients of the country-dummy variables. For example, the specialization coefficients of Korea in 1985-1995 and 1995-2005 are 0.702 ($=0.903-0.201$) and 0.818($=0.871-0.053$), respectively.

It is previously mentioned that heteroscedasticity problem might exist. The OLS estimation results show the problem of heteroscedasticity and autocorrelation. Since the autocorrelation and heteroscedasticity problems exist, the Newey-West HAC Standard Errors and Covariance estimation method is applied. All coefficients of country-dummy variables in the both periods 1985-1995 and 1995-2005 are negative (except country-dummy 3 (Singapore=1) for 1995-2005) and statistically significant (except country

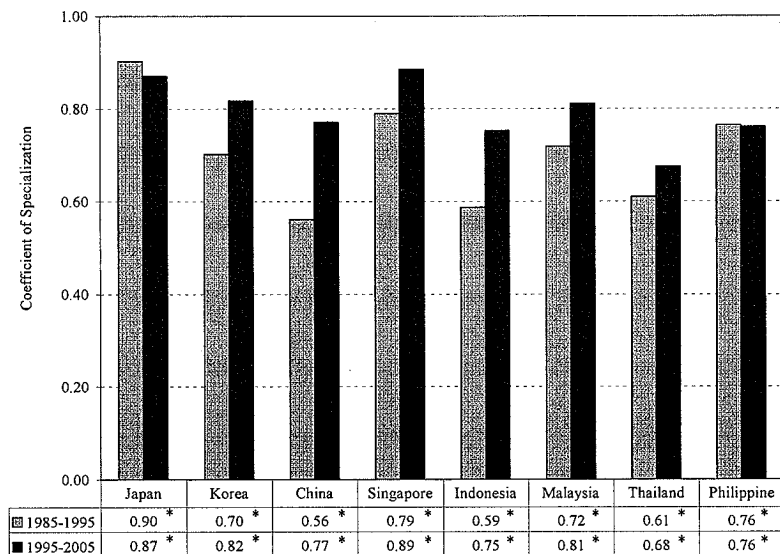
dummy 1 (Korea=1) and country dummy 5 (Malaysia=1) for 1995-2005). It indicates that countries excepting Singapore in 1995-2005 had decreases in their specialization greater than that of Japan.

Table 6.4 The Estimation Results: Specialization across Countries (1985-1995 and 1995-2005)

Variable	Periods			
	1985-1995		1995-2005	
	Coefficient	Standard Error	Coefficient	Standard Error
Constant	-0.071*	0.016	-0.069*	0.013
Specialization (Japan)	0.903*	0.023	0.871*	0.022
Country Dummy 1 (Korea=1)	-0.201*	0.040	-0.053	0.034
Country Dummy 2 (China=1)	-0.341*	0.049	-0.100**	0.040
Country Dummy 3 (Singapore=1)	-0.113**	0.043	0.015	0.029
Country Dummy 4 (Indonesia=1)	-0.315*	0.040	-0.118*	0.031
Country Dummy 5 (Malaysia=1)	-0.185*	0.038	-0.060	0.026
Country Dummy 6 (Thailand=1)	-0.293*	0.048	-0.195*	0.038
Country Dummy 7 (Philippine=1)	-0.138*	0.039	-0.110*	0.041
R-squared	0.554		0.676	
Durbin-Watson Statistic	1.514		1.650	
F-statistic	289.233		485.625	
Method of estimation	Newey-West HAC Standard Errors and Covariance		Newey-West HAC Standard Errors and Covariance	

Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. Detailed estimation output is presented in Appendix A.6.1.
Source: UN-COMTRADE, *author's calculation*.

Figure 6.4 shows the coefficients of specialization across countries for the two periods 1985-1995 and 1995-2005. All countries showed decreases in their specialization since the coefficients of specialization statistically less than one. In 1985-1995, China had a lowest coefficient of specialization. It implies that China had the most dynamic despecialization if it is compared with the other countries. In 1995-2005, Thailand had the lowest coefficient of specialization. In general, the figure also shows that all countries except Japan and the Philippines had increases in coefficients of specialization. It means that the countries had greater despecialization in 1985-1995 than in 1995-2005.



Note: *, ** and *** are significantly different from one at 1%, 5% and 10% level of significance, respectively. Source: UN-COMTRADE, *author's calculation*.

Figure 6.4 The Coefficients of Specialization: across Countries (1985-1995 and 1995-2005)

Previously, it is concluded that all countries showed despecialization since the all countries had coefficients of specialization statistically significant less than one. The next question is whether the despecialization coefficients are statistically different across countries. It might be easy to see this matter from Figure 6.4 that Japan showed less dynamic in despecialization than Korea, for example. However, it is not statistically tested yet. This sub-section provides statistical tests on whether a country has different specialization with the other countries.

Table 6.5 shows F-statistic of Wald coefficient tests (the hypothesis shown in Table 6.2). The hypothesis (H_0) on whether the coefficient of specialization of each country equals one for periods 1985-1995 and 1995-2005 is presented in the second and third column. Since the F-statistic is greater than critical F table, we reject H_0 and conclude that the coefficient of specialization is different from one. As shown by Figure

6.3 that all coefficients of specialization are less than one, now we can firmly say that all countries showed despecialization.

Do they have statistically the same coefficients of specialization? The columns 4-19 of Table 6.5 represent tests on whether one specific country's coefficient of specialization statistically equals the other countries for periods 1985-1995 and 1995-2005. For example, is Japan's coefficient of specialization the same with Korea's one? In general, Japan has statistically different coefficient of specialization for the both two periods 1985-1995 and 1995-2005, except with Korea and Singapore in 1995-2005.

Table 6.5 Results of Hypothesis Testing across Countries: *F*-statistic

Countries	Coefficient of Specialization ¹		Hypothesis Testing															
			Japan		Korea		China		Singapore		Indonesia		Malaysia		Thailand		Philippine	
	85-95	95-05	85-95	95-05	85-95	95-05	85-95	95-05	85-95	95-05	85-95	95-05	85-95	95-05	85-95	95-05	85-95	95-05
Japan	17.7*	35.1*																
Korea	64.6*	31.4*	25.9*	2.49														
China	88.25*	45.9*	49.1*	6.1*	5.9**	0.98												
Singapore	24.6*	17.8*	6.9*	0.25	2.76***	3.4***	14.6*	6.8*										
Indonesia	115.6*	75.2*	61.7*	14.4*	5.1**	2.8***	0.20	0.17	14.3*	14.8*								
Malaysia	62.6*	67.7*	24.0*	5.2**	0.11	0.03	7.7*	0.95	1.9	6.1*	7.0*	3.4***						
Thailand	74.6*	83.1*	36.7*	26.6*	2.59	10.2*	0.6	3.76***	8.9*	26.7*	0.15	3.3***	3.7***	12.6*				
Philippine	38.5*	35.2*	12.7*	7.2*	1.63	1.4	12.6*	0.04	0.2	8.2*	12.5*	0.03	0.95	1.5	7.4*	2.9***		

Note: ¹ Hypothesis testing on whether the coefficient of specialization equal to one or not.

*, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively.

Source: UN-COMTRADE, *author's calculation*

6.4.2. Dynamic specialization across industries

Table 6.6 shows estimation results of the econometric model (6.4) for two periods 1985-1995 and 1995-2005. We find the autocorrelation and heteroscedasticity problems (the result of Breusch-Godfrey Serial Correlation LM test and White Heteroscedasticity test are presented in the Appendix A.6.2) in the OLS method of estimation, therefore, we apply the Newey-West HAC Standard Errors and Covariance method. The sign of estimates are perfectly matched with that theory suggests. The positive sign of coefficient of specialization η (*primary* industries) lies between zero and one (i.e. 0.785 and 0.845 in 1985-1995 and 1995-2005, respectively) indicating that *primary* industries performed despecialization for 1985-1995 and 1995-2005.

Table 6.6 The Estimation Results: Specialization across Industries (1985-1995 and 1995-2005)

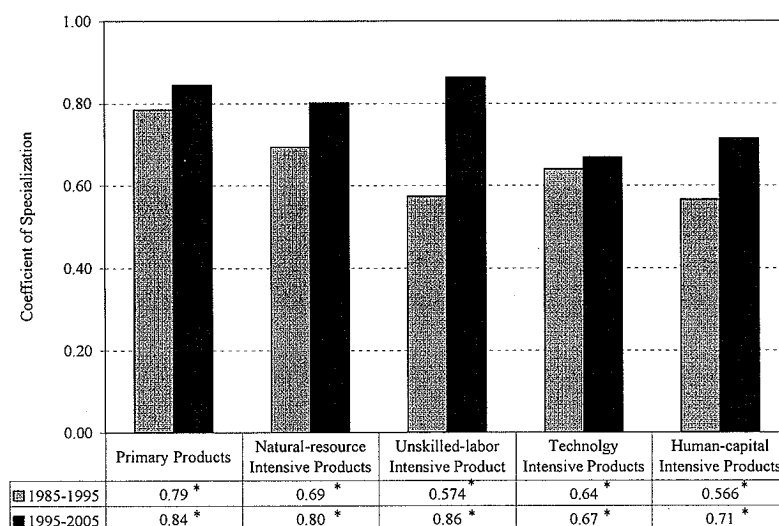
Variable	Periods			
	1985-1995		1995-2005	
	Coefficient	Standard Error	Coefficient	Standard Error
Constant	-0.081*	0.016	-0.078*	0.013
Specialization (<i>Primary</i>)	0.785*	0.024	0.845*	0.017
Product Dummy 1 (<i>Natural resource</i>)	-0.091**	0.042	-0.043	0.029
Product Dummy 2 (<i>Unskilled labor</i>)	-0.211*	0.073	0.019	0.036
Product Dummy 3 (<i>Technology</i>)	-0.145*	0.033	-0.176*	0.027
Product Dummy 4 (<i>Human capital</i>)	-0.219*	0.034	-0.130*	0.032
R-squared	0.548		0.679	
Durbin-Watson Statistic	1.497		1.657	
F-statistic	453.195		791.010	
Method of estimation	Newey-West HAC Standard Errors and Covariance		Newey-West HAC Standard Errors and Covariance	

Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. Detailed estimation output is presented in Appendix A.6.2.

Source: UN-COMTRADE, *author's calculation*.

The coefficients of specialization for other industries can be calculated by adding up the coefficient of specialization of *primary* industries and the corresponding

coefficients of industry-dummy variables. For example, the specialization coefficients of *natural resource*-intensive industries in 1985-1995 and 1995-2005 are 0.694 (=0.785-0.091) and 0.802(=0.845-0.043), respectively. All coefficients of the industry-dummy variables in both periods 1985-1995 and 1995-2005 are negative (except product dummy 3 (*unskilled labor*=1) for 1995-2005) and statistically significant (except product dummy 1 (*natural resource*=1) and product dummy 2 (*unskilled labor*=1) for 1995-2005). It indicates that the industries (except *unskilled labor*-intensive industries in 1995-2005) had greater decreases in their specialization than that of the *primary* industries.



Note: *, **, *** are significant at 1 percent, 5 percent and 10 percent level of significance, respectively. Source: UN-COMTRADE, *author's calculation*

Figure 6.5 Coefficient of Specialization: Across Products

Figure 6.5 depicts the coefficients of specialization across industries for two periods 1985-1995 and 1995-2005. It shows that all industries show decreases in specialization since the coefficients of specialization statistically are less than one. In general, comparing the two periods, the despecialization in 1985-1995 was more dynamic

than the despecialization in 1995-2005. *Primary* and *natural resource*-intensive industries had higher coefficient of specialization.

Table 6.7 shows F-statistics of hypothesis tests on whether the coefficients of specialization equal one and on whether specific industries have the same coefficient of specialization with the others' ones for 1985-1995 and 1995-2005. For the former testing, all industries had F-statistic greater than F-Critical value of 1%, 5 % and 10% level of significance. Therefore, we reject H_0 saying that coefficient of specialization equals one. And from Figure 6.4, we know that all industries had the coefficients of specialization less than one. It implies that all industries statistically showed despecialization process. For the later testing on whether specific industries have the same coefficient of specialization with the others' one, we get mixed results. Some industries have statistically the same coefficients of specialization and some industries do not have. However, we can generally say that all industries in general show despecialization differently. From 10 possible hypothesis tests (*primary* and *natural resource*-intensive industries, *primary* and *unskilled labor*-intensive industries and so on) for both period 1985-1995 and 1995-2005, there are 6 and 8 test results rejecting H_0 , respectively. *Primary* industries showed despecialization significantly different from the other industries for both period 1985-1995 and 1995-2005. From Figure 6.4, it is clearly shown that the coefficient of specialization of *primary* industries is higher than that of other industries, except compared to *unskilled labor*-intensive industries in 1995-2005. It indicates that the comparative advantage of *primary* industries is less dynamic compared to that of the other industries.

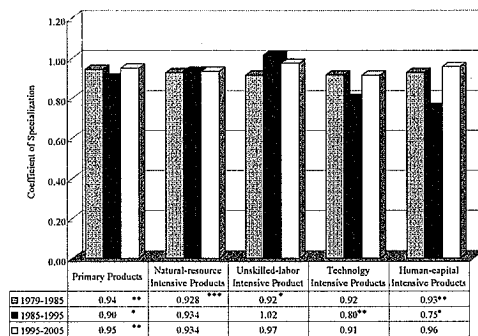
Table 6.7 Results of Hypothesis Testing across Industries: *F*-statistic

Products	Coefficient of Specialization		Hypothesis Testing									
			<i>Primary</i>		<i>Natural resource</i>		<i>Unskilled labor</i>		<i>Technology</i>		<i>Human capital</i>	
	'85-95	'95-05	'85-95	'95-05	'85-95	'95-05	'85-95	'95-05	'85-95	'95-05	'85-95	'95-05
<i>Primary</i>	81.0*	88.0*										
<i>Natural resource</i>	57.8*	48.3*	252.5*	553.2*								
<i>Unskilled labor</i>	37.0*	15.8*	142.7*	339.8*	2.29	2.23						
<i>Technology</i>	130.5*	131.2*	370.1*	876.7*	1.35	13.5*	0.73	21.3*				
<i>Human capital</i>	150.5*	71.9*	356.1*	620.4*	6.17**	4.67**	0.01	9.9*	3.42***	1.47		

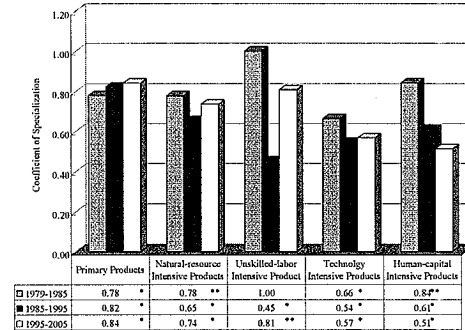
Source: UN-COMTRADE, *author's calculation*

6.4.3. Dynamic specialization across industries within country

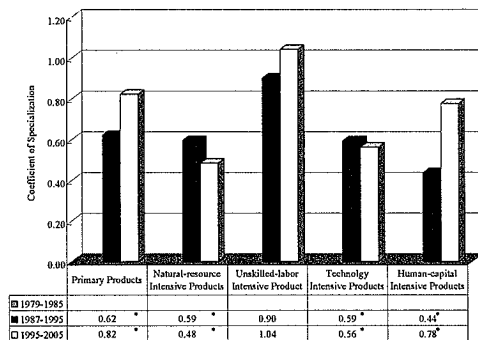
Figure 6.6 (a) – (i) represents the coefficients of specialization for each industries within countries in periods 1979-1985, 1985-1995 and 1995-2005. Due to the availability of data, we analyze China for two periods 1987-1995 and 1995-2005. Some general remarks are noted. *First*, all industries in the all countries showed despecialization - except *unskilled labor*-intensive industries in China for 1995-2005 which had the coefficient greater than one, although it still statistically equals one. *Second*, Japan as the most advanced country in the region showed less despecialization. *Third*, almost all industries in all countries have a pattern of despecialization with “U-shape” i.e. less dynamic despecialization in 1979-1985, more dynamic despecialization in 1985-1995 and again less dynamic despecialization in 1995-2005. Excluding China, from 35 possible results (5 industries in 7 countries) there are 25 having “U-shape” patterns, there are 6 continued despecialization patterns, there are 3 continued less despecialization patterns and there is one inverted “U-shaped” pattern i.e. *unskilled labor*-intensive industries in Japan.



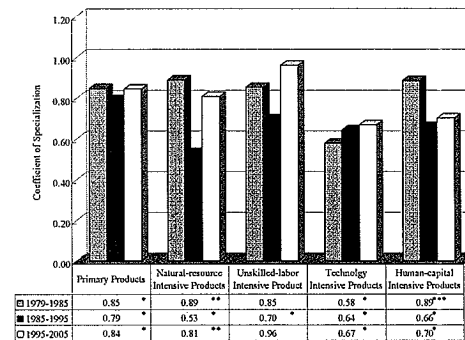
(a) Japan



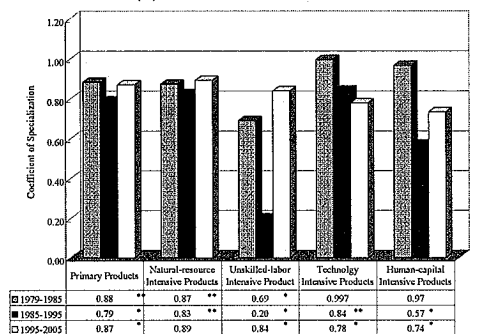
(b) Korea



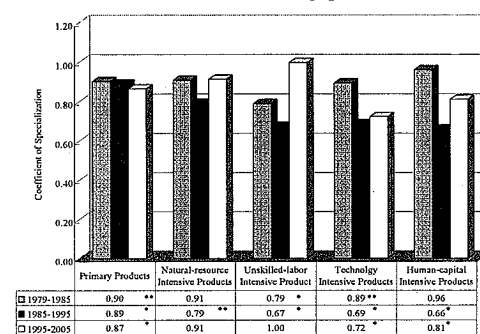
(d) China



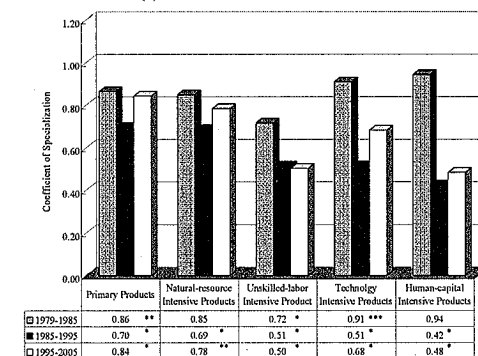
(e) Singapore



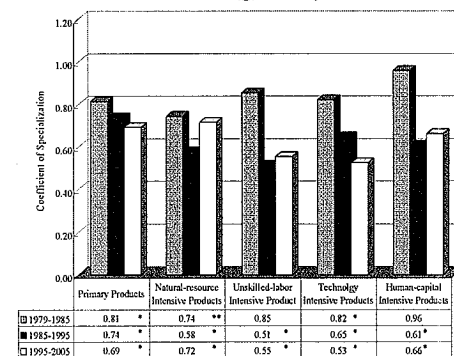
(f) Indonesia



(g) Malaysia



(h) Thailand



(i) Philippine

Note: * ** *** are significantly different from one at 1 percent, 5 percent and 10 percent level of significance, respectively.

Source: UN-COMTRADE, *author's calculation*

Figure 6.6 Coefficients of Specialization: by Countries and Industries

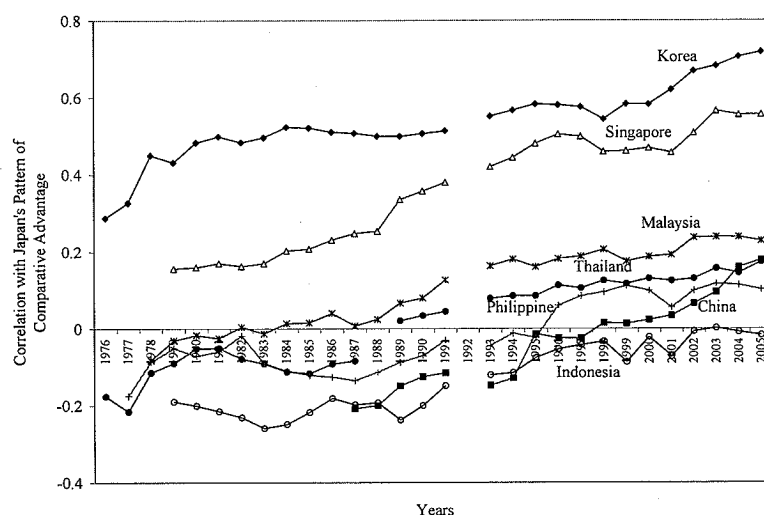
6.4.4. Convergence in the trade pattern

- *General pattern of convergence*

As in Chapter 4, this chapter applies the Spearman rank correlation to examine convergence of the specialization pattern in East Asia. This analytical tool has been intensively applied to analyze some issues like the dynamic similarities in pattern of trade, the shift in comparative advantage and the convergence in the trade patterns by other authors such as Dowling and Cheang (2000), James and Movshuk (2003), among others. Japan as the leader in the flying geese formation of industrialization in East Asia is chosen as the basis of analysis. As previously mentioned, higher positive value of the rank implies more similarity in the pattern of specialization between the two countries. It might also indicate competition between two countries since their patterns of specialization becoming more similar. In contrast, negative value of the rank indicates dissimilarity in the pattern of specialization.

To get the correlation coefficient some stages must be done. *Firstly*, we calculate the revealed symmetric comparative advantage (RSCA) index for all countries for all years. We use the calculation results of RSCA in Chapter 4 (see Appendix 4.2). *Secondly*, we rank the products (SITC) based on their RSCA. *Thirdly*, we calculate the Spearman's rank correlation between the Japan's series and the other countries' series. All calculation results on the correlation between Japan and the other East Asian countries with all statistical stuffs are presented in the Appendix A.6.3. In this part, we only describe our analysis in some figures. Figure 5.7 represents trends in the correlation of specialization pattern between Japan and the other countries. It can be firmly stated that there have been

nice positive trends in the correlation. It implies that the all countries' patterns of specialization have become similar with that of Japan. In other words, there is convergence in the patterns of specialization.



Source: UN-COMTRADE, author's calculation

Figure 6.7 Trends in Correlations of the Specialization Pattern between Japan and Individual Countries

Since the late 1970s, Korea-Japan and Singapore-Japan have had positive correlation coefficients of specialization patterns. In other words, Korea and Singapore are the followers of Japan in terms of the patterns of comparative advantage. It actually also indicates competition between Korea and Japan as well as Singapore and Japan, since they have similarity in the patterns of comparative advantage.

There were dissimilarities in the pattern of comparative advantage between the ASEAN countries and Japan. Started from the end 1980-s for Malaysia and Thailand and from the beginning 1990-s for the Philippines, their correlation have become positive. Although there is a positive trend in the correlation, Indonesia has still had negative value of correlation. It implies that Indonesia has different patterns of comparative advantage

with that of Japan. Meanwhile, started from 1998 the correlation between China's comparative advantage and Japan's one has become positive. Compared with the other trends, China has a steeper trend. It confirms that in term of pattern of comparative advantage, China can catch-up Japan faster than other countries.

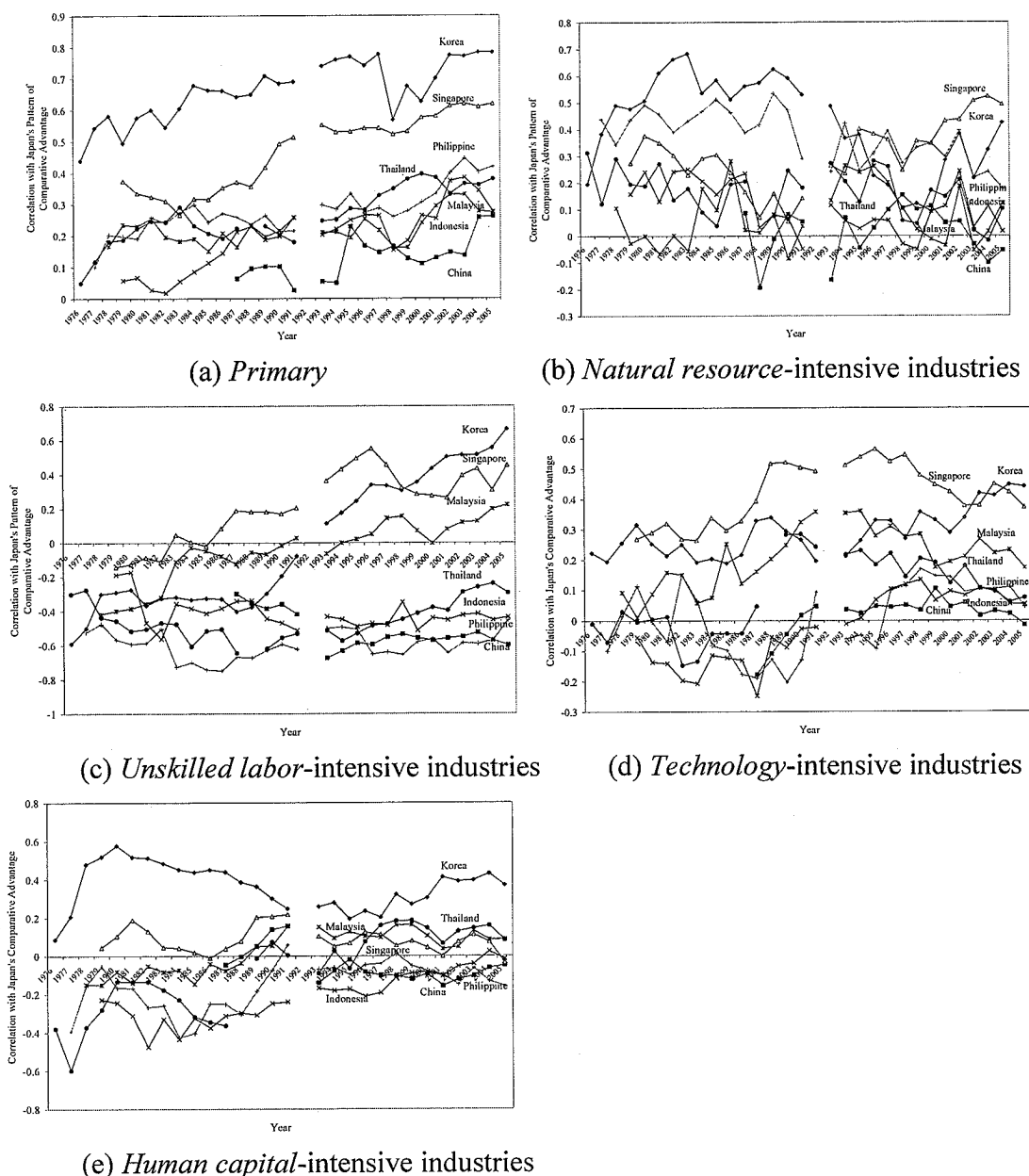
The East Asian countries have similar direction in the pattern of comparative advantage when Japan used as the basis of analysis. When the same direction found using Japan as the basis of analysis, the direction will not change if the basis of analysis change. For example if Korea is used as the basis of analysis, we also will certainly get the similar direction. In contrast, when the different direction found using Japan as the basic of analysis, the direction might not change. Therefore we also can conclude that all East Asian have similar direction in the pattern of comparative advantage. It might not beneficial situation for the East Asian economic integration since the similar direction in the pattern of comparative advantage also indicates competition (substitution) natures unless there is different catch-up process of different stage of economic development like what the flying geese paradigm mentioning. Through Japanese foreign direct investment (pro-trade type) expansion, the pattern of comparative advantage in East Asia will become similar each other with different catch-up process. The analysis of general pattern of comparative advantage empirically shows what commonly believed in the flying geese paradigm that is Korea and Singapore as the first follower of the head goose (Japan), the ASEAN4 as the second follower, and China as the third follower. In addition, China as the third follower shows a faster catching-up process than the others.

- *Pattern of comparative advantage by industries*

Previous subsection shows that there is a nice convergence in general pattern of comparative advantage. The next question is whether converge of pattern of comparative advantage also happens in industries. Following the previous subsection, industries are categorized in to *primary* industries, *natural resource-* intensive industries, *unskilled labor*-intensive industries, *technology*-intensive industries, and *human capital*-intensive industries.

It is interesting to look at trends in the correlation across industries as depicted by Figure 6.8. Some remarks could be made. *First*, there have been positive trends in the correlation of pattern of specialization between Japan and the other East Asian countries in *primary* industries. It might be understandable since the domination of agriculture activities decreases meanwhile the domination of manufacturing sector increases over time in all countries. In turn, the share of agricultural sector in the country's total export decreases. This condition is also worsened by the very high competition market with other developing countries where agriculture sector are still dominant. *Second*, although the correlations are fluctuating, it seems there have been downward trends in the correlation and they converged to zero in *natural resource* industries, except the correlation between Singapore and Japan as well as Korea and Japan which are not rich in natural resources. The correlation converging to zero implies there will be no linear association (relationship) in the pattern of comparative advantage in *natural resource*-intensive industries between Japan and ASEAN4 as well as China. *Third*, Korea, Singapore and Malaysia had positive trends in the correlation meanwhile Indonesia,

Thailand, Philippine and China had relatively constant negative value of correlation in *unskilled labor*-intensive industries.



(e) *Human capital*-intensive industries

Source: UN-COMTRADE, author's calculation

Figure 6.8 Trends in Correlations of the Specialization Pattern between Japan and Individual Countries: across Industries

Fourth, the relatively constant values of correlation also happen in *technology*-intensive industries. It indicates that each country maintains their comparative advantage pattern in these industries. *Fifth*, all countries correlations converge to zero (except Korea) in *human capital*-intensive industries. It indicates no association in the pattern of comparative advantage between Japan and the other East Asian countries (except Korea) in *human capital*-intensive industries.

6.5. Conclusions

This chapter has shown that econometric analysis and the Spearman's rank correlation strongly assert that East Asian countries show less-specialized (despecialization) together with converging trade patterns. It implies that all East Asian countries have boosted products with low comparative advantage in the past, to have relatively higher comparative advantage in the future. China, Thailand and Indonesia have more dynamic despecialization. *Human capital*-intensive industries showed the most dynamic despecialization during 1985-1995 compared with the other industries. Currently, *technology*-intensive industries have most dynamic despecialization. East Asian countries have similar direction in the pattern of comparative advantage i.e. becoming similar to that of Japan. Despecialization together with convergences in the patterns of comparative advantage indicates the rising importance of intra-industry trade (IIT). Therefore, product differentiation, transportation costs, dynamic economies of scale, degree of product aggregation, income distribution in countries, and factors endowments and product variety will be critical issues in the East Asian region.

Chapter 7

Flying Geese and “Products Mapping”

7.1. Introduction

A country's international trade performance changes depending on its dynamic comparative advantage. Industrial cluster in a region is sometimes considered to have strong relations with the different stages of industrial upgrading and structural transformation (Aiginger, 1999). The country with a rapid catching-up process has generally also shown a rapid structural transformation. Chapter 4 concludes that there have been changes in the pattern of comparative advantage of the ASEAN+3. The ASEAN countries have had more dynamic change in the pattern of comparative advantage than the three countries- China, Korea and Japan. In addition, the ASEAN countries' patterns of comparative advantage have become similar with that of Japan. Chapter 5 shows theoretically that not only differences in the factor endowments but also differences in the production function (technology) as well as in the consumption function (taste and preference) can create countries' dynamic comparative advantage¹. For example, Korea still had comparative advantage in *unskilled labor*-intensive industries in 1985 but she had no comparative advantage in the same industries in 2005. Chapter 6

¹ Theoretically, sources of international comparative advantage can be withdrawn from the assumptions that are used to produce theory's sharpest result i.e. *dimensionality* (number of commodities, countries and production factors), *mobility* (in commodities and production factors which might relate with non-traded goods, transportation costs, tariffs, other trade impediments, factor market distortions, factor market adjustment), *competition*, *technology* (specialized factors, public resources, intermediate inputs, economies of scale, technological differences), *factor endowment* (labor, capital, human-capital, natural resources) and *demand* (taste and preference) (Leamer, 1984).

concludes that all the East Asian countries have represented despecialization in their exports. There have been convergences in their patterns of comparative advantage.

The “flying geese” (FG) pattern is one of the well-recognized models to be strongly considered in explaining economic development in East Asia. The model was firstly introduced by Kaname Akamatsu in the 1930s, as an analogous sequential development or catching-up process of manufacturing industries in developing countries (Kojima, 2000; Ozawa, 2001; Kwan, 2002; Kasahara, 2004). By being the region’s most advanced country in term of technology and becoming a main trading partner as well as a source of foreign direct investment (FDI) for the other East Asian countries; Japan has played important roles in the East Asian economic development. The economic catching-up to Japan by the Asian Newly Industrialized Economies (‘ANIEs’ by Kojima (2000)) and by the Association of Southeast Asia Nations (ASEAN) countries as well as China has been frequently associated with the FG model. As far as the FG model is concerned, dynamic specializations describe the catching-up process.

This chapter is addressed to answer some questions. Does the shift in comparative advantage or specialization support the FG model in the East Asian region²? What is the exact position of countries in the FG model? What industries might be transmitted from Japan to the other East Asian countries following the FG pattern in the future? The rest of this chapter is organized as follows. The evolution of the FG paradigm and its underlying economic implications are briefly discussed in section 7.2. The methodology is presented in section 7.3. We make an analytical tool –which is named “products mapping”- to examine empirically the FG paradigm. The analytical tool is constructed by combining

² In this chapter, it consists of Japan, China, Korea, Singapore, Indonesia, Malaysia, Thailand and the Philippines.

two main crucial variables in the FG model i.e. comparative advantage and trade balance (Akamatsu, 1961, 1962; Kojima, 2000; Ozawa, 2001; Kwan, 2002; Kasahara, 2004). The two variables are measured with two empirical indices i.e. Revealed Symmetric Comparative Advantage (RSCA) by Laursen (1998) and Trade Balance Index (TBI) by Lafay (1992). Section 7.4 shows the results and analysis. Finally, conclusions and policy implications are presented in section 7.5.

7.2. The FG Paradigm: Literature Review

In Japanese, the FG paradigm is called the *ganko keitai* (a flock of flying geese). The paradigm tries to explain the phenomenon of industrial development in the catching-up economies. The FG concept was originally coined by Kaname Akamatsu in 1930s and he wrote his works in Japanese so that the concept was not so popular among non-Japanese scholars. After his publication in English during the 1960s together with the increasing popularity of product life cycle (PLC) by Raymond Vernon (1966), the FG paradigm has become popular one. Afterward, the FG concept has been greatly developed and modified by some Japanese scholars such as Kojima and Ozawa (Kasahara, 2004). This new FG model is sometimes referred to as the modern “multi-sequentialist”³ FG model.

7.2.1 The Akamatsu’s original model of flying geese

Akamatsu (1962) argues that the economic growth of developing countries should consider mutual interactions between developing countries and advanced countries. He

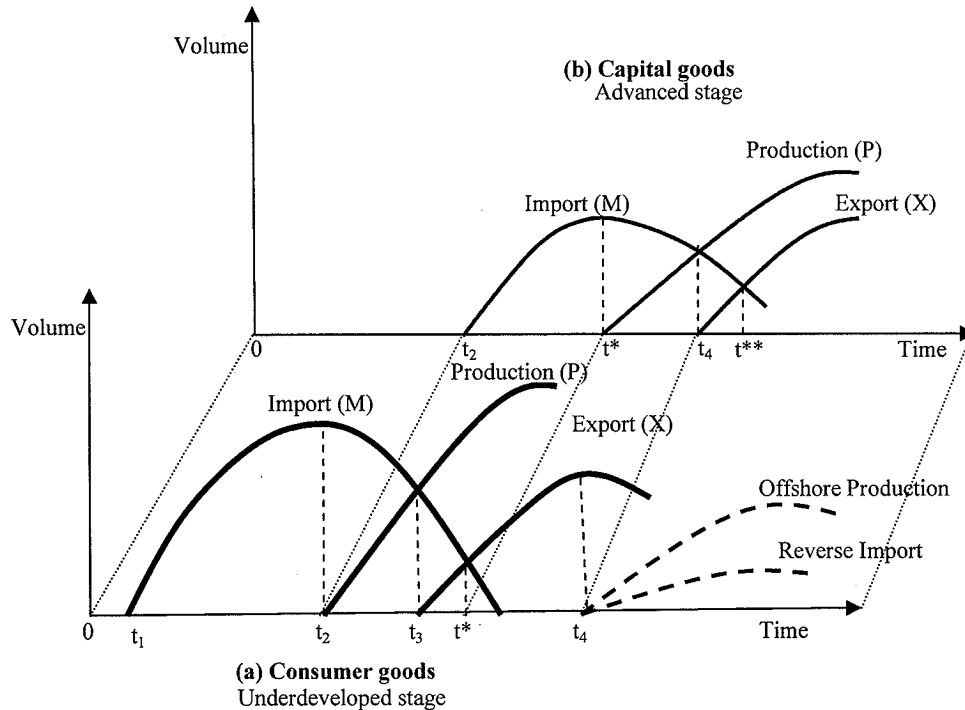
³ Kasahara (2004) and Ozawa (1991).

mentions seven historical stages of the economic growth in developing countries i.e. (a) the development of native (handicraft) industry, (b) the flow of manufactured goods from advanced countries, (c) the infiltration of capital and techniques for large-scale production of *primary* products, (d) the establishment modern industries including the industries processing raw materials, (e) the increased participation of native capital to run the industries processing native raw materials, (f) the native industries handling manufactured goods in general, and (g) the industrialization of the developing countries becoming advanced. The essence of the FG model then might be given by directly citing the original Akamatsu's argument:

The wild-geese-flying pattern of industrial development denotes the development after the less-advanced country's economy enters into an international economic relationship with the advanced countries. This theory leaves out of consideration the period during which less-advanced countries are in the stage of a closed self-sufficient economy or during which there is no international trade of any significance with a neighboring country, since their economic structure are homogenous with each other. A sort of formula for the industrial development of less-advanced countries after they have opened trade ports and entered into large-scale trade relations with the advanced Western European countries is the hereby termed wild-geese-flying pattern of industrial development. (Akamatsu, 1962: p.11).

The basic pattern of development of industry is illustrated like the wild-geese-flying in orderly rank and forming an inverse V, just as 'airplane in shape'. Figure 7.1 shows the Akamatsu's FG concept. He notes four stages of the fundamental of FG pattern that was developed in the historical context of the Euro-American as leader and Asian as follower (Kasahara, 2004; Kojima, 2000). *First stage*: the industries might be classified into several categories. Manufactured consumer goods are imported from advanced countries (started from t_1 in Panel a). Some products (*primary* products for example) are exported by less-advanced countries. In this stage, imported manufactured product may have a negative consequence on the native handicraft industry of the less-advanced countries due to the substitution effect.

When an underdeveloped nation first enters the international economy, the primary products, which are her specialties, are exported and industrial products for consumption are imported from advanced nations. [Because the later's more advanced factory products are superior in quality and cheaper in price.] (Akamatsu, 1961, pp. 206)



Source: Author's modification from Kojima (2000).

Figure 7.1 The Akamatsu's Original FG Paradigm

Second stage: the actual production of the imported manufactured goods (import-substitution strategy) exists (started from time t_2 in Panel a). The imports of consumer goods increase from time t_1 to t_2 and the domestic demand becomes large enough to realize economies of scale. Therefore, the domestic production can start (at t_2 in Panel a). At the same time, the country must also import capital goods (started from t_2 in Panel b). In the case of Japan, not only capital goods such as machinery but also raw materials must be imported (Akamatsu, 1962). At this stage, there was tough competition between imported consumer goods and domestic production. As infant industry arguments show, the government sometimes protected the domestic industry through subsidy, import tariff,

etc. This can be theoretically applied to the other Asian follower countries. Akamatsu (1962) mentions as follows

In the process of recovering the domestic market, there will arise a struggle of economic nationalism in less-advance countries. This presupposes the accumulation of capital and the technological adaptability of the people in those countries. Further, it calls for the government's protective policy to encourage and promote the consumer good industries. (Akamatsu 1962 pp.13).

Third stage: the domestic consumer goods industry develops into the export industry (started from t_3 in Panel a). At time t^* , trade in consumer goods is in the equilibrium or trade balance (Exports=Imports) and domestic production equals domestic demand (since domestic demand = domestic production – exports + imports). This stage implies a successful implementation of the catching-up process of the industry concerned along the sequential path import-production-export (M-P-E), which is the basic pattern of the FG model (Kojima, 2000)⁴. In addition, the industry shifts from import-substitution industry toward export-led growth industry. The consumer goods industry is already homogenized with that of advanced countries. Therefore, the country is no more less-advanced in these goods.

Fourth stage: the advanced status in consumer goods industry is further elevated. It is shown by the decrease of exports in consumer goods (from t_4 in Panel a), meanwhile capital goods export start (from t_4 in Panel b). The export in consumer goods decreases because consumer goods production begins in the less-developed countries, which has imported production technology from the leader goose country (Offshore production depicted by broken line in panel a). In addition, it is possible that the reverse import may happen as Akamatsu suggests:

⁴ This is why this research applies trade balance (net-importer or net-exporter) as one crucial variable in the analytical tool which is developed in part 3. By using trade balance, we can firmly assert the position of a specific country i.e. whether it lays in the period t_1t^* (net importer), t^*t_4 (net exporter) or beyond as a net importer (due to the reverse import).

.....due to the high wages make the import of consumer goods from less-advanced countries more profitable. Thereupon, what had been imported from advanced countries in the early development stages of less-advanced countries are now, conversely, exported to advanced countries from the less advanced countries. ...The wild-geese-flying pattern sees its completion in the fourth stage, with respect to capital goods such as machinery, by going through the importation beginning from the second stage, the initiation of domestic production in third stage, and switch over to export in the fourth stage. Here, domestic industrialization is also achieved for the capital goods industry. (Akamatsu, 1962, pp.16)

The FG pattern does not only happen in the capital goods industry following the consumer goods industry but also in the progression from low technology goods to higher technology goods. According to Akamatsu (1962), the products (industries) diversification is then classifiable into two patterns i.e. intra-industry and inter-industry cycles. The former is created by the emergence of new product groups within each industrial sector, i.e. from cotton to woolen and from woolen to synthetic textiles, or from crude and simple goods to complex and refined goods. The latter represents the development of new industry, for example from textiles to steel to shipbuilding, from auto to computer, or from consumer goods to capital goods. The latter also shows the level of development of any national economy (Kasahara, 2004). Either intra-industry or inter-industry cycle repeats the FG pattern (import-production-export) enhancing competitiveness and efficiency of an industry through the “rationalization” of production (Kojima, 2000). Meanwhile, a diversification of production through inter-industry cycle upgrades the structure of industries and exports. As a result, the parallel progress and interaction between rationalization and diversification of production could stimulate national development.

7.2.2 The modern “multi-sequentialist” concept

The modern FG paradigm considers the sequential transformation of economic activities from industrialized countries to less industrialized countries through the

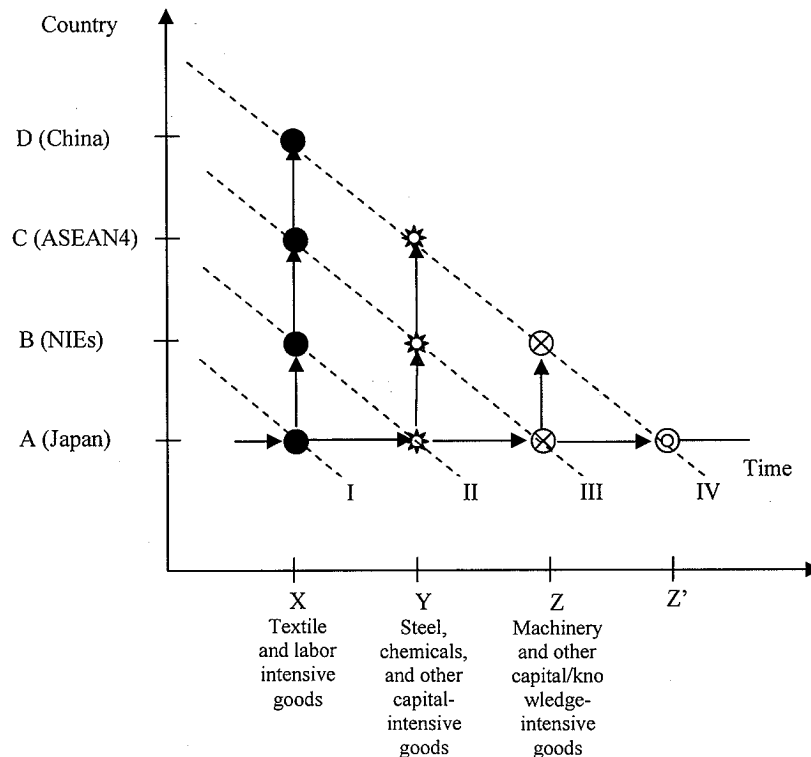
increasing role of transnational corporations (TNCs: by sub-contracting, licensing, joint venture, foreign direct investment, etc.). This occurs in parallel with the dynamic shifts in pattern of comparative advantage. Ozawa (1991) states three types of sequential economic activities –“multi-sequentialist”- within and among a group of national economies (as summarized by Kasahara (2004)). The first type is product-cycle sequencing of a particular product. The national economy follows the trade framework of a product life cycle, consisting of four stages: (a) import, (b) import-substituting production, (c) export and (d) reverse import (“boomerang effect” by Shinohara (1976, 1982)). The above is depicted in Figure 7.1 panel (a). Consumer goods are firstly imported, and then domestically produced, exported and then again imported (M-P-E-M). The second type is industry-cycle sequencing of economies. The changes in factor endowments and industrial development as well as technological progress affect a country’s comparative advantage. The country upgrades its industries, i.e. from the lower value-added, more labor-intensive and less capital-intensive industries, to the higher value-added, less labor-intensive and more capital-intensive industries. In Figure 7.1, this is shown by the shift from panel (a) consumer goods to panel (b) capital goods. The shift shows a signal of the structural process to generate self-sustaining and self-propelling forces along the dynamic path of comparative advantage. The third type is inter-economy sequencing related to the transfers of industrial activities among national economies with different stages of development. These industrial transfers will be made among those follower economies with different levels of human resources, financial resources, technological capacities and economic development.

For the lead goose country, the phase of post-catch-up situation exists (time t^* in Figure 7.1 panel a). Export of consumer goods keeps on rising up to the peak at t_4 and

then it decreases due to the deteriorating comparative advantage (due to the increase in wage). Afterward, through foreign direct investment (FDI), the production process of the labor-intensive consumer goods (including capital, superior technology, and managerial skill as a package) is transferred to another country with lower wage. As a result, the follower goose country can sell the products to domestic market or even export to other countries (including the lead goose country as 'reverse imports'). Kojima (1995) refers to this FDI as "pro-trade oriented type" (PROT). He finds that Japan's FDI has been the pro-trade oriented investment. In this case, there is mutual relationship between the lead goose and follower geese as described by Kojima (2000):

FDI thus augments comparative advantages in both countries, resulting in an expanded basis for trade and a reinforce productivity growth. As long as this type of FDI is promoted, an FG stimulus of industrialization is transmitted sequentially from a lead goose to follower geese, bring about enlarged trade and co-prosperous economic growth. This is nothing else but the "FDI-led growth" of regional economies, which is a prime motive for building regional integration (p. 383)

The modern "multi-sequentialist" FG paradigm is clearly presented in Figure 7.2. Kojima (2000) makes two assumptions: (1) an economy's industrial structure is diversified and upgraded in a sequence from industry X (textiles and other labor-intensive goods) to Y (steel, chemicals, and other capital-intensive goods), and further to Z (machinery and other capital/knowledge-intensive goods). This industrial shift happens horizontally over time, (2) the flying-geese pattern of industrialization is transmitted through pro-trade type of FDI from the lead goose (or Japan), to the follower geese B (or NIEs), C (or ASEAN 4) and D (or China) according to the industrialization or per capita income levels. This geographical spread takes place vertically over time. The passages of time are indicated by broken lines I, II, III, and IV in Figure 7.2.



Source: Kojima (2000)

Figure 7.2 The Modern “Multi-sequentialist” FG Paradigm

At period I, Japan has already achieved the catching-up process in X-industry, and there is no outward FDI yet. At period II, Japan has comparative advantage in Y-industry and invests in country B's X-industry. At period III, Japan upgrades its comparative advantage to industry Z, and invests in country B's Y-industry and country C's X-industry⁵. At period IV, the future progress of Japan's industrialization is yet unclear, but her investment has spread widely toward country B's Z industry, country C's Y-industry and country D's X-industry.

⁵ Dynamic comparative advantage becomes a crucial variable in the FG pattern. This is why this research uses comparative advantage as one crucial variable in the analytical tool, which is developed in part 3. By using a comparative advantage measurement, we can firmly assert the position of the country's comparative advantage in the international market for a specific product.

7.2.3 Previous empirical tests

Kojima (2000) states several empirical researches supporting the FG paradigm. *First*, Tran (1992) examines the serial transfer of Japan's synthetic fiber industry to NIEs, ASEAN4, China and Vietnam, starting from down-stream to upper-stream. *Second*, Kosai and Tran (1994) find geographical extension of a FG pattern. Industrialization⁶ has spread through FDI in the sequence of Korea-Thailand-Malaysia-Indonesia during 1960-1990), and production has been upgraded in the sequence of textiles-synthetic fibers-steel-office equipment in each country. *Third*, APEC Economic Committee (1995) finds that both direct investment and trade are complementary. Kojima (1995) mentions such kind of FDI as pro-trade oriented type (PROT) investment. *Fourth*, Shinohara (1976, 1982) adds another phase in the FG pattern, namely the "boomerang effect", which represents a reverse flow of imports from less advanced countries to the more advanced capital-exporting countries. The boomerang effect explains Japan's declining share in US export markets in the wake of rising exports of Asian countries. Shinohara also finds that there had been rapid increase in machinery trade (i.e. intra-industry horizontal trade) during the 1975 to 1992 period between (a) Japan and Asian countries (NIEs, ASEAN4 and China), (b) the USA and Asian countries and (c) NIEs and ASEAN 4. *Fifth*, Kojima (1995) finds that the mutual FDI, mainly from NIEs to ASEAN and China, rose higher than FDI from Japan, the US and the EU. It was also accompanied by intra-regional trade.

Rana (1990) finds some links between changes in the pattern of trade and economic development, and points out that the shifts in comparative advantage were

⁶ Industrialization is measured by both a manufacturing/GDP ratio and a manufacturing share in total exports

significant from Japan to the NIEs and ASEAN4 and from the NIEs to the ASEAN4. In addition, the shifts were “beneficial” in the sense that the gains increase export earnings and promoted economic development in these countries. Fukasaku (1992) examines the ability of the FG theory in explaining inter-industry trade as the mechanism for promoting growth across countries. By using trade data 1979-1988, Fukasaku finds that the pattern of trade within Asia has gradually shifted away from inter-industry trade toward intra-industry trade. As far as the Asian economies become increasingly integrated and interdependent, the intra-industry trade has stronger grounds to exist. Consequently, the doubt of the FG theory remaining applicable in the future might rise. Following technique used by Lutz (1987), Rana (1990) and Fukasaku (1992); Dowling and Cheang (2000) test the existence of the FG pattern by using Revealed Comparative Advantage (RCA) indices of all 22 industry groups for period of 1970-1995. They find that comparative advantage has shifted from Japan to the NIEs and ASEAN4 during the period 1985 to 1995. In addition, Japanese FDI has been used to “recycle” comparative advantage (Dowling and Cheang, 2000) and to use resources in the ASEAN4.

All studies conducted so far deal with the FG pattern in specific products or industries without mentioning clearly the exact position of countries and the direction of the FG pattern. Therefore, this chapter tries to make an analytical tool namely, “products mapping” to examine the exact position of countries in the FG formation and to predict the industries that might be potentially transferred from the lead-geese to the follower geese.

7.3. Methodology

7.3.1. Data and industries classification

Similar with data used in previous Chapters 4 and 5, this chapter applies data on export and import published by the United Nations (UN) namely United Nations Commodity Trade Statistics Database (UN-COMTRADE). When discussing industries, this chapter focuses on 234 groups of products SITC (3 digit level) classified by factor intensities. Similar with the previous two chapters, we employ the classification of industries by the Empirical Trade Analysis (ETA)⁷.

7.3.2. “Products Mapping”⁸: RSCA and TBI

This sub-section explains the “products mapping”, which is developed to examine the FG pattern. As clearly mentioned in the FG concept, there are two crucial variables in the FG pattern i.e. comparative advantage and export-import (trade balance)⁹. Therefore, the analytical tool is constructed by combining the two variables. Two indicators are chosen i.e. Revealed Symmetric Comparative Advantage (RSCA) as the indicator of comparative advantage and Trade Balance Index (TBI) as the indicator of export-import activities.

⁷ See Empirical Trade Analysis (ETA) at <http://people.few.eur.nl/vanmarrewijk/eta/> for further information.

⁸ This preliminary analytical tool has been presented by the author in the 10th International Conference Society for Global Business & Economic Development (SGBED) “Creativity & Innovation: Imperative for Global Business and Development”, Kyoto, Japan August 8-11, 2007. The author would like to thank Dr. Xu Ming (China Textile University), Dr. Katsuo C. Yamazaki (Shizuoka Sangyo University) and all participants in the conference for the valuable comments.

⁹ It is argued that production is represented well by both export and import activities. In the early stage of import substitution, domestic production is low, there is no export and import is still high. When economies scale is reached, domestic production becomes efficient and product has comparative advantage in international market, export will increase and import will decrease. Beyond time t^* (after the catching-up process) at Figure 7.1 (panel a) for example, domestic production and export increase meanwhile import decreases. See Balance *et al.* (1987) for a good discussion.

The $RSCA_{ij}$ calculated in Chapter 4 (Appendix A.4.2) is used in this chapter. Trade Balance Index (TBI) (Lafay, 1992) is employed to analyze whether a country has specialization in export (as net-exporter) or in import (as net-importer) for a specific group of products (SITC)¹⁰. TBI is simply formulated as follows:

$$TBI_{ij} = (x_{ij} - m_{ij}) / (x_{ij} + m_{ij}) \quad (7.1)$$

where TBI_{ij} denotes trade balance index of country i for group of products (SITC) j ; x_{ij} and m_{ij} represent exports and imports of group of products j by country i , respectively. Values of the index range from -1 to +1. Extremely, the TBI equals -1 if a country only imports, in contrast, the TBI equals +1 if a country only exports. Indeed, the index is not defined when a country neither exports nor imports. In this case, we put zero since the group of products shows either potentially to be exported or imported. Any value within -1 and +1 implies that the country exports and imports a commodity simultaneously. A country is referred to as “net-importer” in a specific group of product where the value of TBI is negative, and as “net-exporter” where the value of TBI is positive (Calculation results of TBI are presented in Appendix A.7.1).

By using the RSCA and TBI indexes, the “products mapping” is constructed¹¹. Products (SITC) can be categorized into four groups A, B, C and D as depicted in Figure

¹⁰ As far as the FG is concerned, the TBI is suitable indicator instead of inter-industry and intra-industry trade index by Grubel and Lloyd (1975:21):

$$\text{Inter-industry trade: } A_{ij} = \left[\frac{|x_{ij} - m_{ij}|}{(x_{ij} + m_{ij})} \right] * 100$$

$$\text{Intra-industry trade: } A_i = \left[\frac{(x_{ji} + m_{ij}) - |x_{ij} - m_{ij}|}{(x_{ij} + m_{ij})} \right] * 100$$

The TBI can indicates clearly whether a country as a net-exporter or net-importer.

¹¹ This preliminary analytical tool has been presented by the author in the 10th International Conference Society for Global Business & Economic Development (SGBED) “Creativity & Innovation: Imperative for Global Business and Development”, Kyoto, Japan August 8-11, 2007. The author would like to thank

7.3. Group A consists of products, which have both comparative advantage and export-specialization; Group B consists of products, which have comparative advantage but no export-specialization; Group C consists of products, which have export-specialization but no comparative advantage; and Group D consists of products, which have neither comparative advantage nor export-specialization¹². (Calculation results of the “products mapping” are presented in Appendix A.7.2)

Revealed Symmetric Comparative Advantage Index (RSCA)	RSCA > 0	Group B: Have Comparative Advantage No Export-Specialization (net-importer) (RSCA > 0 and TBI < 0)	Group A: Have Comparative Advantage Have Export-Specialization (net-exporter) (RSCA > 0 and TBI > 0)
	RSCA < 0	Group D: No Comparative Advantage No Export-Specialization (net-importer) (RSCA < 0 and TBI < 0)	Group C: No Comparative Advantage Have Export-Specialization (net-exporter) (RSCA < 0 and TBI > 0)
		TBI < 0	TBI > 0
		Trade Balance Index (TBI)	

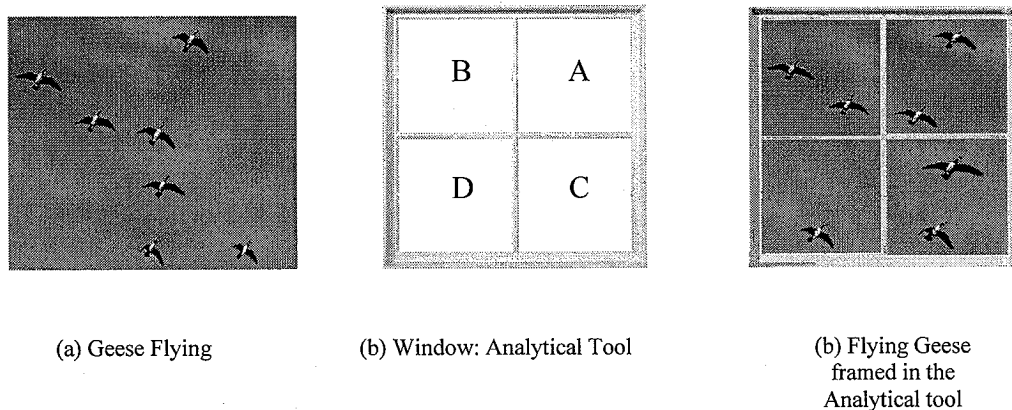
Figure 7.3 Products Mapping

The analytical tool, “products mapping” is used to examine the flying geese pattern. Figure 7.4 shows geese flying in panel (a), the analytical tool “product mapping” in panel (b) and geese flying framed in the analytical tool “product mapping” in panel (c). Imagine we are sitting in a room. There we see a window (panel b) corresponding with

Dr. Xu Ming (China Textile University), Dr. Katsuo C. Yamazaki (Shizuoka Sangyo University) and all participants in the conference for the valuable comments.

¹² The conventional definition of comparative advantage states that a country will export products with comparative advantage and import products with comparative disadvantage. Heckscher-Ohlin (H-O) model assumes a perfectly homogenous commodity. This definition of commodity is sufficient to explain the existence of international trade. However, empirical studies involving this theoretical definition have a problem. With many characteristics of commodities, it is difficult to have two goods with perfect substitute each other. Therefore, for analytical and statistical purposes it is necessary to aggregate the production, trade and consumption of commodities into sets (groups) (Grubel and Lloyd, 1975). This research applies 3-digit SITC revision 2. We use the analytical tool of Trade Balance Index. Since we use groups of products instead of a particular product, it is possible a country exports and imports simultaneously a group of products. Therefore, a country can be a net-exporter of products in which it has seemingly “comparative disadvantage”. If a country simply “re-exports” (without any physical fabrication) almost all the products which it “imported” and consume domestically only a part of such products, the country will be a “net-exporter”. Therefore, this kind of “comparative advantage” comes from the better management of export and import services.

the analytical tool in Figure 7.3. Outside, through the window, we see geese flying (panel c). In this research, flying geese might be products (SITC), then the analytical tool is called “products mapping”. The geese might be industries, then the analytical tool is called “industries mapping”. Finally, the geese might also be countries, the analytical tool is called “countries mapping”.



Source: http://www.pbase.com/cogard/flying_ducks_geese_shorebirds for the geese flying

Figure 7.4 Geese Flying and “Product Mapping”

7.4. Results and Analysis

7.4.1. “Products mapping”

Table 7.1 shows the products mapping based on comparative advantage and trade balance previously explained in sub-section 7.3.2. The first column represents the figure of products mapping. The second column represents top-ten listed products in Group A. These products are considered as the best-ten products in term of their comparative advantage and trade balance. They are in the position of having comparative advantage in the international trade and the country in the position of having positive trade balance (or as net-exporter).

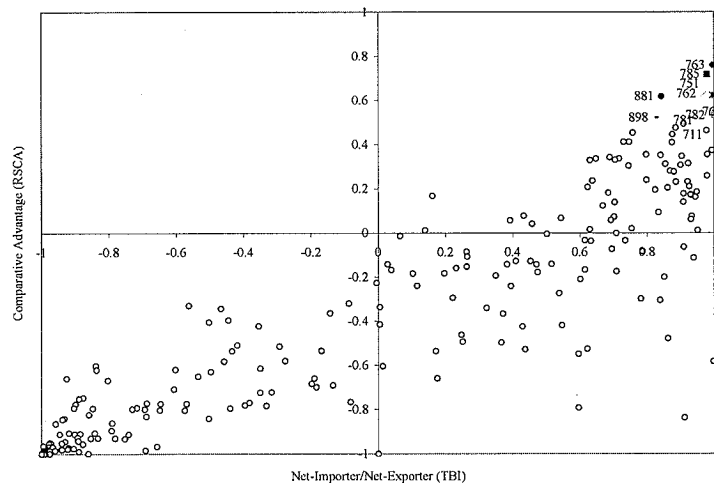
There are some general conclusions withdrawn from Table 7.1. *First*, all figures show positive relationship between comparative advantage and trade balance. The higher is the comparative advantage, the bigger will be the trade balance. Table 7.2 shows the average number of SITC products in each group A, B, C and D from 1976-2005 for each country. For example, during 1976-2005, Japan had on average 65 products (27%) in Group A; 1 product (0.3%) in group B, 40 products (17%) in Group C and 31 products (55.2%) in Group D. All countries together, the average number of products for the period 1976-2005 in Group A, B, C and D are 49 products (21%), 6 products (3%), 36 products (15%) and 146 products (62%), respectively.

Second, many products i.e. more than 50% (except China) lie in group D (products have no comparative advantage and the country is a net importer). On average, for the period 1976-2005, the Philippines and Malaysia had very big proportion of products lying in group D i.e. 71.4 percent and 70.7 percent, respectively. Group B is a rather strange group, because it consists of products, which have comparative advantage but the country as a whole is a net-importer. Compared with the other countries, on average for the period 1976-2005 Singapore had the highest portion of products lying in this group i.e. 14 products (6%). China, Japan, Thailand and Korea had more than 20 percent of their products lying in the Group A on average for the period 1976-2005.

Table 7.1 “Products Mapping”: Top-Ten Products in 1985 and 2005

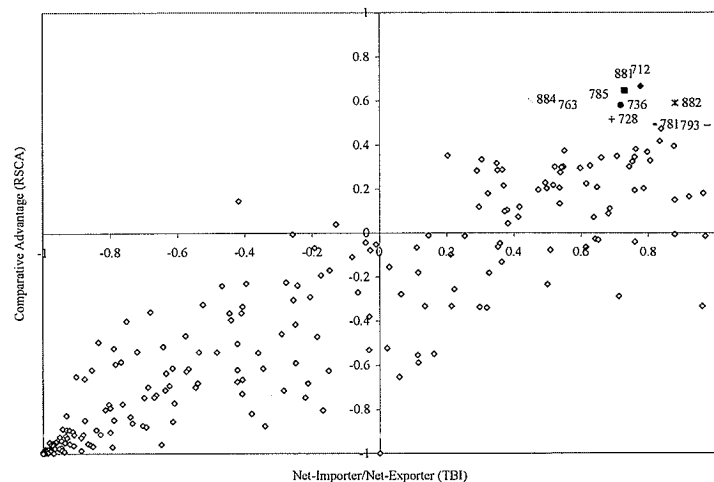
Products Mapping

Top-Ten Products



a.1. Japan 1985:

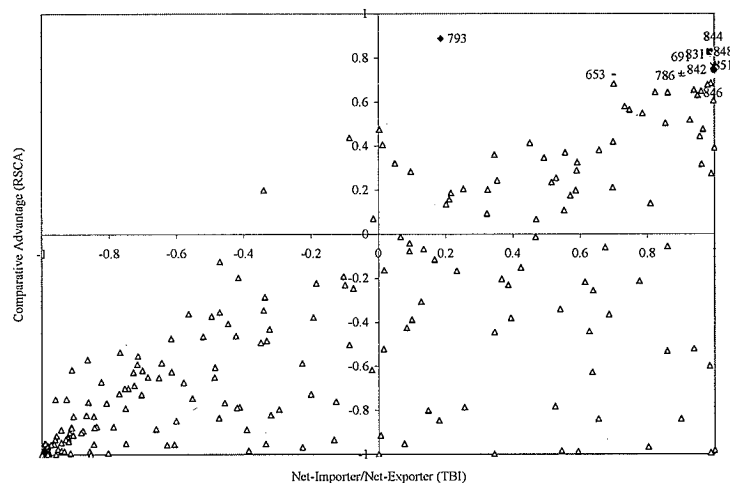
SITC	Commodity Description
763	Gramophones, dictating machines and other sound recorders
785	Cycles, scooters, motorized or not; invalid carriages
751	Office machines
762	Radio-broadcast receivers
761	Television receivers
881	Photographic apparatus and equipment, nes
782	Lorries and special purposes motor vehicles
898	Musical instruments, parts and accessories thereof
711	Steam boilers and auxiliary plant; and parts thereof, nes
781	Passenger motor vehicles (excluding buses)



a.2. Japan 2005:

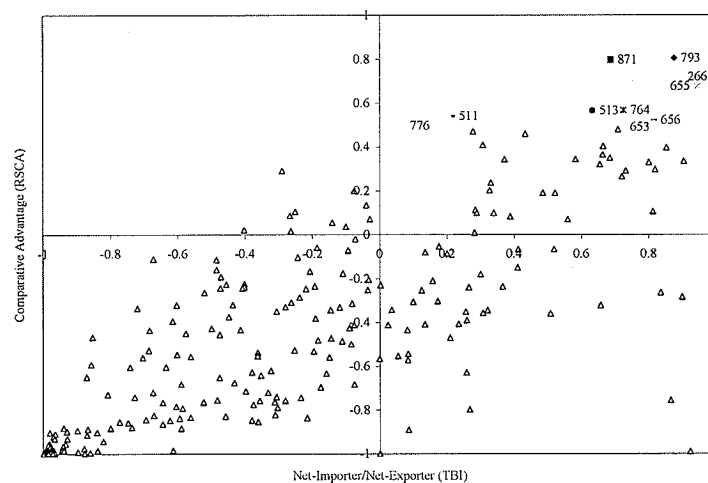
SITC	Commodity Description
712	Steam engines, turbines
881	Photographic apparatus and equipment, nes
785	Cycles, scooters, motorized or not; invalid carriages
884	Optical goods nes
882	Photographic and cinematographic supplies
736	Metalworking machine-tools, parts and accessories thereof, nes
763	Gramophones, dictating machines and other sound recorders
728	Other machinery, equipment, for specialized industries; parts nes
781	Passenger motor vehicles (excluding buses)
793	Ships, boats and floating structures

Products Mapping



b.1. Korea 1985:

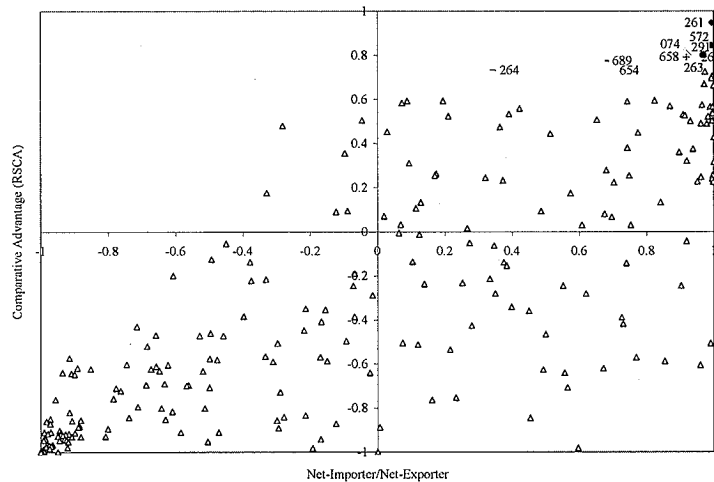
SITC	Commodity Description
793	Ships, boats and floating structures
848	Articles of apparel, clothing accessories, non-textile, headgear
844	Under garments of textile fabrics, not knitted or crocheted
831	Travel goods, handbags etc, of leather, plastics, textile, others
851	Footwear
842	Men's and boys' outerwear, textile fabrics not knitted or crocheted
691	Structures and parts, nes, of iron, steel or aluminium
653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)
786	Trailers, and other vehicles, not motorized, nes
846	Under-garments, knitted or crocheted



b.1. Korea 2005:

SITC	Commodity Description
793	Ships, boats and floating structures
871	Optical instruments and apparatus
266	Synthetic fibres suitable for spinning
655	Knitted or crocheted fabrics (including tubular, etc, fabrics)
764	Telecommunication equipment, nes; parts and accessories, nes
513	Carboxylic acids, and their derivatives
511	Hydrocarbons, nes, and derivatives
656	Tulle, lace, embroidery, ribbons, trimmings and other small wares
776	Thermionic, microcircuits, transistors, valves, etc
653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)

Products Mapping

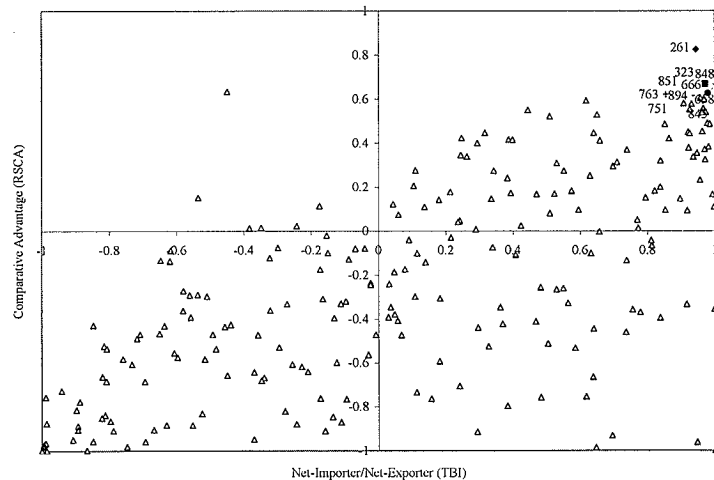


Top-Ten Products

c.1. China 1987:

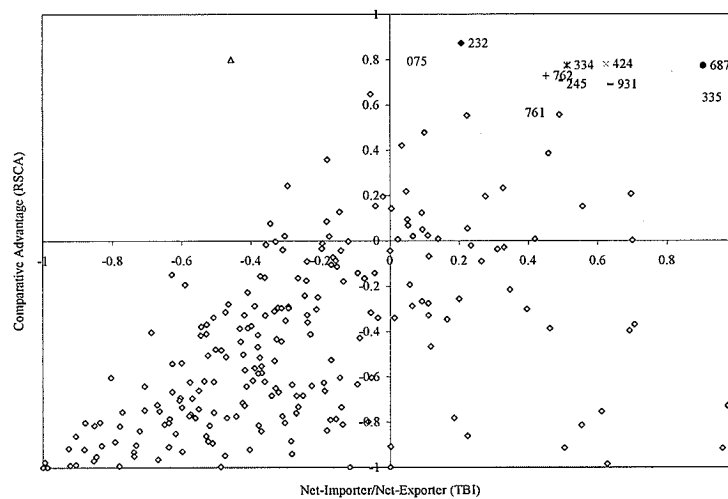
SITC	Commodity Description
261	Silk
572	Explosives and pyrotechnic products
291	Crude animal materials, nes
074	Tea and mate
265	Vegetable textile fibres, excluding cotton, jute, and waste
263	Cotton
658	Made-up articles, wholly or chiefly of textile materials, nes
689	Miscellaneous non-ferrous base metals, employed in metallurgy
264	Jute, other textile bast fibres, nes, raw, processed but not spun
654	Textile fabrics, woven, other than cotton or man-made fibres

c.2. China 2005:



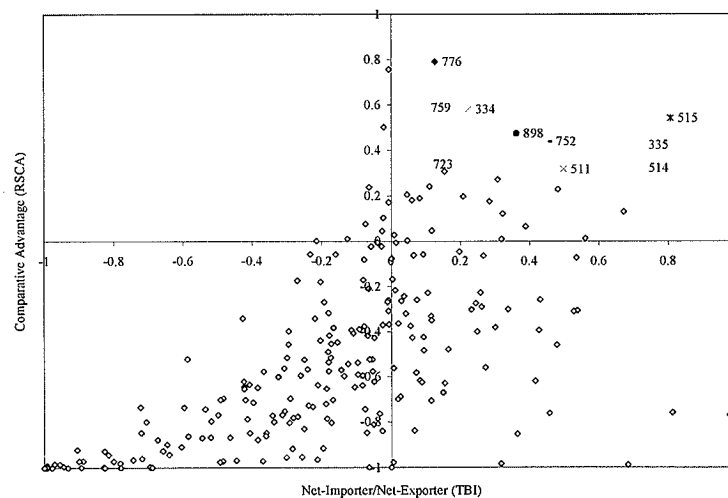
SITC	Commodity Description
261	Silk
848	Articles of apparel, clothing accessories, non-textile, headgear
666	Pottery
323	Briquettes; coke and semi-coke; lignite or peat; retort carbon
658	Made-up articles, wholly or chiefly of textile materials, nes
763	Gramophones, dictating machines and other sound recorders
851	Footwear
894	Baby carriages, toys, games and sporting goods
751	Office machines
845	Outerwear knitted or crocheted, not elastic nor rubberized

Products Mapping



d.1. Singapore 1985:

SITC	Commodity Description
232	Natural rubber latex; rubber and gums
075	Spices
424	Other fixed vegetable oils, fluid or solid, crude, refined
334	Petroleum products, refined
687	Tin
762	Radio-broadcast receivers
245	Fuel wood and wood charcoal
931	Special transactions, commodity not classified according to class
335	Residual petroleum products, nes and related materials
761	Television receivers

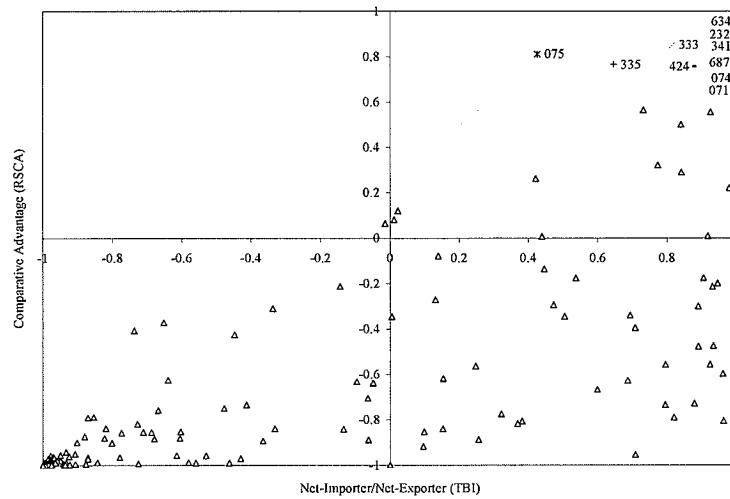


d.2. Singapore 2005:

SITC	Commodity Description
776	Thermionic, microcircuits, transistors, valves, etc
687	Tin
759	Parts, nes of and accessories for machines of headings 751 or 752
334	Petroleum products, refined
515	Organo-inorganic and heterocyclic compounds
277	Natural abrasives, nes
898	Musical instruments, parts and accessories thereof
752	Automatic data processing machines and units thereof
335	Residual petroleum products, nes and related materials
723	Civil engineering, contractors' plant and equipment and parts, nes
514	Nitrogen-function compounds
511	Hydrocarbons, nes, and derivatives

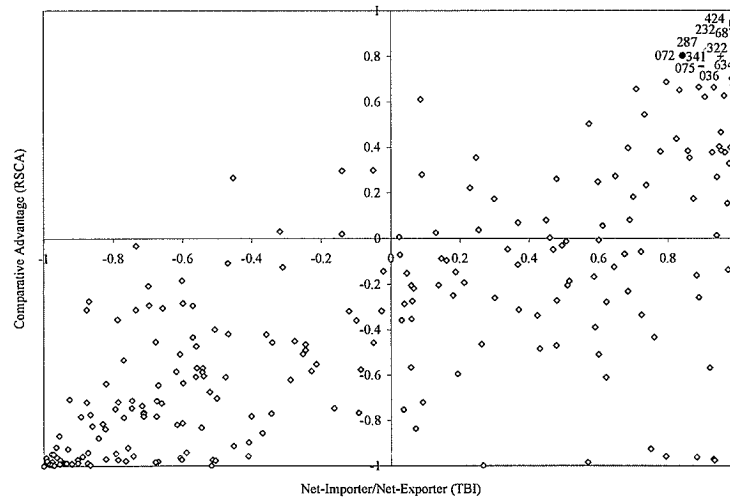
Products Mapping

Top-Ten Products



e.1. Indonesia 1985:

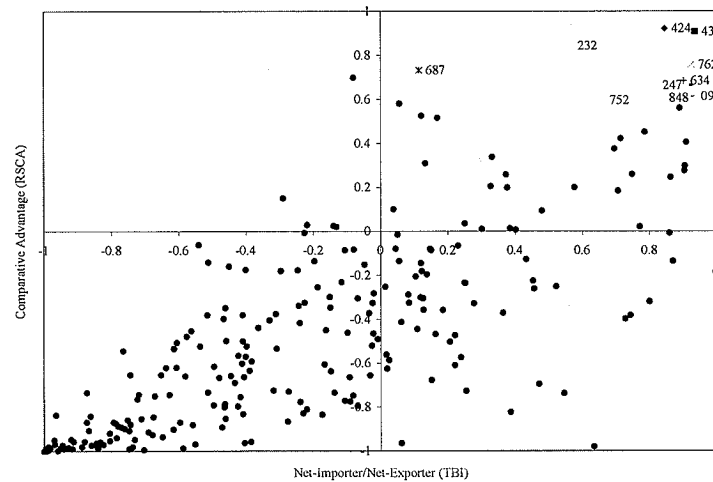
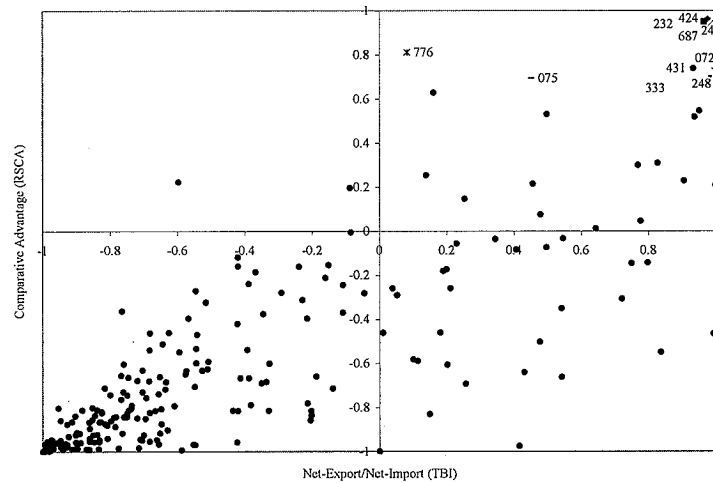
SITC	Commodity Description
634	Veneers, plywood, improved" wood and other wood worked nes"
232	Natural rubber latex; rubber and gums
341	Gas, natural and manufactured
333	Crude petroleum and oils obtained from bituminous minerals
075	Spices
687	Tin
335	Residual petroleum products, nes and related materials
424	Other fixed vegetable oils, fluid or solid, crude, refined
074	Tea and mate
071	Coffee and coffee substitutes



e.2. Indonesia 2005:

SITC	Commodity Description
424	Other fixed vegetable oils, fluid or solid, crude, refined
687	Tin
232	Natural rubber latex; rubber and gums
287	Ores and concentrates of base metals, nes
322	Coal, lignite and peat
072	Cocoa
634	Veneers, plywood, improved" wood and other wood worked nes"
341	Gas, natural and manufactured
075	Spices
036	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc

Products Mapping



Top-Ten Products

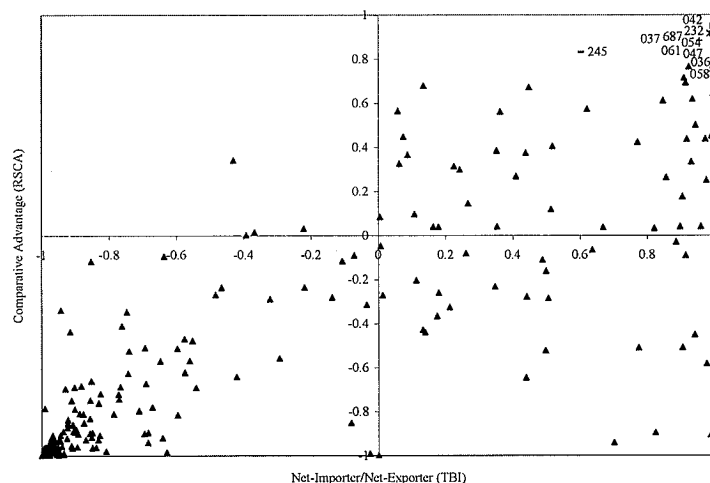
f.1. Malaysia 1985:

SITC	Commodity 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
776	Thermionic, microcircuits, transistors, valves, etc
431	Animal and vegetable oils and fats, processed, and waxes
072	Cocoa
248	Wood, simply worked, and railway sleepers of wood
075	Spices
333	Crude petroleum and oils obtained from bituminous minerals

f.2. Malaysia 2005:

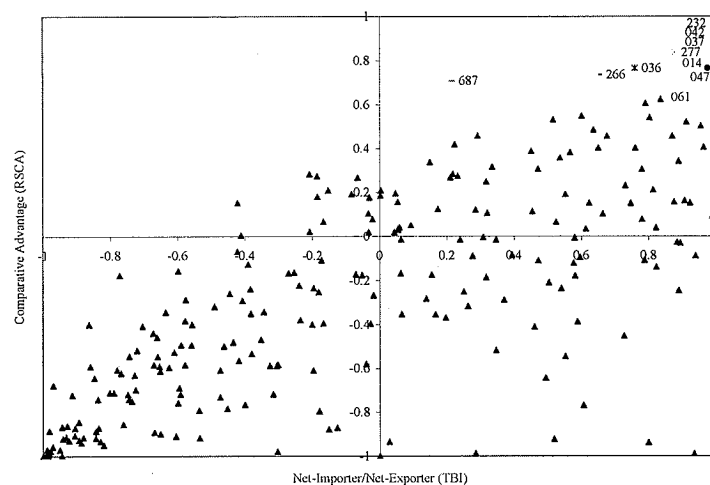
SITC	Commodity Description
424	Other fixed vegetable oils, fluid or solid, crude, refined
431	Animal and vegetable oils and fats, processed, and waxes
232	Natural rubber latex; rubber and gums
762	Radio-broadcast receivers
687	Tin
634	Veneers, plywood, improved" wood and other wood worked nes"
247	Other wood in the rough or roughly squared
091	Margarine and shortening
848	Articles of apparel, clothing accessories, non-textile, headgear
752	Automatic data processing machines and units thereof

Products Mapping



g.1. Thailand 1985:

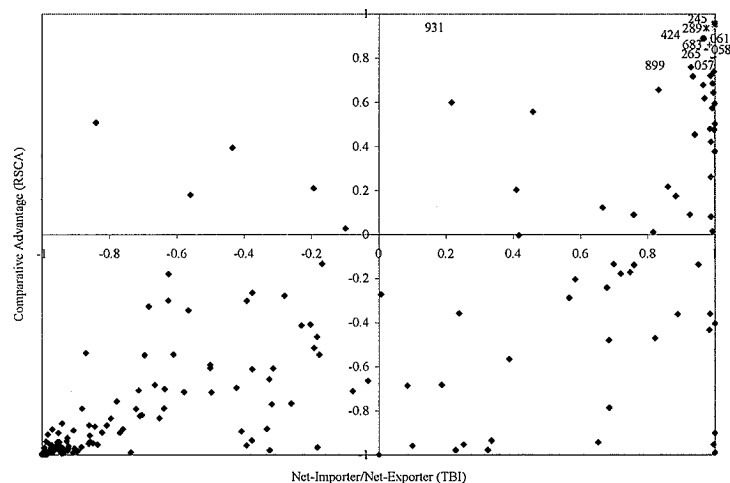
SITC	Commodity Description
042	Rice
232	Natural rubber latex; rubber and gums
037	Fish, crustaceans and molluscs, prepared or preserved, nes
687	Tin
054	Vegetables, fresh or simply preserved; roots and tubers, nes
047	Other cereal meals and flour
036	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc
061	Sugar and honey
245	Fuel wood and wood charcoal
058	Fruit, preserved, and fruits preparations



g.2. Thailand 2005:

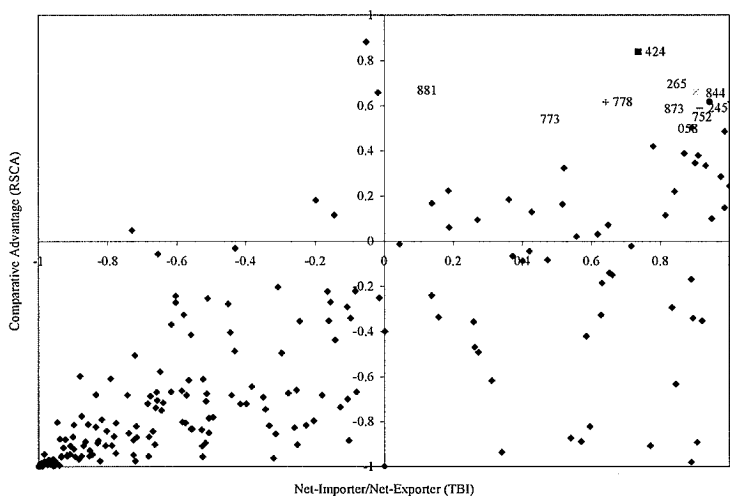
SITC	Commodity Description
232	Natural rubber latex; rubber and gums
042	Rice
037	Fish, crustaceans and molluscs, prepared or preserved, nes
277	Natural abrasives, nes
036	Crustaceans and molluscs, fresh, chilled, frozen, salted, etc
047	Other cereal meals and flour
014	Meat and edible meat offal, prepared, preserved, nes; fish extracts
266	Synthetic fibres suitable for spinning
687	Tin
061	Sugar and honey

Products Mapping



h.1. Philippine 1985:

SITC	Commodity Description
245	Fuel wood and wood charcoal
289	Ores and concentrates of precious metals, waste, scrap
931	Special transactions, commodity not classified according to class
265	Vegetable textile fibres, excluding cotton, jute, and waste
424	Other fixed vegetable oils, fluid or solid, crude, refined
061	Sugar and honey
683	Nickel
058	Fruit, preserved, and fruits preparations
057	Fruit and nuts, fresh, dried
899	Other miscellaneous manufactured articles, nes



h.2. Philippine 2005:

SITC	Commodity Description
424	Other fixed vegetable oils, fluid or solid, crude, refined
881	Photographic apparatus and equipment, nes
265	Vegetable textile fibres, excluding cotton, jute, and waste
844	Under garments of textile fabrics, not knitted or crocheted
778	Electrical machinery and apparatus, nes
245	Fuel wood and wood charcoal
752	Automatic data processing machines and units thereof
873	Meters and counters, nes
058	Fruit, preserved, and fruits preparations
773	Equipment for distribution of electricity

Source: UN-COMTRADE, *author's calculation*.

**Table 7.2 Average the Number of Products
in each Group A, B, C and D for 1976-2005**

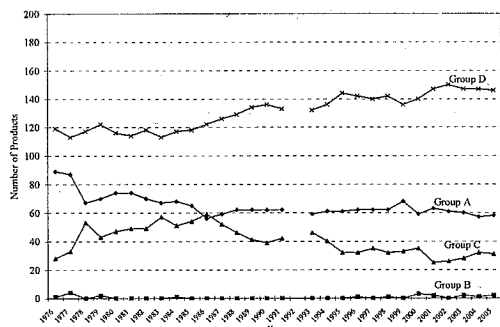
Group C			Group A		
Japan	1	(0.3%)	Japan	65	(27.5%)
Korea	7	(2.8%)	Korea	53	(22.2%)
China	8	(3.2%)	China	82	(34.4%)
Singapore	14	(6.0%)	Singapore	29	(12.2%)
Indonesia	4	(1.5%)	Indonesia	41	(17.4%)
Malaysia	4	(1.6%)	Malaysia	30	(12.6%)
Thailand	8	(3.5%)	Thailand	54	(22.8%)
Philippine	5	(2.3%)	Philippine	36	(15.2%)
Average	6	(3%)	Average	49	(21%)

Group E			Group D		
Japan	131	(55.2%)	Japan	40	(17.0%)
Korea	142	(59.8%)	Korea	36	(15.3%)
China	105	(44.2%)	China	43	(18.1%)
Singapore	161	(67.9%)	Singapore	33	(14.0%)
Indonesia	152	(64.0%)	Indonesia	40	(17.0%)
Malaysia	167	(70.7%)	Malaysia	36	(15.1%)
Thailand	143	(60.5%)	Thailand	31	(13.2%)
Philippine	169	(71.4%)	Philippine	26	(11.1%)
Average	146	(62%)	Average	36	(15%)

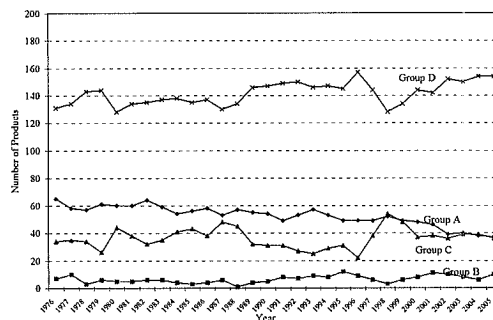
Source: UN-COMTRADE, *author's calculation*.

Figure 7.5 shows trends in the number of products in each group. In general, Japan has the increasing number of products in group D, meanwhile the numbers of products in groups A and C have decreased. Though with some fluctuations, Korea has basically similar pattern of trends with those of Japan. In contrast, Singapore has negative trends in the numbers of products in group B and D, but she has positive trends in the numbers of products in group A and C since the mid-1990s. However, the number of products in group A decreased for the last four years. This indicates that Singapore, lack of natural resources, is a net exporter of products with no comparative advantage in international market.

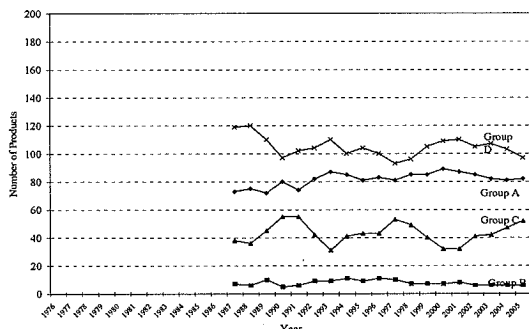
It is rather difficult to make general conclusion on the trend in China, however for the last 4 years the number of products in group C increased significantly. Indonesia, Malaysia and Thailand have a similar trend in the number of products in each group i.e. decreasing in group D but increasing in group A and C. The Philippines shows relatively steady trends in the number of products in each group.



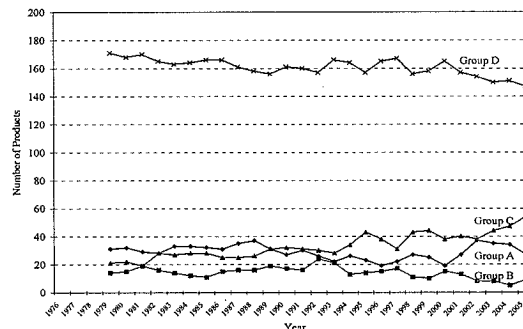
(a) Japan



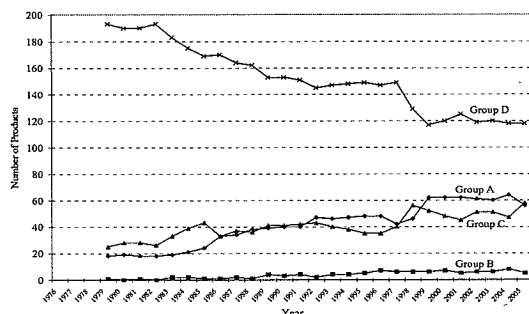
(b) Korea



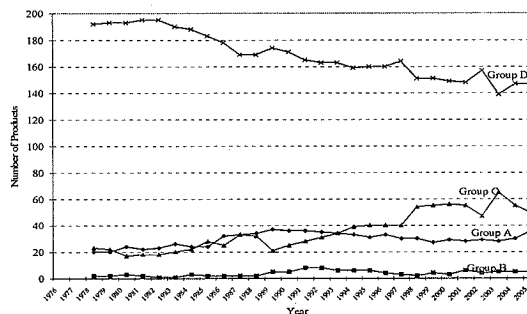
(c) China



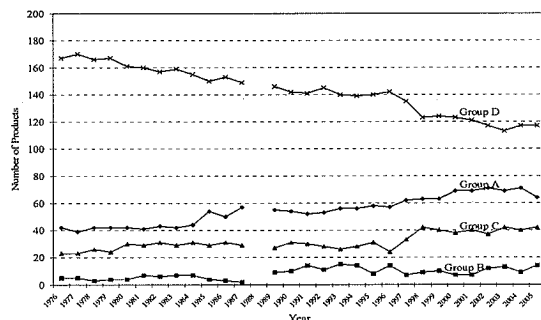
(d) Singapore



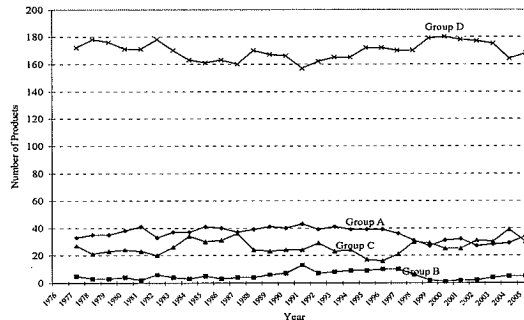
(e) Indonesia



(f) Malaysia



(g) Thailand



(h) Philippine

Source: UN-COMTRADE, *author's calculation.*

Figure 7.5 Trends in the Number of Products in Each Group A, B, C and D

7.4.2. The Flying Geese pattern

This sub-section describes the position of countries in the FG pattern in East Asia. Three questions to be answered are: (1) What industries are in the first round, second round and third round in the FG formation? (2) Where is the position of a specific country in the FG pattern? (3) What industries might be transferred in the future to other countries following the FG pattern? To answer these questions, there are three assumptions to be made. *First*, Japan is the lead goose in the FG pattern. This is commonly and empirically believed. *Second*, Japan will transfer (through pro-trade type FDI) its industries to the other countries following the FG pattern. *Third*, Japan's current comparative advantage could indicate robustly the rounds in the FG pattern.

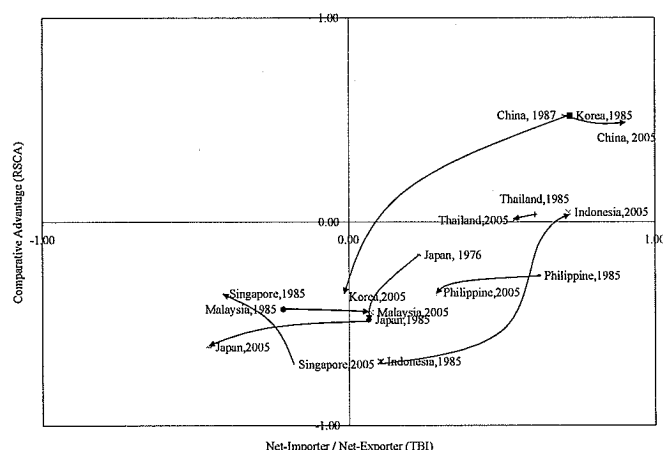
7.4.2.1. The rounds of industries in the FG pattern

As previously mentioned, industries are categorized following the ETA i.e. *primary* industries, *natural resource*-intensive industries, *unskilled labor*-intensive industries, *technology*-intensive industries and *human capital*-intensive industries. The first two industries are omitted from the analysis since Japan, as the lead-goose has no comparative advantage on them. Figures 7.6, 7.7 and 7.8 describe the “products mapping” for the industries. These figures are obtained by following the next three stages. *Firstly*, the RSCA and TBI indexes for each SITC are calculated. *Secondly*, the median of RSCA and TBI indexes for each industries classification are calculated¹³. *Thirdly*, for each industries classification, the median RSCA and TBI indexes are plotted into the “products mapping” (in Figure 7.3) for the two years 1985 and 2005.

¹³ We find that RSCA and TBI indexes have skewed distributions. Therefore, the median is better measurement of the central tendency than the mean (McClave *et al.*, 2001).

From Figures 7.6, 7.7 and 7.8, we argue that *unskilled labor*-intensive industries are in the first round, *human capital*-intensive industries are in the second round and *technology*-intensive industries are in the third round of the FG pattern in the East Asian region for three reasons. *First*, Japan had very high comparative advantage in *unskilled labor*-intensive industries in the past. In the catch-up years of the 1950s and 1960s, Japanese industrial policy was designed to develop leading manufacturing industries. By the 1970s, Japan had already caught-up with the West (Sumita and Namiki, 1997). Now, the industries have been transferred through pro-type FDI to other countries in East Asia. As a result, the Japanese comparative advantage in these industries decreases. As depicted in Figure 7.6, the Japanese comparative advantage decreased in the period 1985-2005. Japan was still net-exporter of products from these industries in 1985, but Japan became net-importer in 2005. This confirms the reverse import (Kojima, 2000) or “boomerang effect” (Shinohara, 1976, 1982). Therefore, if *unskilled labor*-intensive industries are associated with consumer goods in Figure 7.1, this situation is reflected by the two dotted lines beyond time t_4 . Japan has had the reverse import of products in *unskilled labor*-intensive industries, which she used to have high comparative advantage in the past. Similarly, Korea has also not specialized in *unskilled labor*-intensive industries any more. Until the 1960s, Korean industrial policy was mainly inward-looking, encouraging import-substitution in non-durable consumer good industries. In 1961, Korea adopted outward-looking and export-oriented industrialization (Masuyama, 1997). In 1985, Korea had very high comparative advantage and was a net-exporter in products of these industries. Woo (2001) argues that an important aspect of Korean success in the phase of outward-looking trade policy was her deliberate concentration on

industries with relatively low capital requirements or *unskilled labor*-intensiveness (such as clothing and wigs), which had favorable and rising international demand. However, those industries have been later caught-up one after another by China, Thailand and Indonesia, which have abundant unskilled labor. Those countries currently have high comparative advantage in these industries and become net-exporters.

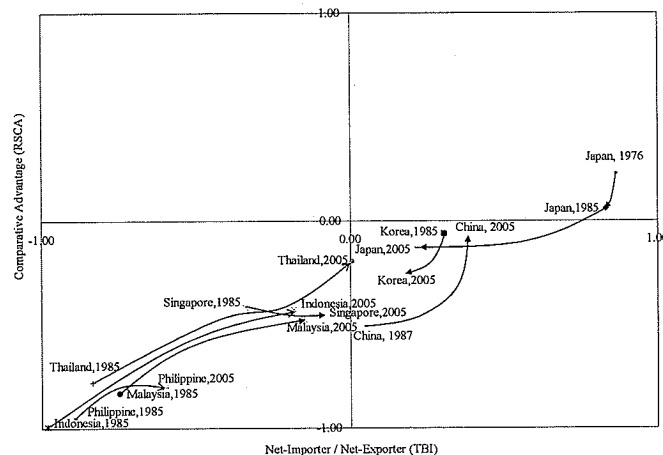


Source: UN-COMTRADE, *author's calculation.*

Figure 7.6 The East Asia FG Pattern: *Unskilled labor*-Intensive Industries

Second, Japan had very high comparative advantage and was a net-exporter of products of *human capital*-intensive industries in 1976 as depicted in Figure 7.7. If *human capital*-intensive industries are associated with capital goods in Figure 7.1, this situation is reflected by situation in time beyond t^{**} . Although Japan has no comparative advantage anymore in *human capital*-intensive industries, Japan is still as a net-exporter in the period 1976-2005. China, Korea and Thailand are the first follower geese. Singapore, Malaysia, Indonesia and the Philippines are the second follower geese. From Figure 7.7, it seems that Korea had lost competitiveness in these industries for the period 1985-2005. During the 1970s, under the heavy and chemical industries (HCIs)-biased development strategy, Korea created comparative advantage in more capital-intensive

industries, physical or human capital-intensive. After obtaining substantial gains in the 1970s, the chemical industry and primary metal manufacturing industries had lost ground slightly in the 1980s. Woo (2001) states that the over ambitious HCI strategy has caused serious economic problems such as “inter-sectoral resource misallocation, external debts, and serious distortions in the private sector decision processes”. Unlike in *unskilled labor*-intensive industries, it is clear that the other East Asian countries have similar directions i.e. they are increasing comparative advantage and becoming net-exporters in *human capital*-intensive industries.

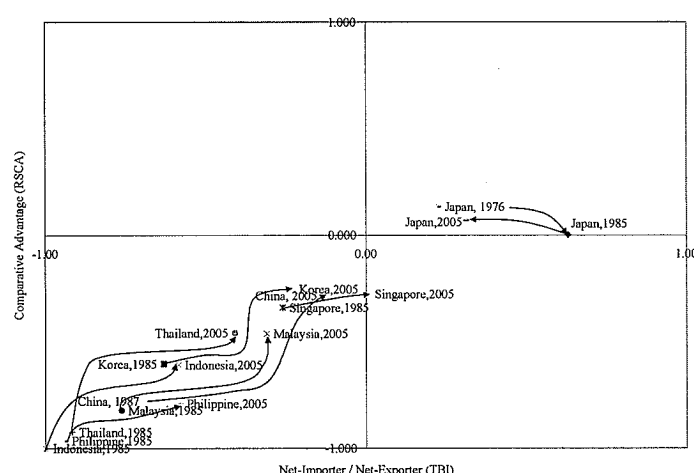


Source: UN-COMTRADE, *author's calculation*.

Figure 7.7 The East Asian FG Pattern: *Human Capital*-Intensive Industries

Third, until recently Japan has still kept comparative advantage in *technology*-intensive industries and been a net-exporter. After success in the catching-up with Europe and North America in manufacturing sector by the second half of the 1970s and into the first half of the 1980s, Japan had shifted her industrial policy to create a business environment more suitable to intellectual and creative pursuits for not easily caught-up comparative advantage in the second half of the 1980s and the 1990s (Sumita and Namiki, 1999). *Technology*-intensive industries have become the leading industries in Japan. The

other East Asian countries have the same direction to be like Japan. However, until 2005 they have not had comparative advantage in these industries yet. Consecutively, Singapore, Korea, China, Malaysia, Thailand, Indonesia and Philippine are the follower geese. Therefore, *technology*-intensive industries can be considered as the third round in the FG formation following the first round *unskilled labor*-intensive industries and the second round *human capital*-intensive industries.



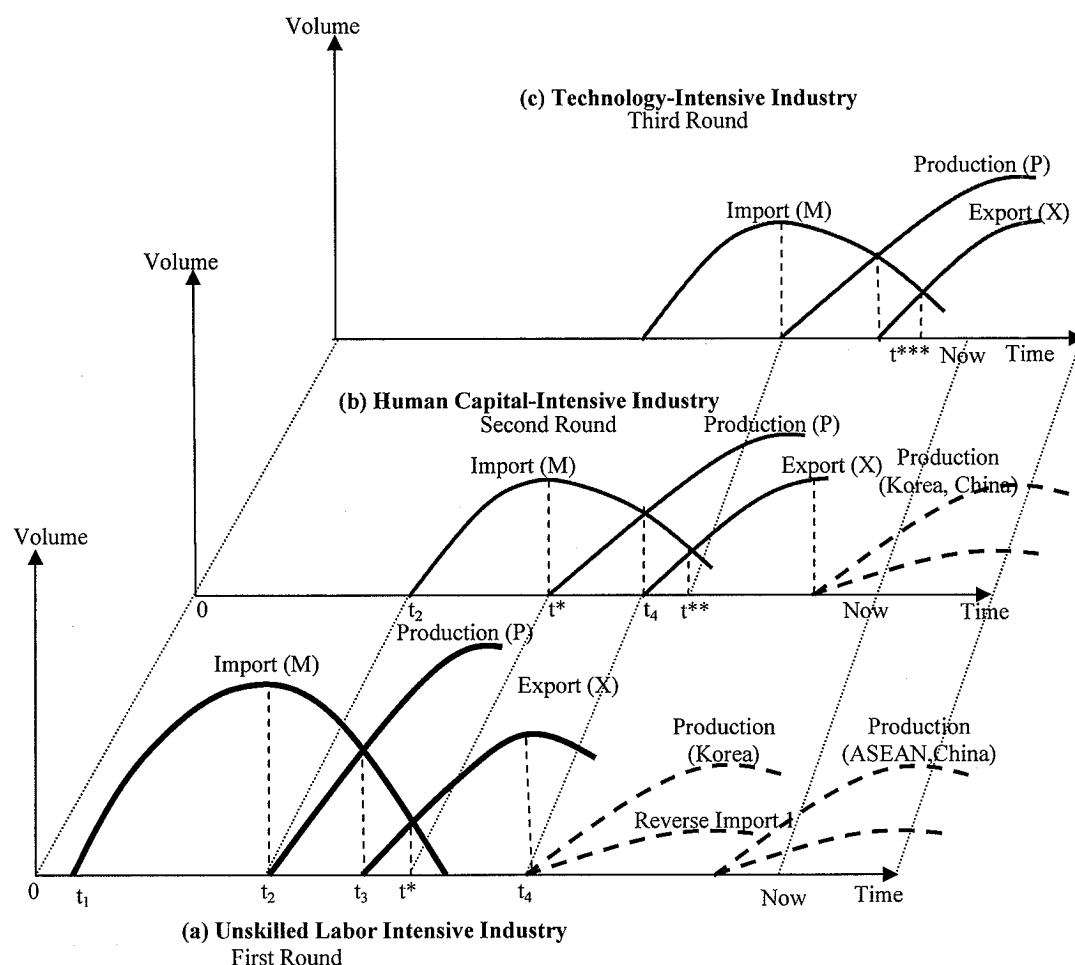
Source: UN-COMTRADE, *author's calculation*.

Figure 7.8 The East Asian FG Pattern: *Human Capital*-Intensive Industries

Figure 7.9 shows the empirical flying geese pattern in East Asia as previously explained¹⁴. Panel (a) represents the flying geese pattern in *unskilled labor*-intensive industries (the first round). Japan as the leader goose has been a net-importer in these industries. Korea has also not specialized in these industries anymore. The industries have been transferred to ASEAN (Indonesia and Thailand) and China. Panel (b) shows the flying geese pattern in *human capital*-intensive industries (the second round).

¹⁴ It is important to note that the empirical flying geese pattern here is only derived from export and import data (RSCA and TBI). It is reasonable to exclude production in this analysis for two practical reasons *First*, exports are theoretically only certain part of production. *Second*, it is difficult to get data on production for all industries and all countries.

Although Japan has a decreasing trend in comparative advantage of these industries, she is still a net-exporter of products in these industries. The follower geese countries (Korea, Malaysia, the Philippines and China) have an increasing trend in their comparative advantage and have been net-exporters in these industries. Panel (c) represents the flying geese pattern in *technology-intensive* industries (the third round). Japan currently has still had comparative advantage in these industries. The ASEAN countries, Korea and China have the similar directions in catching up with Japan but their position in the FG formation are still far from the lead goose.

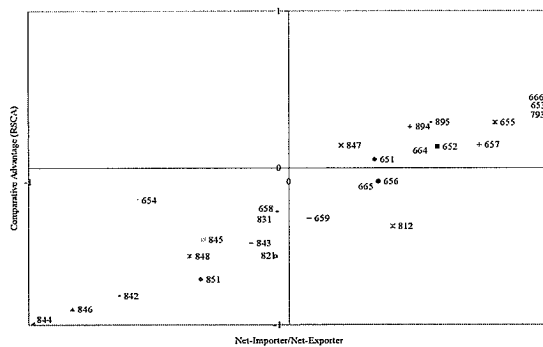


Notes: The similar diagrams have been originally drawn by Kojima (2000) and adjusted by the author using his calculation results.

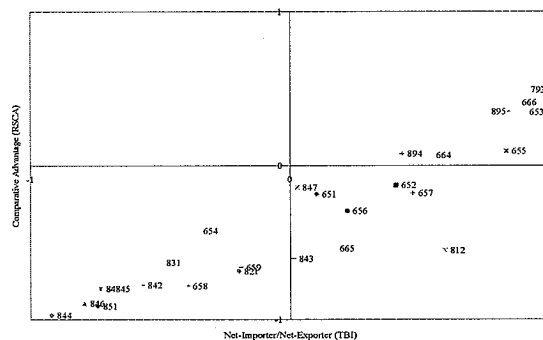
Figure 7.9 The Empirical Flying Geese Pattern

7.4.2.2. Potential industries transmitted from Japan to the follower-geese

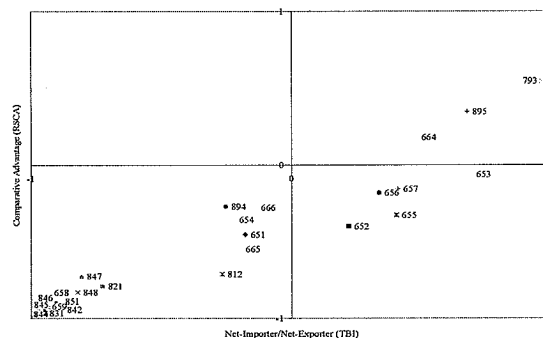
Most *unskilled labor*-intensive industries and some *human capital*-intensive industries have been transferred from Japan as the lead goose to the other East Asian countries as the follower geese. This sub-section examines what products (SITC) are potentially transferred from Japan to the other East Asian countries in the future. These rounds of industrial changes in the FG pattern previously mentioned will be more or less applicable to the other developing countries in the world. Although it is mentioned that *unskilled labor*-intensive industries are in the first round, it does not necessarily mean that all *unskilled labor*-intensive industries have already been transmitted from Japan to the other East Asian countries. Of course, there are some products (SITC) in which Japan has still specialized. These products are potentially transmitted from Japan to other East Asian countries in the future. Akamatsu (1962) mentions that the FG pattern does not only happen in the capital goods industry following the consumer goods industry but also in the progress from low technology to higher technology goods.



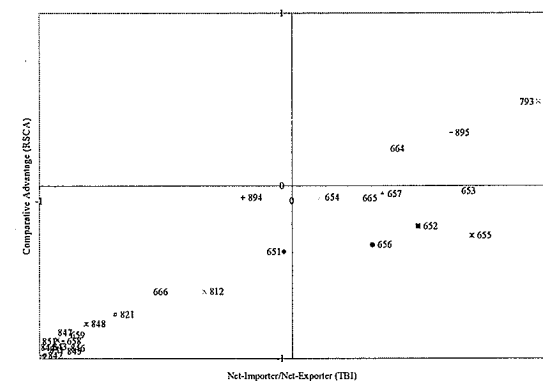
(a) 1976



(a) 1985



(b) 1995



(d) 2005

Notes

SITC	Commodity Description
651	Textile yarn
652	Cotton fabrics, woven (not including narrow or special fabrics)
653	Fabrics, woven, of man-made fibres (not narrow or special fabrics)
654	Textile fabrics, woven, other than cotton or man-made fibres
655	Knitted or crocheted fabrics (including tubular, etc, fabrics)
656	Tulle, lace, embroidery, ribbons, trimmings and other small wares
657	Special textile fabrics and related products
658	Made-up articles, wholly or chiefly of textile materials, nes
659	Floor coverings, etc
664	Glass
665	Glassware
666	Pottery
793	Ships, boats and floating structures
812	Sanitary, plumbing, heating, lighting fixtures and fittings, nes
821	Furniture and parts thereof
831	Travel goods, handbags etc, of leather, plastics, textile, others
842	Men's and boys' outerwear, textile fabrics not knitted or crocheted
843	Womens, girls, infants outerwear, textile, not knitted or crocheted
844	Under garments of textile fabrics, not knitted or crocheted
845	Outerwear knitted or crocheted, not elastic nor rubberized
846	Under-garments, knitted or crocheted
847	Clothing accessories, of textile fabrics, nes
848	Articles of apparel, clothing accessories, non-textile, headgear
851	Footwear
894	Baby carriages, toys, games and sporting goods
895	Office and stationary supplies, nes

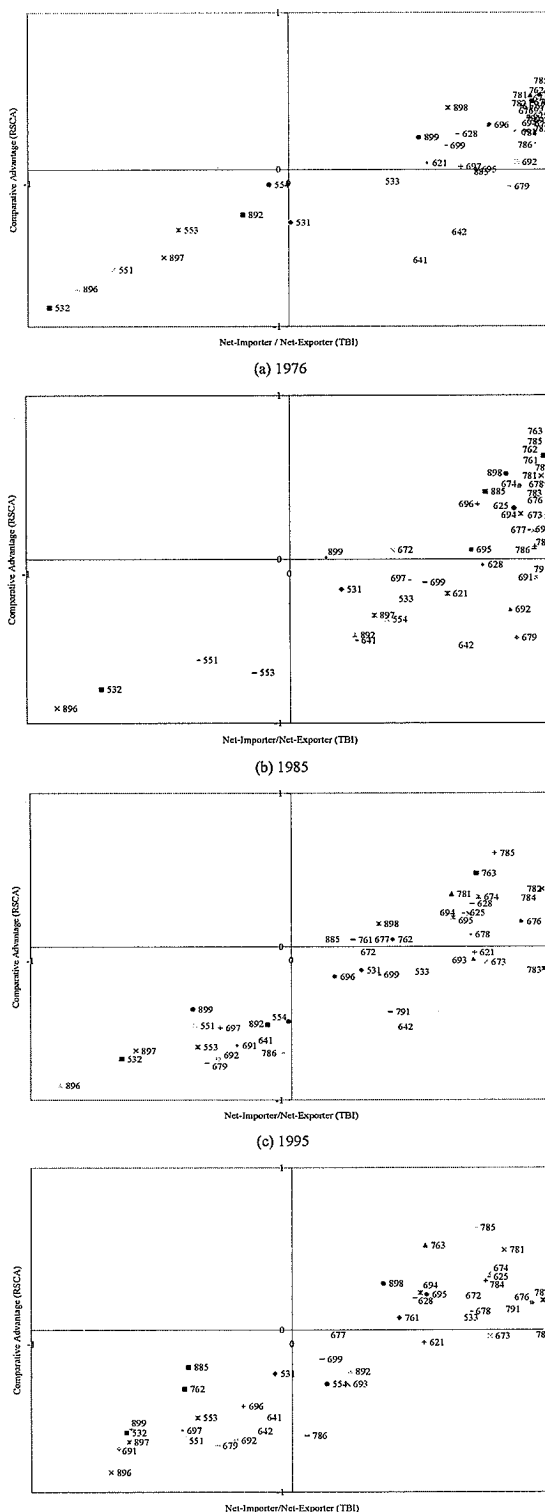
Source: UN-COMTRADE, author's calculation.

Figure 7.10 The “Products Mapping” of Japanese *Unskilled labor*-Intensive Industries: 1976, 1985, 1995 and 2005

To promote smoother transmission of industries from the lead goose country, the follower countries must have infrastructure more suitable for the next comer industries. To find them out, we examine the Japanese existing ‘products mapping’. Figure 7.10 shows the “product mapping” of Japanese *unskilled labor*-intensive industries for 1976, 1985, 1995 and 2005. At least for the last decade (1995-2005), Japan still has comparative advantage in three products (SITC) i.e. Ships, boats and floating structures (SITC 793), Office and stationary supplies, nes (SITC 895) and Glass (SITC 664). These products lie in the Group A and they might potentially be transferred from Japan to other East Asian countries in the future.

Figure 7.11 represents the “products mapping” of Japanese *human capital*-intensive industries for 1985, 1995 and 2005. Many products in these industries were in Group A and C in 1985. In 1995 there were many products with decreasing comparative advantage (shown by the increase in the number of products in Group D). However, Japan still has a lot of products lying in Group A in 2005 such as Cycles, scooters, motorized or not; invalid carriages (SITC 785), Gramophones, dictating machines and other sound recorders (SITC 763), Passenger motor vehicles (excluding buses) (SITC 781), Universals, plates, and sheets, of iron or steel (SITC 674), Rubber tires, tire cases, inner and flaps, for wheels of all kinds (SITC 625), Motor vehicle parts and accessories, nes (SITC 784), Musical instruments, parts and accessories thereof (SITC 898), Nails, screws, nuts, bolts, rivets, etc, of iron, steel or copper (SITC 694), Tools for use in the hand or in machines (SITC 695), Ingots and other primary forms, of iron or steel (SITC 672), Lorries and special purposes motor vehicles (SITC 782), Rails and railway track construction materials, of iron or steel (SITC 676), Railway vehicles and associated

equipment (SITC 791), Tube, pipes and fittings, of iron or steel (SITC 678), Television receivers (SITC 761) and Pigments, paints, varnishes and related materials (SITC 533). These products might potentially be transferred from Japan to other East Asian countries.



Notes

SITC	Commodity Description
531	Synthetic dye, natural indigo, lakes
532	Dyeing and tanning extracts, and synthetic tanning materials
533	Pigments, paints, varnishes and related materials
551	Essential oils, perfume and flavour materials
553	Perfumery, cosmetics, toilet preparations, etc
554	Soap, cleansing and polishing preparations
621	Materials of rubber
625	Rubber tires, tire cases, inner and flaps, for wheels of all kinds
628	Articles of rubber, nes
641	Paper and paperboard
642	Paper and paperboard, precut, and articles of paper or paperboard
672	Ingots and other primary forms, of iron or steel
673	Iron and steel bars, rods, shapes and sections
674	Universals, plates, and sheets, of iron or steel
676	Rails and railway track construction materials, of iron or steel
677	Iron or steel wire (excluding wire rod), not insulated
678	Tube, pipes and fittings, of iron or steel
679	Iron, steel casting, forging and stamping, in the rough state, nes
691	Structures and parts, nes, of iron, steel or aluminium
692	Metal containers for storage and transport
693	Wire products (excluding insulated electrical wire); fencing grills
694	Nails, screws, nuts, bolts, rivets, etc, of iron, steel or copper
695	Tools for use in the hand or in machines
696	Cutlery
697	Household equipment of base metal, nes
699	Manufactures of base metal, nes
761	Television receivers
762	Radio-broadcast receivers
763	Gramophones, dictating machines and other sound recorders
781	Passenger motor vehicles (excluding buses)
782	Lorries and special purposes motor vehicles
783	Road motor vehicles, nes
784	Motor vehicle parts and accessories, nes
785	Cycles, scooters, motorized or not; invalid carriages
786	Trailers, and other vehicles, not motorized, nes
791	Railway vehicles and associated equipment
885	Watches and clocks
892	Printed matter
896	Works of art, collectors' pieces and antiques
897	Gold, silver ware, jewelry and articles of precious materials, nes
898	Musical instruments, parts and accessories thereof
899	Other miscellaneous manufactured articles, nes

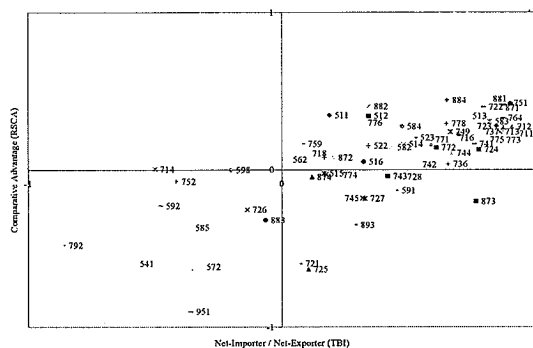
Source: UN-COMTRADE, author's calculation.

Figure 7.11 The “Products Mapping” of Japanese *Human Capital-Intensive* Industries: 1976, 1985, 1995 and 2005

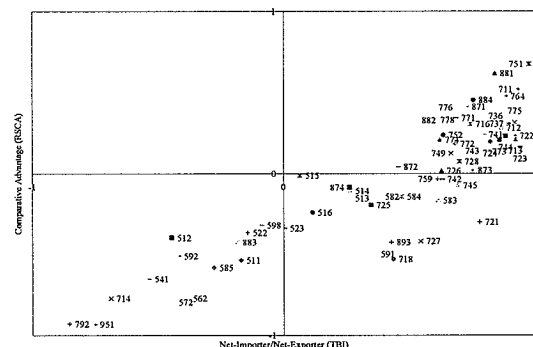
7.4.2.3. The third round: the FG paradigm might be less significant

Figure 7.12 represents the “products mapping” of Japanese *technology*-intensive industries. A lot of products in these industries were in Group A in 2005 such as Steam engines, turbines (SITC 712), Photographic apparatus and equipment, nes (SITC 881), Optical goods nes (SITC 884), Photographic and cinematographic supplies (SITC 882), Metalworking machine-tools, parts and accessories thereof, nes (SITC 736), Other machinery, equipment, for specialized industries; parts nes (SITC 728), Steam boilers and auxiliary plant; and parts thereof, nes (SITC 711), Hydrocarbons, nes, and derivatives (SITC 511), Optical instruments and apparatus (SITC 871), Civil engineering, contractors' plant and equipment and parts, nes (SITC 723), Thermionic, microcircuits, transistors, valves, etc (SITC 776), Measuring, checking, analysis, controlling instruments, nes, parts (SITC 874), Electrical apparatus for making and breaking electrical circuits (SITC 772), Electrical machinery and apparatus, nes (SITC 778), Textile and leather machinery, and parts thereof, nes (SITC 724), Internal combustion piston engines, and parts thereof, nes (SITC 713), Parts, nes of and accessories for machines of headings 751 or 752 (SITC 759), Electro-medical and radiological equipment (SITC 774), Miscellaneous chemical products, nes (SITC 598), Regenerated cellulose; derivatives of cellulose; vulcanized fibre (SITC 584), Metalworking machinery (other than machine-tools), and parts, nes (SITC 737), Non-electric parts and accessories of machinery, nes 749, Tractors (other than those falling in heading 74411 and 7832) (SITC 722), Printing, bookbinding machinery, and parts thereof, nes (SITC 726), Pumps, compressors; centrifuges; filtering apparatus; etc, parts (SITC 743), Mechanical handling equipment, and parts thereof, nes (SITC 744), Rotating electric plant and parts thereof,

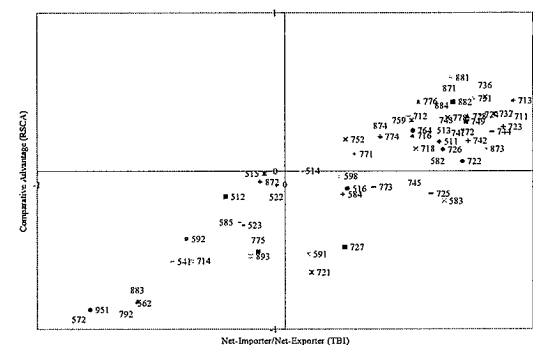
nes (SITC 716), Pumps for liquids; liquid elevators; and parts thereof, nes (SITC 742), Heating and cooling equipment and parts thereof, nes (SITC 741), Condensation, polycondensation and polyaddition products (SITC 582), Internal combustion piston engines, and parts thereof, nes (SITC 513) and Other power generating machinery and parts thereof, nes (SITC 718). They might potentially be transferred from Japan to other East Asian countries.



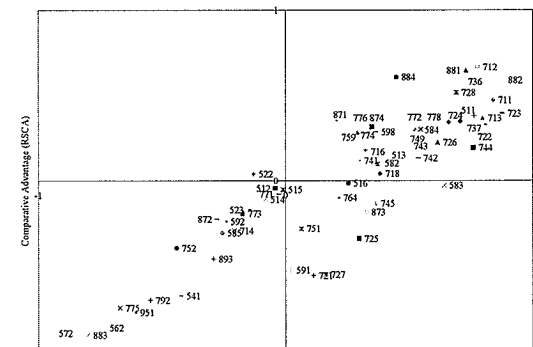
(a) 1976



(b) 1985



(c) 1995



(d) 2005

Notes;

SITC	Commodity Description
511	Hydrocarbons, nes, and derivatives
512	Alcohols, phenols etc, and their derivatives
513	Carboxylic acids, and their derivatives
514	Nitrogen-function compounds
515	Organo-inorganic and heterocyclic compounds
516	Other organic chemicals
522	Inorganic chemical elements, oxides and halogen salts
523	Other inorganic chemicals; compounds of precious metals
541	Medicinal and pharmaceutical products
562	Fertilizers, manufactured
572	Explosives and pyrotechnic products
582	Condensation, polycondensation and polyaddition products
583	Polymerization and copolymerization products
584	Regenerated cellulose; derivatives of cellulose; vulcanized fibre
585	Other artificial resins and plastic materials
591	Pesticides, disinfectants
592	Starches, insulin and wheat gluten; albuminoid substances; glues
598	Miscellaneous chemical products, nes
711	Steam boilers and auxiliary plant; and parts thereof, nes
712	Steam engines, turbines
713	Internal combustion piston engines, and parts thereof, nes
714	Engines and motors, non-electric; parts, nes; group 714, item 71888
716	Rotating electric plant and parts thereof, nes
718	Other power generating machinery and parts thereof, nes
721	Agricultural machinery (excluding tractors) and parts thereof, nes
722	Tractors (other than those falling in heading 74411 and 7832)
723	Civil engineering, contractors' plant and equipment and parts, nes
724	Textile and leather machinery, and parts thereof, nes
725	Paper and paper manufacture machinery, and parts thereof, nes
726	Printing, bookbinding machinery, and parts thereof, nes
727	Food-processing machines (non-domestic) and parts thereof, nes
728	Other machinery, equipment, for specialized industries; parts nes
736	Metalworking machine-tools, parts and accessories thereof, nes
737	Metalworking machinery (other than machine-tools), and parts, nes
741	Heating and cooling equipment and parts thereof, nes
742	Pumps for liquids; liquid elevators; and parts thereof, nes
743	Pump, compressors; centrifuges; filtering apparatus; etc, parts
744	Mechanical handling equipment, and parts thereof, nes
745	Other non-electric machinery, tools and mechanical apparatus, nes
749	Non-electric parts and accessories of machinery, nes
751	Office machines
752	Automatic data processing machines and units thereof
759	Parts, nes of and accessories for machines of headings 751 or 752
764	Telecommunication equipment, nes; parts and accessories, nes
771	Electric power machinery, and parts thereof, nes
772	Electrical apparatus for making and breaking electrical circuits
773	Equipment for distribution of electricity
774	Electro-medical and radiological equipment
775	Household type equipment, nes
776	Thermionic, microcircuits, transistors, valves, etc
778	Electrical machinery and apparatus, nes
792	Aircraft and associated equipment, and parts thereof, nes
871	Optical instruments and apparatus
872	Medical instruments and appliances, nes
873	Meters and counters, nes
874	Measuring, checking, analysis, controlling instruments, nes, parts
881	Photographic apparatus and equipment, nes
882	Photographic and cinematographic supplies
883	Cinematograph film, exposed and developed
884	Optical goods nes
893	Articles, nes of plastic materials
951	Armoured fighting vehicles, war firearms, ammunition, parts, nes

Source: UN-COMTRADE, *author's calculation*.

Figure 7.12 The “Products Mapping” of Japanese *Technology-Intensive* Industries: 1976, 1985, 1995 and 2005

Affected by globalization and liberalization, there has been a “paradigm shift”¹⁵ from industrial technology to information technology (IT). The dynamics of the industrial structure in the East Asian region follows this paradigm. In this structural change in East Asian industries, the traditional FG concept might be less relevant to explain the economic and industrial development in the region. Industrial pattern has become less predictable. Masuyama and Vandenbrink (2001: 22-23) state that the paradigm shift has been encouraging structural changes in East Asian industries in the following five ways i.e. (a) accelerating the transfer of mature industrial (manufacturing) technology from advanced countries to less-developed economies through FDI, (b) increasing the share of the IT industries in East Asia, (c) increasing the knowledge content of the production process as information (knowledge) substitutes for labor and capital as a production input, except perhaps in the assembly function, (d) forcing a change in industrial organization from the self-contained organization such as *keiretsu* and *chaebol* to the networked (outsourcing and supply-chain) organization, (e) changing the pattern of international production network from Japan (during 1980s in industrial technology) to the US (as source of innovation in the IT industries).

7.5. Conclusions and Policy Implications

This chapter examines the FG pattern in the East Asian region. *First*, the evolution of FG concept starting from the original Akamatsu’s concept to the modern one is briefly described. There are two crucial variables in the FG model i.e. comparative advantage and trade balance (export-import). Industries will be transmitted from the lead-

¹⁵ Masuyama and Vandenbrink (2001: 22)

goose country to the follower-geese countries based on their comparative advantage. The successful catching-up process for a specific industry in a specific country is reflected by the country's trade balance. *Second*, from the FG concept, we develop an analytical tool namely the "products mapping", which is constructed by combining the two crucial variables. We use the Revealed Symmetric Comparative Advantage (RSCA) index as the indicator of comparative advantage and the Trade Balance Index (TBI) as the indicator of export-import activities.

The analytical tool is applied to examine empirically the FG pattern in the East Asian Region. This research empirically shows that the FG pattern is recognized in the case of the East Asian region. The industries in the first round of the FG pattern are *unskilled labor*-intensive industries, followed by *human capital*-intensive industries in the second round and *technology*-intensive industries in the third round. In the case of first round (*unskilled labor*-intensive industries), we find that there has been a clear indication of industrial transfer from Japan as the lead-goose to Korea and then to the ASEAN countries and China as the follower geese. Currently, China, Thailand and Indonesia have comparative advantage in *unskilled labor*-intensive industries. In the case of second round (*human capital*-intensive industries), Korea has already caught up with Japan. Until recently, Japan has still kept having high comparative advantage in *technology*-intensive industries.

Some policies implications might rise. *First*, as far as the FG pattern is concerned, the products (SITC), which Japan have comparative advantage are potentially transmitted to the follower geese in the future. We find three products in *unskilled labor*-intensive industries might be potentially transmitted in the future i.e. Ships, boats and floating

structures (SITC 793), Office and stationary supplies, nes (SITC 895) and Glass (SITC 664). In addition, there are still a lot of products in the *human capital*-intensive industries might be transmitted in the future.

Second, the follower-geese must be well prepared in accepting new industries transferred from the more advanced countries. The follower-geese must be also well prepared to give away the industries, which might be reallocated to the next follower geese. The key in attracting new industries and keeping established industries operating in the domestic economy is to create more comparative advantage than the other countries. This is related with how the governments prepare the domestic infrastructure, improve taxation system, help create industrial cluster and lower cost in doing business, and promote competitive factor prices and better quality of factors (including human resources).

Third, to remain as the leader of the geese formation, Japan needs actively create new products through innovative research and development (R&D). For most products in *unskilled labor*-intensive industries, Japan has no comparative advantage anymore. Many products in *human capital*-intensive industries still have comparative advantage. For the next 20 years, Japan might have a decreasing trend in comparative advantage of these industries. Now, Japan has very high comparative advantage in *technology*-intensive industries. What will be the next industries promising for Japan? The development model by Todaro and Smith (2006) states that an economy undergoes a structural change in its development from agriculture-based to manufacture-based and even further to service-based economies. Then the next promising industries for Japan will lie in the service sector, especially in the financial sub-sector. Ozawa (2001) states that the FG model

should encompass not only the industrial dimension of catch-up but also its institutional, particularly financial, dimension. Japan must quickly adjust to the paradigm shift from industrial technology to information technology (IT) and also anticipate the consequence of the paradigm shift.

Chapter 8

Export Performance: Constant Market Shares Analysis

8.1. Introduction

A country's export performance can be explained by the demand and supply sides. The demand side relates with the economic development of the country's exports destinations or markets (Leamer and Stern, 1970). For example, if the income per capita and the number of population in the markets increase, the country's exports will consequently also increase. Meanwhile, the supply side closely relates with how the country could compete with other sources of supply. The country's relative factor endowments create its comparative advantages.

There have been changes in the world trade volume due to trade liberalization. Regionalization, economic integration, bilateral and multilateral trade agreements have significantly affected the world trade through trade creation and trade diversion. The patterns of world exports have also changed due to the dynamics in countries' specialization (Krugman, 1995; Aiginger, 1999; Wörz, 2005). In the case of East Asia, until the late 1980s these patterns were dominated by the traditional comparative advantage in which factors endowments play important role. Japan and Asian Newly Industrialized Economies (ANIEs) have comparative advantage in *capital-* and *human capital-*intensive commodities, meanwhile the developing East Asian countries have specialized in *natural resource-* and *unskilled labor-*intensive ones. The pattern of

industrial location and international trade has significantly evolved since the 1990s (Fouquin *et al.*, 2006).

Many researchers have tried to explain factors underlying countries' export performance. Paper by Tyszynski (1951) provides a fundamental analytical tool, which has been famous as Constant Market Shares (CMS)¹. Tyszynski breaks down the change in a country's share of exports into two components i.e. the constant share (hypothetical exports) and the competitiveness effect. The more comprehensive and applicable version of the CMS is proposed by Leamer and Stern (1970). They note that a country's exports might fail to grow as rapidly as the world average exports for the following three reasons. *First*, exports may be concentrated relatively in commodities for which demand is growing slowly. *Second*, exports may be going primarily to relatively stagnant regions. *Third*, the country in question may have been unable or unwilling to compete effectively with other sources of supply.

Although Richardson (1971a, 1971b) asserts several shortcomings of the CMS as mentioned in the next section, it does not reduce the popularity of the CMS. Fagerberg and Sollie (1987) try to explain factors underlying the changes in a country's shares in world exports. They note that the changes in the country's shares in world exports can be broken into five effects i.e. market shares, market distribution, commodity composition, commodity adaptation and market adaptation effects.

The aim of this chapter is to develop a *new version* of the CMS method that avoids such problems and weaknesses as Richardson (1971a, 1971b) clearly outlines. Fagerberg and Sollie (1987) argue that the CMS method could be improved in theoretical

¹ Since then the CMS has been employed by many authors including Fleming and Tsiang (1956), Baldwin (1958), Junz and Rhomberg (1965), Leamer and Stern (1970), Richardson (1971a, 1971b), Fagerberg and Sollie (1987) and James and Movshuk (2004), among others.

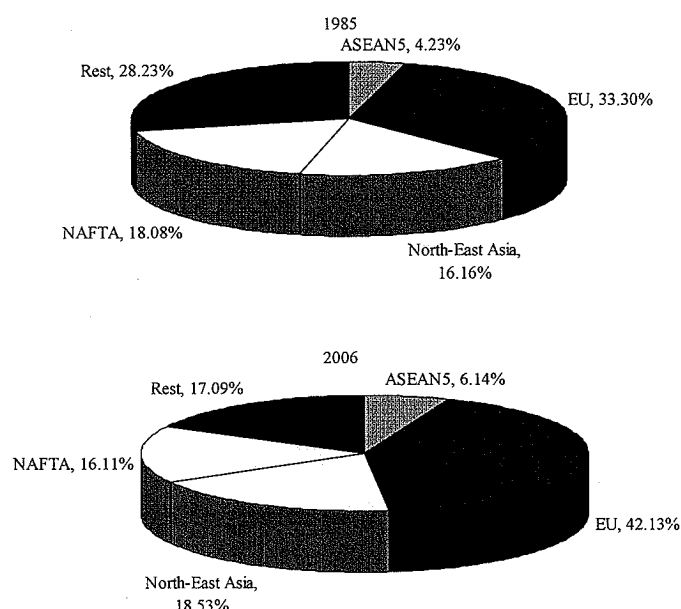
consistency and in empirical applicability if the initial years' weights (Laspeyres indices) are employed throughout the calculation and if the economic interpretation of the residual terms is made explicitly (instead of including them in an arbitrary way in some of other effects). Considering papers by Tyszynski (1951), Richardson (1971a, 1971b) and Fagerberg and Sollie (1987), we derive a *new version* of the CMS method of Leamer and Stern (1970). In addition, the *new version* of the CMS is employed to analyze the exports performance of some regions and East Asian countries.

The rest of this chapter is organized as follows. Section 8.2 describes the trends in exports of some regions and East Asian countries. Section 8.3 discusses the CMS. After discussing comprehensively the basic concepts of CMS, this section ends up with a proposal of *new version* of the CMS. Section 8.4 shows the empirical results and analysis. Finally, some conclusions are presented in Section 8.5.

8.2. Trends in exports

The East Asian region has increasingly become one of the dominant regions in the world trade. Figure 8.1 shows the shares of some regions in the world exports in 1985 and 2006. The East Asian region and the EU have taken greater shares of the world exports during 1985-2006. The ASEAN5 (Singapore, Indonesia, Malaysia, Thailand and the Philippines) covered 4.23% of the world exports in 1985 and it became 6.14% in 2006. Similarly, the North East Asia (Japan, Korea, China and Hong Kong) had a significant increase in the share, from 16.16% in 1985 to 18.93% in 2006. A remarkable increase in the share was noted by the European Union (EU: all 27 countries) from 33.30% in 1985 to 42.13% in 2006. In contrast, the North American Free Trade Area

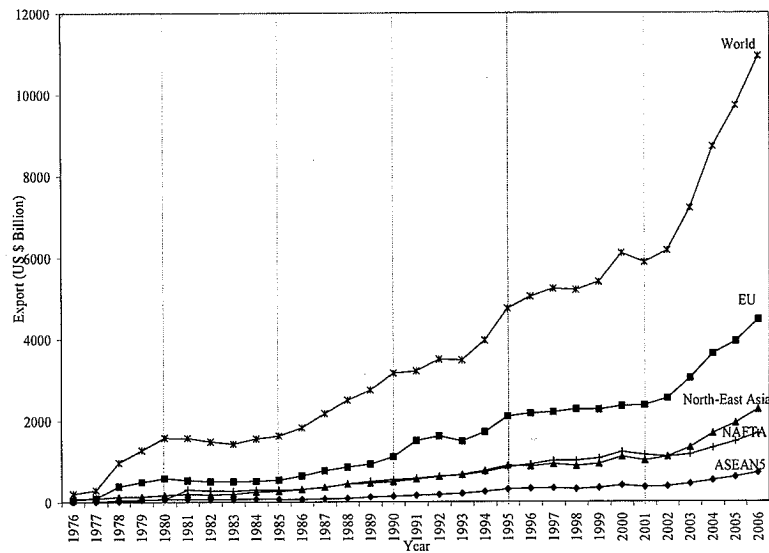
(NAFTA: the USA, Canada and Mexico) had a decrease in the share from 18.08% in 1985 to 16.11% in 2006



Source: UN-COMTRADE. *Author's calculation*

Figure 8.1 Shares of Regions in World Exports

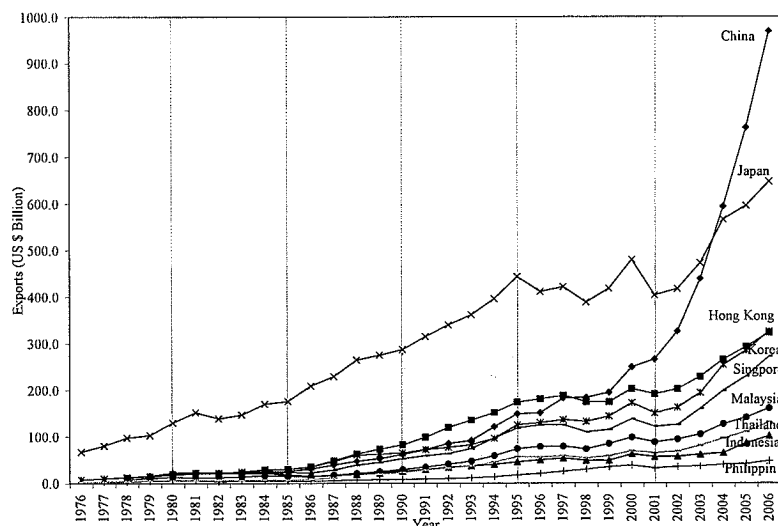
The world exports have changed drastically parallel with the world trade liberalization. Figure 8.2 shows trends in the exports value of the world and some regions (the EU, the NAFTA, the ASEAN5 and the North East Asia). The sharp increases in the world exports during the period 1976-1995 were followed by the steady increases during the period 1995-2001 and then by the sharper increases during the period 2001-2006. All regions' trends in exports relatively had similar pattern to that of the world with different rates of change. During the period 2001-2006, the EU and the North East Asia had higher increase in their exports than the NAFTA and the ASEAN5.



Source: UN-COMTRADE. Author's calculation

Figure 8.2 Exports by Regions

Individual countries in the East Asian region also have similar trends in exports to that of the world. Figure 8.3 shows the trends in exports by individual countries in the East Asian region. It seems that Korea and the ASEAN5 countries have similar trends in exports. Japan had a steady positive trend in exports during the period 1976-1995, but it became fluctuated during the period 1995-2001. Japan had a similar trend in exports to that of the EU except during the period 1995-2001. However, Japan has had a sharper upward trend in exports since 2001. China has made a remarkable upward trend in exports especially since 2001. Chinese exports have achieved a record exceeding Japanese exports since 2004. It is interesting to analyze the factors underlying the changes in exports of several regions mentioned in the above. By using the Constant Market Shares analysis, it is possible for us to analyze the factors affecting the changes in exports.



Source: 3-digit SITC Revision 2, UN-COMTRADE. Author's calculation

Figure 8.3 Exports by Countries in East Asia

8.3. The Constant Market Shares (CMS)

Tyszynski (1951) firstly proposes the CMS method. However, Leamer and Stern (1970) give a more detailed discussion of the method and possible applications. They also propose a version of the method², where the changes in exports can be caused by (a) the general rise in world exports, (b) the commodity composition, (c) the market distribution and (d) the competitiveness. Ricardson (1971a, 1971b) points out that the commodity composition and market distribution effects are interdependent (the order of their calculation matters), and that the values and signs may change if the final, instead of the initial, year of the period under consideration is used as the base year. Fagerberg and Sollie (1987) develop their version of the method, which can explicitly give the interpretation of the competitiveness effect. They find five effects instead of Leamer and

² Fagerberg and Sollie (1987) assert that Leamer and Stern calculated the effects underlying the growth of exports, not the growth of market share, as Tyszynski does. Fagerberg and Sollie argue that the method proposed by Leamer and Stern has insignificant difference with that of Tyszynski.

Stern's three effects. The two additional effects reflect a country's ability to adapt its export structure to changes in the commodity and market composition of the world exports.

It is important to discuss the development of CMS method since it has become a popular method of the empirical studies on countries' export performance. It is also useful to know the limitations or shortcomings of the methods, therefore more careful interpretation can be delivered. This section explains the development of the CMS and pays more attentions on four works by Leamer and Stern (1970), Richardson (1971a, 1971b), and Fagerberg and Sollie (1987). From the comprehensive explanations by them, we combine the four works to propose a *new version* of ours on the CMS method, which is presented in the end of this section.

8.3.1. The constant-share norm

The CMS method is derived from the constant-share norm. Suppose, there are two competitive countries A and B exporting their commodity to a particular market. Demand for exports from the two competing suppliers may be shown by the following expression:

$$\frac{q_A}{q_B} = f\left(\frac{p_A}{p_B}\right) \quad (8.1)$$

where q_A and q_B refer to quantity sold by A and B, respectively. Meanwhile, p_A and p_B represent price of the commodity from country A and B, respectively. By multiplying the both right-hand and left-hand sides of (8.1) with p_A/p_B , the following expression is obtained:

$$\frac{p_A q_A}{p_B q_B} = \frac{p_A}{p_B} f\left(\frac{p_A}{p_B}\right) \quad (8.2)$$

The country A's share of exports is expressed as follows:

$$\begin{aligned}
 \frac{p_A q_A}{p_A q_A + p_B q_B} &= \left(1 + \frac{p_B q_B}{p_A q_A} \right)^{-1} \\
 &= \left\{ 1 + \left[\frac{p_A f(p_A/p_B)}{p_A} \right]^{-1} \right\}^{-1} \\
 &= h\left(\frac{p_A}{p_B} \right)
 \end{aligned} \tag{8.3}$$

Equation (8.3) implies that country A's share of the market in question

$\left(\frac{p_A q_A}{p_A q_A + p_B q_B} \right)$ will be unchanged except as the price ratio $\left(\frac{p_A}{p_B} \right)$ changes. This refers

to the validity of the constant-share norm. It also shows that the difference between exports growth may be indicated by the price changes. Tyszynski (1951) states that the aggregate market share of a country will be the same if its market shares in individual commodity groups have also remained constant (hypothetical). Tyszynski refers to the difference between the hypothetical and the initial market shares as the changes in market share, which is caused by the structural changes in the world market. The residual –the difference between the final and the hypothetical market shares- is due to the changes in competitiveness. This method is called as “constant market shares” (CMS) analysis.

Leamer and Stern (1970) refer to the discrepancy between the constant-share norm and actual shares as the “competitiveness effect”. If a country fails to maintain its share in the world market, the competitiveness term will be negative. It also indicates that the country's prices increase relatively higher than that of the competitors as shown in equation (8.3). However, Richardson (1970) states that this is the case if we impose an additional assumption of the elasticity of substitution exceeding one in absolute value.

8.3.2. The levels of analysis

Figure 8.4 illustrates countries' and the world's trade flows for the two periods 0 and t. It is used to explain the CMS method. Suppose, there are a number of exporter countries (z) and importer countries (k) in the world. Exporter country A is a country in question. The definitions and notations used here are firstly determined:

- $V_{i\bullet}^{w0}$ = value of the world's exports of commodity i in period 0
- $V_{i\bullet}^{wt}$ = value of the world's exports of commodity i in period t
- $V_{\bullet j}^{w0}$ = value of the world's exports to country j in period 0
- $V_{\bullet j}^{wt}$ = value of the world's exports to country j in period t
- V_{ij}^{w0} = value of the world's exports of commodity i to country j in period 0
- V_{ij}^{wt} = value of the world's exports of commodity i to country j in period t
- $V_{\bullet\bullet}^{w0}$ = value of the world's exports in period 0
- $V_{\bullet\bullet}^{wt}$ = value of the world's exports in period t
- $V_{i\bullet}^{A0}$ = value of country A's exports of commodity i in period 0
- $V_{i\bullet}^{At}$ = value of country A's exports of commodity i in period t
- $V_{\bullet j}^{A0}$ = value of country A's exports to country j in period 0
- $V_{\bullet j}^{At}$ = value of country A's exports to country j in period t
- V_{ij}^{A0} = value of country A's exports of commodity i to country j in period 0
- V_{ij}^{At} = value of country A's exports of commodity i to country j in period t
- r = percentage increase in total world exports;
- $$r = \frac{V_{\bullet\bullet}^{wt} - V_{\bullet\bullet}^{w0}}{V_{\bullet\bullet}^{w0}}$$
- r_i = percentage increase in world exports of commodity i;
- $$r_i = \frac{V_{i\bullet}^{wt} - V_{i\bullet}^{w0}}{V_{i\bullet}^{w0}}$$
- r_{ij} = percentage increase in world exports of commodity i to country j;
- $$r_{ij} = \frac{V_{ij}^{wt} - V_{ij}^{w0}}{V_{ij}^{w0}}$$

From above definitions and notations, the country A's total exports values for commodity i and for destination country j for period 0 can be written as:

$$\sum_j V_{ij}^{A0} = V_{i\bullet}^{A0} \quad \text{and} \quad \sum_i V_{ij}^{A0} = V_{\bullet j}^{A0} \quad (8.4)$$

and similarly for the period t. In addition, the value of country A's exports in the period 0 is given by:

$$\sum_i \sum_j V_{ij}^{A0} = \sum_i V_{i\bullet}^{A0} = \sum_j V_{\bullet j}^{A0} = V_{\bullet\bullet}^{A0} \quad (8.5)$$

Country A's Exports to World	Country A's Exports to Country 1	Country A's Exports to Country K																																																																									
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<p>r = percentage increase in total world export</p> $r = \frac{V_{\bullet\bullet}^{Wt} - V_{\bullet\bullet}^{W0}}{V_{\bullet\bullet}^{W0}}$ <p>r_i =percentage increase in world export of commodity i</p> $r_i = \frac{V_{i\bullet}^{Wt} - V_{i\bullet}^{W0}}{V_{i\bullet}^{W0}}$	<p>r_{i1} = percentage increase in world export of commodity i to country 1:</p> $r_{i1} = \frac{V_{i1}^{Wt} - V_{i1}^{W0}}{V_{i1}^{W0}}$		<p>r_{iK} = percentage increase in world export of commodity i to country j:</p> $r_{iK} = \frac{V_{iK}^{Wt} - V_{iK}^{W0}}{V_{iK}^{W0}}$																																																																									

Figure 8.4 Illustration of Exports Flows

There are three levels of CMS analysis, which depend on how we treat markets and commodities (Leamer and Stern, 1970). *First*, it may be assumed that exported commodities can be treated as a single and completely undifferentiated good. In addition, export destinations can be treated as a single market. In short, exports may be treated as a single good destined for a single market. If country A maintains its share in this market, its exports would simply increase by $rV_{..}^{A0}$, and the following identity is obtained:

$$V_{..}^{At} - V_{..}^{A0} \equiv rV_{..}^{A0} + (V_{..}^{At} - V_{..}^{A0} - rV_{..}^{A0}) \quad (8.6)$$

Equation (8.6) is called a “one level” analysis. It implies that the change in A’s exports $(V_{..}^{At} - V_{..}^{A0})$ can be divided into two parts i.e. (a) a part related with the general increase in world exports $(rV_{..}^{A0})$ and (b) an unexplained part, the competitiveness effect $(V_{..}^{At} - V_{..}^{A0} - rV_{..}^{A0})$.

Second, it may be assumed that exported commodities are quite diverse sets of goods. For a specific commodity (say i), an analogous identity may be written as follows:

$$V_{i.}^{At} - V_{i.}^{A0} \equiv r_i V_{i.}^{A0} + (V_{i.}^{At} - V_{i.}^{A0} - r_i V_{i.}^{A0}) \quad (8.7)$$

Taking the aggregate equation (8.7), the following expression is obtained:

$$\begin{aligned} V_{..}^{At} - V_{..}^{A0} &\equiv \sum_i r_i V_{i.}^{A0} + \sum_i (V_{i.}^{At} - V_{i.}^{A0} - r_i V_{i.}^{A0}) \\ &\equiv (rV_{..}^{A0}) + \sum_i (r_i - r)V_{i.}^{A0} + \sum_i (V_{i.}^{At} - V_{i.}^{A0} - r_i V_{i.}^{A0}) \end{aligned} \quad (8.8)$$

(a) (b) (c)

Equation (8.8) is called a “two level” analysis. The change in A’s exports $(V_{..}^{At} - V_{..}^{A0})$ is broken down into three components regarding with: (a) the general rise in world exports $(rV_{..}^{A0})$, (b) the commodity composition of A’s exports in the period 0

$\left(\sum_i (r_i - r) V_{i\bullet}^{A0}\right)$; and (c) an unexplained residual (the competitiveness effect)

$\left(\sum_i (V_{i\bullet}^{At} - V_{i\bullet}^{A0} - r_i V_{i\bullet}^{A0})\right)$. The difference between the “one level” and “two level” analysis

is in the existence of the commodity composition effect, $\sum_i (r_i - r) V_{i\bullet}^{A0}$. If the world

exports of commodity i increase by more than the world average for all commodities,

$(r_i - r) > 0$, the exports of commodity i contribute to the increase in country A's exports.

Therefore, the sum represented by $\sum_i (r_i - r) V_{i\bullet}^{A0}$ would be positive if A has concentrated

on the export of commodities whose markets are growing relatively faster and would be

negative if A has concentrated in slowly growing commodity markets. *Third*, it may be

assumed that exports are differentiated by destinations as well as commodity types. In

this case, exports of a particular commodity for a particular destination are considered.

Therefore, the analogous identity can be written as follows:

$$V_{ij}^{At} - V_{ij}^{A0} \equiv r_{ij} V_{ij}^{A0} + (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \quad (8.9)$$

Taking the aggregate equation (8.9) yields:

$$\begin{aligned} V_{\bullet\bullet}^{At} - V_{\bullet\bullet}^{A0} &\equiv \sum_i \sum_j r_{ij} V_{ij}^{A0} + \sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \\ &\equiv r V_{\bullet\bullet}^{A0} + \underbrace{\sum_i (r_i - r) V_{i\bullet}^{A0}}_{(b)} + \underbrace{\sum_i \sum_j (r_{ij} - r_i) V_{ij}^{A0}}_{(c)} + \underbrace{\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0})}_{(d)} \end{aligned} \quad (8.10)$$

Expression (8.10) shows a “three level” analysis. The change in country A's

exports $(V_{\bullet\bullet}^{At} - V_{\bullet\bullet}^{A0})$ can be divided into four components associated with: (a) the general

rise in world exports, $(r V_{\bullet\bullet}^{A0})$; (b) the commodity composition of country A's exports,

$\left(\sum_i (r_i - r) V_{i\bullet}^{A0}\right)$; (c) the market distribution of country A's exports, $\left(\sum_i \sum_j (r_{ij} - r_i) V_{ij}^{A0}\right)$;

and (d) an unexplained residual (the competitiveness effect), $\left(\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \right)$. The market distribution effect $\sum_i \sum_j (r_{ij} - r_i) V_{ij}^{A0}$ will be positive if country A has concentrated its exports in markets with relatively rapid growth. It is important to note that whether the commodity effect (b) follows the market distribution effect (c), or *vice versa*. Therefore, equation (8.10) can be described in another way:

$$V_{..}^{At} - V_{..}^{A0} \equiv \underbrace{r V_{..}^{A0}}_{(a)} + \underbrace{\sum_j (r_j - r) V_{.j}^{A0}}_{(b)} + \underbrace{\sum_i \sum_j (r_{ij} - r_j) V_{ij}^{A0}}_{(c)} + \underbrace{\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0})}_{(d)} \quad (8.11)$$

Now, the increase of country A's exports $(V_{..}^{At} - V_{..}^{A0})$ can be divided into four components associated with: (a) the general rise in world exports $(r V_{..}^{A0})$; (b) the market distribution of country A's exports $\left(\sum_j (r_j - r) V_{.j}^{A0} \right)$; (c) the commodity composition of country A's exports $\left(\sum_i \sum_j (r_{ij} - r_j) V_{ij}^{A0} \right)$; and (d) an unexplained residual (the competitiveness effect) $\left(\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0}) \right)$. The equation (8.10) can be normalized by dividing $V_{..}^{A0}$ (Laspeyres index) or $V_{..}^{At}$ (Paasche index)³:

$$\text{Laspeyres Index: } \frac{V_{..}^{At} - V_{..}^{A0}}{V_{..}^{A0}} \equiv \underbrace{\frac{r V_{..}^{A0}}{V_{..}^{A0}}}_{(1)} + \underbrace{\frac{\sum_j (r_j - r) V_{.j}^{A0}}{V_{..}^{A0}}}_{(2)} + \underbrace{\frac{\sum_i \sum_j (r_{ij} - r_j) V_{ij}^{A0}}{V_{..}^{A0}}}_{(3)} + \underbrace{\frac{\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij} V_{ij}^{A0})}{V_{..}^{A0}}}_{(4)} \quad (8.12)$$

³ Tyszynski (1951) actually employs $\frac{V_{..}^{At}}{V_{..}^{Wt}} - \frac{V_{..}^{A0}}{V_{..}^{W0}} = \left(\frac{\sum_i (r_i + 1) V_{i.}^{A0}}{V_{..}^{Wt}} - \frac{V_{i.}^{A0}}{V_{..}^{W0}} \right) + \left(\frac{V_{..}^{At}}{V_{..}^{Wt}} - \frac{\sum_i (r_i + 1) V_{i.}^{A0}}{V_{..}^{Wt}} \right)$

$$\text{Paasche Index: } \frac{V_{..}^{At} - V_{..}^{A0}}{V_{..}^{At}} \equiv \underbrace{\frac{rV_{..}^{A0}}{V_{..}^{At}}}_{(1)} + \underbrace{\frac{\sum_i (r_i - r)V_{i.}^{A0}}{V_{..}^{At}}}_{(2)} + \underbrace{\frac{\sum_i \sum_j (r_{ij} - r_i)V_{ij}^{A0}}{V_{..}^{At}}}_{(3)} + \underbrace{\frac{\sum_i \sum_j (V_{ij}^{At} - V_{ij}^{A0} - r_{ij}V_{ij}^{A0})}{V_{..}^{At}}}_{(4)} \quad (8.13)$$

8.3.3. The shortcomings of the Leamer and Stern's version

Richardson (1971b) notes several shortcomings in the application of the CMS by Leamer and Stern (1970). *First*, the various components in the basic identity (8.10) will vary with the level of commodity aggregate i.e. the composition of class i. Therefore, commodity classification (i) should be as homogeneous as possible. *Second*, the CMS effects will vary with the degree of market consolidation, i.e. the identification of each market (j). *Third*, the application of the equations (8.10) or (8.11) is somewhat arbitrary. It depends on the researcher's subjectivity. In (8.10), the commodity effect $\left(\sum_i (r_i - r)V_{i.}^{A0} \right)$ is calculated "before"⁴ the market effect $\left(\sum_i \sum_j (r_{ij} - r_i)V_{ij}^{A0} \right)$. In contrast, in (8.11) the market effect $\left(\sum_j (r_j - r)V_{.j}^{A0} \right)$ is calculated "before" the commodity effect $\left(\sum_i \sum_j (r_{ij} - r_j)V_{ij}^{A0} \right)$. Even if the sum of the two effects is the same, this change in the sequence of calculation would change the values of the individual commodity and market effects. *Fourth*, alternative choice of the world or the standard area will cause the CMS to vary. In principle, the appropriate "world" (i.e. the area to which the denominator of an export shares refers) should include only true competitor. *Fifth*, the ability to make more than one choices of calculation basis represents the index number problem, for example Laspeyres Index (8.12) and Paasche Index (8.13).

⁴ Richardson (1971b)

8.3.4. Changes in the share of exports: the Fagerberg and Sollie's version

The interpretation of competitiveness effect (d) in the identity (8.10) is not as straightforward as the other terms. There are many other things beside the relative prices affecting a country's competitiveness such as (a) the differential rates of export price inflation, (b) differential rates of quality improvement and the development of new products, (c) differential rates of improvement in the efficiency of marketing or in the terms of financing the sale of export goods, (d) differential changes in the ability for prompts fulfillment of export orders (Leamer and Stern, 1970). More recently, Fagerberg and Sollie (1987) develop another version of the CMS method by Tyszynski (1951). This version gives much more explanation on the competitiveness effect.

The change in share of exports depends on how we treat markets and commodities in our analysis (Fagerberg and Sollie, 1987). To give clear explanation, two cases will be described separately, i.e. 'several commodities – one market' and 'several commodities – several market' cases⁵. The following symbols and definitions will be used⁶:

V	= value of exports;
i	= commodities
j	= exports (destinations) markets
n	= number of commodities;
k	= number of countries (K is the last exports market)

⁵ We will use variable (data) on exports only. This is slightly different with that of Fagerberg and Sollie (1987). They use term exports of specific country. However, for market destination they employ "total import of a country" instead of "world exports to the country". Theoretically, the two terms must be the same i.e. the "total imports" value of a country is the same with the "world exports" to the country. In practice, since imports are calculated based on cost-insurance-freight (CIF) meanwhile exports are calculated base on free-on-board (FOB), the use of only exports can therefore avoids misleading.

⁶ The symbols and definitions are different with those of Fagerberg and Sollie (1987). This is to accommodate our comparison analysis among the versions of CMS method.

- 0,t = subscripts which refer to the initial year and to the final year of the comparison, respectively;
A = country in question
W = world
 S^A = market shares of country A in world exports (the ratio of A's total exports and the world total exports);

$$S^A = S^{A1} + S^{A2} + \dots + S^{AK} = \frac{\sum_i \sum_j V_{ij}^A}{\sum_i \sum_j V_{ij}^W}$$

- s^A = macro share of country A in world exports (the ratio of A's total export and world total export in each market); row vector of dimension K:

$$s^A = [s^{A1} \quad s^{A2} \quad \dots \quad s^{AK}] = \left[\frac{\sum_i V_{i1}^A}{\sum_i V_{i1}^W} \quad \frac{\sum_i V_{i2}^A}{\sum_i V_{i2}^W} \quad \dots \quad \frac{\sum_i V_{iK}^A}{\sum_i V_{iK}^W} \right]$$

- α^{Aj} = market shares, by commodity, of country A (micro share of country A) in the world exports to market j (the ratio of country A's and the world's exports of commodity i to country K); matrix of dimension Kxn:

$$\alpha^{Aj} = \begin{bmatrix} \alpha_1^{A1} & \alpha_2^{A1} & \dots & \alpha_n^{A1} \\ \alpha_1^{A2} & \alpha_2^{A2} & \dots & \alpha_n^{A2} \\ \vdots & \vdots & \ddots & \vdots \\ \alpha_1^{AK} & \alpha_2^{AK} & \dots & \alpha_n^{AK} \end{bmatrix} = \begin{bmatrix} \frac{V_{11}^A}{V_{11}^W} & \frac{V_{21}^A}{V_{21}^W} & \dots & \frac{V_{n1}^A}{V_{n1}^W} \\ \frac{V_{12}^A}{V_{12}^W} & \frac{V_{22}^A}{V_{22}^W} & \dots & \frac{V_{n2}^A}{V_{n2}^W} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{V_{1K}^A}{V_{1K}^W} & \frac{V_{2K}^A}{V_{2K}^W} & \dots & \frac{V_{nK}^A}{V_{nK}^W} \end{bmatrix}$$

- β^{Wj} = commodity shares of the world exports to country j to the world total exports (the ratio of world's specific commodity exports and total world's exports to country K); matrix of dimension nxK:

$$\beta^{Wj} = \begin{bmatrix} \beta_1^{W1} & \beta_1^{W2} & \dots & \beta_1^{WK} \\ \beta_2^{W1} & \beta_2^{W2} & \dots & \beta_2^{WK} \\ \vdots & \vdots & \ddots & \vdots \\ \beta_n^{W1} & \beta_n^{W2} & \dots & \beta_n^{WK} \end{bmatrix} = \begin{bmatrix} V_{11}^W / \sum_i V_{i1}^W & V_{12}^W / \sum_i V_{i2}^W & \dots & V_{1K}^W / \sum_i V_{iK}^W \\ V_{21}^W / \sum_i V_{i1}^W & V_{22}^W / \sum_i V_{i2}^W & \dots & V_{2K}^W / \sum_i V_{iK}^W \\ \vdots & \vdots & \ddots & \vdots \\ V_{n1}^W / \sum_i V_{i1}^W & V_{n2}^W / \sum_i V_{i2}^W & \dots & V_{nK}^W / \sum_i V_{iK}^W \end{bmatrix}$$

- δ^{Wj} = country shares of the world exports (the ratio of the world exports to country j and the world total exports); column vector of dimension K:

$$\delta^{Wj} = \begin{bmatrix} \delta^{W1} \\ \delta^{W2} \\ \vdots \\ \delta^{WK} \end{bmatrix} = \begin{bmatrix} \sum_i V_{i1}^W / \sum_i \sum_j V_{ij}^W \\ \sum_i V_{i2}^W / \sum_i \sum_j V_{ij}^W \\ \vdots \\ \sum_i V_{iK}^W / \sum_i \sum_j V_{ij}^W \end{bmatrix}$$

The ‘several commodities – one market’ case

In the case of ‘several commodities – one market’, it is assumed that country A in question exports several commodities (n) in only one market, say market K (i.e. j=K). In Figure 8.4, it is depicted by the last column. Based on the definitions and symbols, the macro share of country A (S^{AK}) can be written as the inner product of the vector of its micro share (α^{AK}) and the vector of commodity share in total world export to county K (β^{WK}), as follows:

$$S^{AK} = \alpha^{AK} \beta^{WK} = \begin{bmatrix} \frac{V_{1K}^A}{V_{1K}^W} & \frac{V_{2K}^A}{V_{2K}^W} & \dots & \frac{V_{nK}^A}{V_{nK}^W} \end{bmatrix} \begin{bmatrix} V_{1K}^W / \sum_i V_{iK}^W \\ V_{2K}^W / \sum_i V_{iK}^W \\ \vdots \\ V_{nK}^W / \sum_i V_{iK}^W \end{bmatrix} \quad (8.14)$$

The change in macro share of country A (ΔS^{AK}) between the two periods t and 0 can be obtained:

$$\begin{aligned} \Delta S^{AK} &= S_t^{AK} - S_0^{AK} \\ &= \alpha_t^{AK} \beta_t^{WK} - \alpha_0^{AK} \beta_0^{WK} \\ &= \begin{bmatrix} \frac{V_{1K,t}^A}{V_{1K,t}^W} & \frac{V_{2K,t}^A}{V_{2K,t}^W} & \dots & \frac{V_{nK,t}^A}{V_{nK,t}^W} \end{bmatrix} \begin{bmatrix} V_{1K,t}^W / \sum_i V_{iK,t}^W \\ V_{2K,t}^W / \sum_i V_{iK,t}^W \\ \vdots \\ V_{nK,t}^W / \sum_i V_{iK,t}^W \end{bmatrix} - \begin{bmatrix} \frac{V_{1K,0}^A}{V_{1K,0}^W} & \frac{V_{2K,0}^A}{V_{2K,0}^W} & \dots & \frac{V_{nK,0}^A}{V_{nK,0}^W} \end{bmatrix} \begin{bmatrix} V_{1K,0}^W / \sum_i V_{iK,0}^W \\ V_{2K,0}^W / \sum_i V_{iK,0}^W \\ \vdots \\ V_{nK,0}^W / \sum_i V_{iK,0}^W \end{bmatrix} \end{aligned} \quad (8.15)$$

If either the Laspeyres or Paasche indices are employed for the whole calculation, a third (residual) term necessarily appears. This is because neither Laspeyres nor Paasche index passes the factor reversal test⁷ (Fagerberg and Sollie, 1987). Therefore, the residual term appears as shown as follows (Laspeyres index is used):

⁷ The factor reversal test requires that multiplying a price index and a volume index of the same type should be equal to the proportionate change in the current values.

$$\Delta S^{AK} = \Delta S_{\alpha}^{AK} + \Delta S_{\beta}^{AK} + \Delta S_{\alpha\beta}^{AK} \quad (8.16)$$

where:

$$\begin{aligned} \Delta S_{\alpha}^{AK} &= (\alpha_t^{AK} - \alpha_0^{AK}) \beta_0^{AK} \\ &= \left(\left[\frac{V_{1K,t}^A}{V_{1K,t}^W} \quad \frac{V_{2K,t}^A}{V_{2K,t}^W} \quad \dots \quad \frac{V_{nK,t}^A}{V_{nK,t}^W} \right] - \left[\frac{V_{1K,0}^A}{V_{1K,0}^W} \quad \frac{V_{2K,0}^A}{V_{2K,0}^W} \quad \dots \quad \frac{V_{nK,0}^A}{V_{nK,0}^W} \right] \right) \begin{bmatrix} V_{1K,0}^W / \sum_i V_{iK,0}^W \\ V_{2K,0}^W / \sum_i V_{iK,0}^W \\ \vdots \\ V_{nK,0}^W / \sum_i V_{iK,0}^W \end{bmatrix} \end{aligned} \quad (8.17)$$

$$\begin{aligned} \Delta S_{\beta}^{AK} &= \alpha_0^{AK} (\beta_t^{AK} - \beta_0^{AK}) \\ &= \left[\frac{V_{1K,0}^A}{V_{1K,0}^W} \quad \frac{V_{2K,0}^A}{V_{2K,0}^W} \quad \dots \quad \frac{V_{nK,0}^A}{V_{nK,0}^W} \right] \begin{bmatrix} V_{1K,t}^W / \sum_i V_{iK,t}^W \\ V_{2K,t}^W / \sum_i V_{iK,t}^W \\ \vdots \\ V_{nK,t}^W / \sum_i V_{iK,t}^W \end{bmatrix} - \left[\frac{V_{1K,0}^A}{V_{1K,0}^W} \quad \frac{V_{2K,0}^A}{V_{2K,0}^W} \quad \dots \quad \frac{V_{nK,0}^A}{V_{nK,0}^W} \right] \begin{bmatrix} V_{1K,0}^W / \sum_i V_{iK,0}^W \\ V_{2K,0}^W / \sum_i V_{iK,0}^W \\ \vdots \\ V_{nK,0}^W / \sum_i V_{iK,0}^W \end{bmatrix} \end{aligned} \quad (8.18)$$

$$\begin{aligned} \Delta S_{\alpha\beta}^{AK} &= (\alpha_t^{AK} - \alpha_0^{AK}) (\beta_t^{AK} - \beta_0^{AK}) \\ &= \left(\left[\frac{V_{1K,t}^A}{V_{1K,t}^W} \quad \frac{V_{2K,t}^A}{V_{2K,t}^W} \quad \dots \quad \frac{V_{nK,t}^A}{V_{nK,t}^W} \right] - \left[\frac{V_{1K,0}^A}{V_{1K,0}^W} \quad \frac{V_{2K,0}^A}{V_{2K,0}^W} \quad \dots \quad \frac{V_{nK,0}^A}{V_{nK,0}^W} \right] \right) \begin{bmatrix} V_{1K,t}^W / \sum_i V_{iK,t}^W \\ V_{2K,t}^W / \sum_i V_{iK,t}^W \\ \vdots \\ V_{nK,t}^W / \sum_i V_{iK,t}^W \end{bmatrix} - \left[\frac{V_{1K,0}^A}{V_{1K,0}^W} \quad \frac{V_{2K,0}^A}{V_{2K,0}^W} \quad \dots \quad \frac{V_{nK,0}^A}{V_{nK,0}^W} \right] \begin{bmatrix} V_{1K,0}^W / \sum_i V_{iK,0}^W \\ V_{2K,0}^W / \sum_i V_{iK,0}^W \\ \vdots \\ V_{nK,0}^W / \sum_i V_{iK,0}^W \end{bmatrix} \end{aligned} \quad (8.19)$$

The first term (ΔS_{α}^{AK}) is the effect of changes in micro shares (micro share effect), the second term (ΔS_{β}^{AK}) is the commodity composition effect. The third (residual) term ($\Delta S_{\alpha\beta}^{AK}$) is the inner product of a vector of changes in micro shares and a vector of changes in commodity composition. Fagerberg and Sollie (1987) argue that the residual term has economic meaning, since its sign and value depend on the correlation between the changes in micro shares of the country and the change in commodity composition of the market. A formal proof on this matter is given below (for simplicity reason, the superscripts of country A and market K are omitted):

$$\Delta S_{\alpha\beta} = (\alpha_t - \alpha_0)(\beta_t - \beta_0) \quad (8.20)$$

The correlation coefficient between the changes in micro shares $(\alpha_t - \alpha_0)$ and the changes in commodity shares $(\beta_t - \beta_0)$, which is denoted by $r_{\alpha\beta}$, is formulated as⁸:

$$r_{\alpha\beta} = \frac{(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\beta_t - \beta_0 - \bar{\beta}_t + \bar{\beta}_0)}{\sqrt{(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\beta_t - \beta_0 - \bar{\beta}_t + \bar{\beta}_0)(\beta_t - \beta_0 - \bar{\beta}_t + \bar{\beta}_0)}} \quad (8.21)$$

The symbol (') denotes transposition, while $\bar{\alpha}_t, \bar{\alpha}_0, \bar{\beta}_t$ and $\bar{\beta}_0$ are vectors of means, defined by:

$$\bar{\alpha}_t = (1/n)\alpha_t u u' \quad (8.22)$$

$$\bar{\alpha}_0 = (1/n)\alpha_0 u u' \quad (8.23)$$

$$\bar{\beta}_t = (1/n)u' \beta_t u = (1/n)u \quad (8.24)$$

$$\bar{\beta}_0 = (1/n)u' \beta_0 u = (1/n)u \quad (8.25)$$

where u is vector of one $\begin{bmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{bmatrix}$ and u' denotes transposition of u . It follows from

equations 8.21-8.25 that:

$$r_{\alpha\beta} \sqrt{(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\beta_t - \beta_0)(\beta_t - \beta_0)} = (\alpha_t - \alpha_0 - (1/n)\alpha_t u u' + (1/n)\alpha_0 u u')(\beta_t - \beta_0) \quad (8.26)$$

By rearranging, equation (8.26) can be simplified as follows:

$$r_{\alpha\beta} \sqrt{(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\beta_t - \beta_0)(\beta_t - \beta_0)} = (\alpha_t - \alpha_0)(\beta_t - \beta_0) - (1/n)(\alpha_t - \alpha_0)u u'(\beta_t - \beta_0) \quad (8.27)$$

Since the sum of the commodity shares is always equal to one, it follows that:

$$u'(\beta_t - \beta_0) = 0 \quad (8.28)$$

Therefore, it is:

⁸ From the standard statistics, correlation between two variables X and Y with n observations is formulated

$$\text{as: } r_{xy} = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2 \sum (Y - \bar{Y})^2}} \quad \text{where } \bar{X} = \frac{\sum_{i=1}^n X_i}{n} \quad \text{and} \quad \bar{Y} = \frac{\sum_{i=1}^n Y_i}{n}.$$

$$r_{\alpha\beta} \sqrt{(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)(\alpha_t - \alpha_0 - \bar{\alpha}_t + \bar{\alpha}_0)} (\beta_t - \beta_0)' (\beta_t - \beta_0) = (\alpha_t - \alpha_0)(\beta_t - \beta_0) \quad (8.29)$$

By substituting equation (8.29) into equation (8.20) the residual can be expressed as the product of the correlation between the changes in micro shares and the change in commodity shares, and two terms which are necessarily non-negative. The first of these terms is a measure of the spread of the changes in micro shares, while the second is a measure of the changes in commodity shares (superscript are reintroduced):

$$\begin{aligned} \Delta S_{\alpha\beta}^{AK} &= (\alpha_t^{AK} - \alpha_0^{AK})(\beta_t^{AK} - \beta_0^{AK}) \\ &= r_{\alpha\beta}^{AK} \sqrt{(\alpha_t^{AK} - \alpha_0^{AK} - \bar{\alpha}_t^{AK} + \bar{\alpha}_0^{AK})(\alpha_t^{AK} - \alpha_0^{AK} - \bar{\alpha}_t^{AK} + \bar{\alpha}_0^{AK})} (\beta_t^{WK} - \beta_0^{WK})' (\beta_t^{WK} - \beta_0^{WK}) \end{aligned} \quad (8.30)$$

Therefore, the third effect shows to what degree a country has succeeded in adapting the commodity composition of its exports to the changes in the commodity composition of the market. Fagerberg and Sollie (1987) name it as the ‘relative commodity adaptation effect’ or just simply ‘commodity adaptation effect’. If the commodity adaptation effect equals zero, it does not necessarily means that no adaptation takes place, but that the country adapts its export structure at exactly the same rate as the average of all countries exporting to the market in question.

The ‘several commodities – several markets’ case

This sub-section explains the CMS method in the case of ‘several commodities – several markets’. For example, we want to analyze country A that export n commodities to all k countries (export destinations) as depicted in Figure 8.4. The market share of country A in world export (S^A) can be written as the inner product of the vector of its macro share (s^A) and the vector of country shares of world exports (δ^{Wj}):

$$S^A = s^A \delta^{Wj} = \begin{bmatrix} \frac{\sum_i V_{i1}^A}{\sum_i V_{i1}^W} & \frac{\sum_i V_{i2}^A}{\sum_i V_{i2}^W} & \dots & \frac{\sum_i V_{iK}^A}{\sum_i V_{iK}^W} \end{bmatrix} \begin{bmatrix} \frac{\sum_i V_{i1}^W}{\sum_i \sum_j V_{ij}^W} \\ \frac{\sum_i V_{i2}^W}{\sum_i \sum_j V_{ij}^W} \\ \vdots \\ \frac{\sum_i V_{iK}^W}{\sum_i \sum_j V_{ij}^W} \end{bmatrix} \quad (8.31)$$

The change in ΔS^A between the periods 0 and t is:

$$\Delta S^A = S_t^A - S_0^A \quad (8.32)$$

or

$$\Delta S^A = \Delta(s^A \delta^{Wj}) = \begin{bmatrix} \frac{\sum_i V_{i1,t}^A}{\sum_i V_{i1,t}^W} & \frac{\sum_i V_{i2,t}^A}{\sum_i V_{i2,t}^W} & \dots & \frac{\sum_i V_{iK,t}^A}{\sum_i V_{iK,t}^W} \end{bmatrix} \begin{bmatrix} \frac{\sum_i V_{i1,t}^W}{\sum_i \sum_j V_{ij,t}^W} \\ \frac{\sum_i V_{i2,t}^W}{\sum_i \sum_j V_{ij,t}^W} \\ \vdots \\ \frac{\sum_i V_{iK,t}^W}{\sum_i \sum_j V_{ij,t}^W} \end{bmatrix} - \begin{bmatrix} \frac{\sum_i V_{i1,0}^A}{\sum_i V_{i1,0}^W} & \frac{\sum_i V_{i2,0}^A}{\sum_i V_{i2,0}^W} & \dots & \frac{\sum_i V_{iK,0}^A}{\sum_i V_{iK,0}^W} \end{bmatrix} \begin{bmatrix} \frac{\sum_i V_{i1,0}^W}{\sum_i \sum_j V_{ij,0}^W} \\ \frac{\sum_i V_{i2,0}^W}{\sum_i \sum_j V_{ij,0}^W} \\ \vdots \\ \frac{\sum_i V_{iK,0}^W}{\sum_i \sum_j V_{ij,0}^W} \end{bmatrix} \quad (8.33)$$

The change in the market share can be broken down into three effects:

$$\Delta S^A = \Delta S_s^A + \Delta S_\delta^A + \Delta S_{s\delta}^A \quad (20.34)$$

where:

$$\Delta S_s^A = (s_t^A - s_0^A) \delta_0^{Wj} = \left(\begin{bmatrix} \frac{\sum_i V_{i1,t}^A}{\sum_i V_{i1,t}^W} & \frac{\sum_i V_{i2,t}^A}{\sum_i V_{i2,t}^W} & \dots & \frac{\sum_i V_{iK,t}^A}{\sum_i V_{iK,t}^W} \end{bmatrix} - \begin{bmatrix} \frac{\sum_i V_{i1,0}^A}{\sum_i V_{i1,0}^W} & \frac{\sum_i V_{i2,0}^A}{\sum_i V_{i2,0}^W} & \dots & \frac{\sum_i V_{iK,0}^A}{\sum_i V_{iK,0}^W} \end{bmatrix} \right) \begin{bmatrix} \frac{\sum_i V_{i1,0}^W}{\sum_i \sum_j V_{ij,0}^W} \\ \frac{\sum_i V_{i2,0}^W}{\sum_i \sum_j V_{ij,0}^W} \\ \vdots \\ \frac{\sum_i V_{iK,0}^W}{\sum_i \sum_j V_{ij,0}^W} \end{bmatrix} \quad (20.35)$$

$$\Delta S_\delta^A = s_0^A (\delta_t^{Wj} - \delta_0^{Wj}) = \begin{bmatrix} \frac{\sum_i V_{i1,0}^A}{\sum_i V_{i1,0}^W} & \frac{\sum_i V_{i2,0}^A}{\sum_i V_{i2,0}^W} & \dots & \frac{\sum_i V_{iK,0}^A}{\sum_i V_{iK,0}^W} \end{bmatrix} \left(\begin{bmatrix} \frac{\sum_i V_{i1,t}^W}{\sum_i \sum_j V_{ij,t}^W} \\ \frac{\sum_i V_{i2,t}^W}{\sum_i \sum_j V_{ij,t}^W} \\ \vdots \\ \frac{\sum_i V_{iK,t}^W}{\sum_i \sum_j V_{ij,t}^W} \end{bmatrix} - \begin{bmatrix} \frac{\sum_i V_{i1,0}^W}{\sum_i \sum_j V_{ij,0}^W} \\ \frac{\sum_i V_{i2,0}^W}{\sum_i \sum_j V_{ij,0}^W} \\ \vdots \\ \frac{\sum_i V_{iK,0}^W}{\sum_i \sum_j V_{ij,0}^W} \end{bmatrix} \right) \quad (20.36)$$

$$\Delta S_{ss}^A = (s_t^A - s_0^A)(\delta_t^{Wj} - \delta_0^{Wj})$$

$$= \left(\begin{bmatrix} \frac{\sum_i V_{i1,t}^A}{\sum_i V_{i1,t}^W} & \frac{\sum_i V_{i2,t}^A}{\sum_i V_{i2,t}^W} & \dots & \frac{\sum_i V_{iK,t}^A}{\sum_i V_{iK,t}^W} \end{bmatrix} - \begin{bmatrix} \frac{\sum_i V_{i1,0}^A}{\sum_i V_{i1,0}^W} & \frac{\sum_i V_{i2,0}^A}{\sum_i V_{i2,0}^W} & \dots & \frac{\sum_i V_{iK,0}^A}{\sum_i V_{iK,0}^W} \end{bmatrix} \right) \begin{bmatrix} \frac{\sum_i V_{i1,t}^W / \sum_{i,j} V_{ij,t}^W}{\sum_i V_{i2,t}^W / \sum_{i,j} V_{ij,t}^W} \\ \vdots \\ \frac{\sum_i V_{iK,t}^W / \sum_{i,j} V_{ij,t}^W}{\sum_i V_{iK,0}^W / \sum_{i,j} V_{ij,0}^W} \end{bmatrix} \quad (20.37)$$

The first effect is the changes in the macro shares weighted by country shares in the initial year, while the second effect is the changes in the country shares weighted by macro shares in the initial year. Thus, the second effect measures the effect on the market share of a country in the world market of changes in the composition of the market. It is named the market composition effect. The third effect can be interpreted as the degree of success of the country in adapting the market composition of its export to the changes in the country composition of world imports. Therefore, following the argument described in the previous sub-section, it is named the market adaptation effect. A formal proof on this matter is given below. Let $r_{s\delta}^A$ denotes the correlation coefficient between the changes in macro shares and the changes in country shares, and let \bar{s}_0^A , \bar{s}_t^A , $\bar{\delta}_0^A$ and $\bar{\delta}_t^A$ be vectors of means. The correlation coefficient between the changes in micro shares $(s_t - s_0)$ and the changes in commodity shares $(\delta_t - \delta_0)$, which is symbolized by $r_{s\delta}$, is formulated as:

$$r_{s\delta} = \frac{(s_t - s_0 - \bar{s}_t + \bar{s}_0)(\delta_t - \delta_0 - \bar{\delta}_t + \bar{\delta}_0)}{\sqrt{(s_t - s_0 - \bar{s}_t + \bar{s}_0)(s_t - s_0 - \bar{s}_t + \bar{s}_0)(\delta_t - \delta_0 - \bar{\delta}_t + \bar{\delta}_0)(\delta_t - \delta_0 - \bar{\delta}_t + \bar{\delta}_0)}} \quad (8.38)$$

The symbol $\bar{s}_t, \bar{s}_0, \bar{\delta}_t$ and $\bar{\delta}_0$ are vectors of means, defined by:

$$\bar{s}_t = (1/n)s_t uu' \quad (8.39)$$

$$\bar{s}_0 = (1/n)s_0 uu' \quad (8.40)$$

$$\bar{\delta}_t = (1/n)u'\delta_t u = (1/n)u \quad (8.41)$$

$$\bar{\delta}_0 = (1/n)u'\delta_0 u = (1/n)u \quad (8.42)$$

It follows from equations 8.38-8.42 that:

$$r_{s\delta} \sqrt{(s_t - s_0 - \bar{s}_t + \bar{s}_0)(s_t - s_0 - \bar{s}_t + \bar{s}_0)} (\delta_t - \delta_0) (\delta_t - \delta_0) = (s_t - s_0 - (1/n)s_t u u' + (1/n)s_0 u u') (\delta_t - \delta_0) \quad (8.43)$$

By rearranging, we get:

$$r_{s\delta} \sqrt{(s_t - s_0 - \bar{s}_t + \bar{s}_0)(s_t - s_0 - \bar{s}_t + \bar{s}_0)} (\delta_t - \delta_0) (\delta_t - \delta_0) = (s_t - s_0) (\delta_t - \delta_0) - (1/n)(s_t - s_0) u u' (\delta_t - \delta_0) \quad (8.44)$$

Since the sum of the country shares is always equal to one, it follows that:

$$u'(\delta_t - \delta_0) = 0 \quad (8.45)$$

Therefore

$$r_{s\delta} \sqrt{(s_t - s_0 - \bar{s}_t + \bar{s}_0)(s_t - s_0 - \bar{s}_t + \bar{s}_0)} (\delta_t - \delta_0) (\delta_t - \delta_0) = (s_t - s_0) (\delta_t - \delta_0) \quad (8.46)$$

And

$$\Delta S_{s\delta}^A = r_{s\delta} \sqrt{(s_t^A - s_0^A - \bar{s}_t^A + \bar{s}_0^A)(s_t^A - s_0^A - \bar{s}_t^A + \bar{s}_0^A)} (\delta_t^{wj} - \delta_0^{wj}) (\delta_t^{wj} - \delta_0^{wj}) \quad (8.47)$$

By taking into account equation 8.15-8.19 and the definition of s^A , ΔS_s^A may be written as the sum of three effects:

$$\Delta S_s^A = \Delta S_\alpha^A + \Delta S_\beta^A + \Delta S_{\alpha\beta}^A \quad (8.48)$$

$$\Delta S_\alpha^A = \sum_j (\alpha_t^{Aj} - \alpha_0^{Aj}) \beta_0^{wj} \delta_0^{wj} \quad (8.49)$$

$$\Delta S_\beta^A = \sum_j \alpha_0^{Aj} (\beta_t^{wj} - \beta_0^{wj}) \beta_0^{wj} \quad (8.50)$$

$$\Delta S_{\alpha\beta}^A = \sum_j (\alpha_t^{wj} - \alpha_0^{wj}) (\beta_t^{wj} - \beta_0^{wj}) \beta_0^{wj} \quad (8.51)$$

The first effect (ΔS_α^A) is the effect of changes in the micro shares of county A in each market weighted by the commodity composition of each market and the country composition of total world exports in the initial year. Following the argument of the previous section, this is labeled ‘the market share effect’. By the same token, the second effect (ΔS_β^A) is labeled ‘the commodity composition effect’ and the third ($\Delta S_{\alpha\beta}^A$) is

labeled ‘the commodity adaptation effect’. Since the proof and interpretation in the latter case is quite analogous to the previous case, the result of the proof is simply stated here:

$$\Delta S_{\alpha\beta}^A = \sum_j r_{\alpha\beta}^j \delta_0^{w_j} \sqrt{\left(\alpha_t^{A_j} - \alpha_0^{A_j} - \bar{\alpha}_t^{A_j} + \bar{\alpha}_0^{A_j} \right) \left(\alpha_t^{A_j} - \alpha_0^{A_j} - \bar{\alpha}_t^{A_j} + \bar{\alpha}_0^{A_j} \right) \left(\beta_t^{w_j} - \beta_0^{w_j} \right) \left(\beta_t^{w_j} - \beta_0^{w_j} \right)} \quad (8.52)$$

To sum up, the change in the country’s market share in total world exports may be split into five effects:

- ΔS_{α}^A = the market share effect;
 - ΔS_{β}^A = the commodity composition effect;
 - ΔS_{δ}^A = the market composition effect;
 - $\Delta S_{\alpha\beta}^A$ = the commodity adaptation effect;
 - $\Delta S_{s\delta}^A$ = the market adaptation effect;
- so that

$$\Delta S^A = \Delta S_{\alpha}^A + \Delta S_{\beta}^A + \Delta S_{\delta}^A + \Delta S_{\alpha\beta}^A + \Delta S_{s\delta}^A \quad (8.53)$$

8.3.5. Two different points of view: a *new version* of CMS

After describing comprehensively the two fundamental methods of CMS proposed by Leamer and Stern (1970) and Fagerberg and Sollie (1987), we argue that the concepts have different focuses. Leamer and Stern focus on factors underlying the changes in exports $(V_{\bullet\bullet}^{At} - V_{\bullet\bullet}^{A0})$, which also may be represented as the growth of exports, either using Laspeyres index $\left(\frac{V_{\bullet\bullet}^{At} - V_{\bullet\bullet}^{A0}}{V_{\bullet\bullet}^{A0}} \right)$ or Paasche index $\left(\frac{V_{\bullet\bullet}^{At} - V_{\bullet\bullet}^{A0}}{V_{\bullet\bullet}^{At}} \right)$. They conclude that the change (growth) in exports may be caused by (a) the general rise in world exports; (b) the market distribution of country A’s export; (c) the commodity composition of country A’s export; and (d) an unexplained residual (the competitiveness effect).

Meanwhile, Fagerberg and Sollie examine factors causing the changes in shares of export or the change in market share $\left(\frac{V_{\bullet\bullet}^{At}}{V_{\bullet\bullet}^{Wt}} - \frac{V_{\bullet\bullet}^{A0}}{V_{\bullet\bullet}^{W0}} \right)$. They conclude that the change in market share can be caused by (a) the market share effect; (b) the commodity composition effect; (c) the market composition effect; (d) the commodity adaptation effect; (e) the market adaptation effect. Since the market share shows the competitiveness, we argue that Fagerberg and Sollie (1987) actually focus on factors underlying the change in country's competitiveness, not the change in exports as described by Leamer and Stern (1970).

We derive the following *new version* of the CMS method by combining the two methods by Leamer and Stern (1970) and Fagerberg and Sollie (1987) previously discussed. The paragraphs below explain the derivation of the *new version*. The increase in the market share implies the increase in competitiveness. The share of exports of a given country is a function of the country's relative "competitiveness" (Richardson, 1971a):

$$S^A \equiv \frac{V_{\bullet\bullet}^A}{V_{\bullet\bullet}^W} = f\left(\frac{c}{C}\right) \quad (8.54)$$

where $f'(\cdot) > 0$, S^A is the export share of the focus country A; $V_{\bullet\bullet}^A$ and $V_{\bullet\bullet}^W$ are total exports of the focus country A and the world, respectively; c and C are "competitiveness" of the focus country and the world, respectively. Taking the derivative with respect to time (t) of equation (8.54) will result:

$$\frac{dV_{\bullet\bullet}^A}{dt} = S^A \frac{dV_{\bullet\bullet}^W}{dt} + V_{\bullet\bullet}^W \frac{dS^A}{dt} = S^A \frac{dQ}{dt} + V_{\bullet\bullet}^W \frac{df\left(\frac{c}{C}\right)}{dt} \quad (8.55)$$

or

$$\begin{aligned}\dot{V}_{..}^A &= S^A \dot{V}_{..}^W + V_{..}^W \dot{S}^A \\ &= S^A \dot{V}_{..}^W + V_{..}^W df' \left(\frac{\dot{c}}{C} \right)\end{aligned}\quad (8.56)$$

A doted $\left(\dot{} \right)$ variable represents that the derivative of the variable with respect to time (t). In this simplest CMS model, a country's total export growth ($\dot{V}_{..}^A$) is explained by (a) world growth effect ($S^A \dot{V}_{..}^W$) and (b) competitive effect ($V_{..}^W \dot{S}^A$). The former represents the country's growth in exports would have been if it had maintained its export share and the later represents any additional export growth due to changes in relative competitiveness. In term of the discrete time, equation (8.56) can be written as:

$$\Delta V_{..}^A = S^A \Delta V_{..}^W + V_{..}^W \Delta S^A \quad (8.57)$$

Substituting ΔS^A with equation (8.31), a *new version* of the CMS method is obtained:

$$\Delta V_{..}^A = S^A \Delta V_{..}^W + V_{..}^W \left(\Delta S_{\alpha}^A + \Delta S_{\beta}^A + \Delta S_{\delta}^A + \Delta M_{\alpha\beta}^A + \Delta M_{s\delta}^A \right) \quad (8.58)$$

Where

- $\Delta V_{..}^A$ = change of country A's exports
- $S^A \Delta V_{..}^W$ = change in A's exports due to the general rise of world's export
- $V_{..}^W \Delta S_{\alpha}^A$ = the market share effect
- $V_{..}^W \Delta S_{\beta}^A$ = the commodity composition effect
- $V_{..}^W \Delta S_{\delta}^A$ = the market composition effect
- $V_{..}^W \Delta S_{\alpha\beta}^A$ = the commodity adaptation effect
- $V_{..}^W \Delta S_{s\delta}^A$ = the market adaptation effect

If fully written, the equation (8.58) will as follows⁹:

⁹ As stated by Baldwin (1958) and Spiegelglas (1959), this is the case only as long as initial (0) and final year (t) are used in the calculation. If the first effect is calculated by using initial year (0) then the second

$$\begin{aligned}
\Delta V_{..}^A &= S_t^A \Delta V_{..}^W + V_{..}^{W0} \sum_j (\alpha_t^{Aj} - \alpha_0^{Aj}) \beta_0^{Wj} \delta_0^{Wj} \\
&\quad (a) \qquad (b) \\
&+ V_{..}^{W0} \sum_j \alpha_0^{Aj} (\beta_t^{Wj} - \beta_0^{Wj}) \delta_0^{Wj} + V_{..}^{W0} s_0^A (\delta_t - \delta_0) \\
&\quad (c) \qquad (d) \\
&+ V_{..}^{W0} \sum_j (\alpha_t^{Wj} - \alpha_0^{Wj}) (\beta_t^{Wj} - \beta_0^{Wj}) \delta_0^{Wj} + V_{..}^{W0} (s_t^A - s_0^A) (\delta_t^A - \delta_0^A) \\
&\quad (e) \qquad (f)
\end{aligned} \tag{8.59}$$

Equation (8.59) implies that the change in country A's exports can be caused by (a) the general changes in the world's export, (b) the market share effect, (c) the commodity composition effect, (d) the market composition effect, (e) the commodity adaptation effect, (f) the market adaptation effect.

There are three main differences between the *new version* (59) and Leamer and Stern's (1970) version. *First*, the problem of subjectivity in choosing the market distribution effect or the commodity composition effect to be calculated first in the CMS version by Leamer and Stern(1970) is avoided in this *new version*. *Second*, the *new version* gives six effects instead of Leamer and Stern's four effects. In the *new version* the market adaptation and commodity adaptation effects are introduced instead of Leamer and Stern's residual effect. Clear economic interpretation of the two effects is also given.

effect must necessarily be calculated by using final year (t), vice versa. This implies

$$V_{..}^{At} - V_{..}^{A0} = \frac{V_{..}^{A0}}{V_{..}^{W0}} (V_{..}^{Wt} - V_{..}^{W0}) + V_{..}^{Wt} \left(\frac{V_{..}^{At}}{V_{..}^{Wt}} - \frac{V_{..}^{A0}}{V_{..}^{W0}} \right) \text{ or } V_{..}^{At} - V_{..}^{A0} = \frac{V_{..}^{At}}{V_{..}^{Wt}} (V_{..}^{Wt} - V_{..}^{W0}) + V_{..}^{W0} \left(\frac{V_{..}^{At}}{V_{..}^{Wt}} - \frac{V_{..}^{A0}}{V_{..}^{W0}} \right).$$

Accordingly, Equation (8.59) alternatively can be written as:

$$\begin{aligned}
\Delta V_{..}^A &= S_0^A \Delta V_{..}^W + V_{..}^{Wt} \sum_j (\alpha_t^{Aj} - \alpha_0^{Aj}) \beta_0^{Wj} \delta_0^{Wj} \\
&\quad (a) \qquad (b) \\
&+ V_{..}^{Wt} \sum_j \alpha_0^{Aj} (\beta_t^{Wj} - \beta_0^{Wj}) \delta_0^{Wj} + V_{..}^{Wt} s_0^A (\delta_t - \delta_0) \\
&\quad (c) \qquad (d) \\
&+ V_{..}^{Wt} \sum_j (\alpha_t^{Wj} - \alpha_0^{Wj}) (\beta_t^{Wj} - \beta_0^{Wj}) \delta_0^{Wj} + V_{..}^{Wt} (s_t^A - s_0^A) (\delta_t^A - \delta_0^A) \\
&\quad (e) \qquad (f)
\end{aligned}$$

Third, Laspeyres index is employed throughout the calculations. Therefore, lack of comparability due to differences in weighting procedures is avoided (Fagerberg and Sollie, 1987).

8.4. Empirical Results and Analysis

To show the empirical relevance of the *new version* (equation (59)), it is applied to examine the export performance of some regions and countries. This chapter applies data on exports by products and destinations published by the United Nations (UN) namely United Nations Commodity Trade Statistics Database (UN-COMTRADE). We use 3-digit SITC Revision 2. This chapter applies the definitions of products by the Empirical Trade Analysis (ETA): (a) *primary* products (83 SITC), (b) *natural resource*-intensive products (21 SITC), (c) *unskilled labor*-intensive products (26 SITC), (d) *technology*-intensive products (62 SITC), (e) *human capital*-intensive products (43 SITC), (f) *others* (5 SITC). (See Appendix A.5.2 for detailed classifications).

This research defines the export destinations consisting of the ASEAN5 (Singapore, Indonesia, Malaysia, Thailand and the Philippines), the North East Asia (Japan, Korea, China and Hong Kong), the European Union (EU: all 27 countries) and the North American Free Trade Area (NAFTA: the US, Canada and Mexico), and the rest of the world (Rest). The period of analysis covers periods 1980-1985, 1985-1990, 1990-1995, 1995-2001, and 2001-2006. The periods of analysis is chosen by considering the fact that the steady increase in the world exports during 1976-1995 was followed by the slower increase during 1995-2001 and by the sharper increase during 2001-2006 as mentioned in Section 8.2.

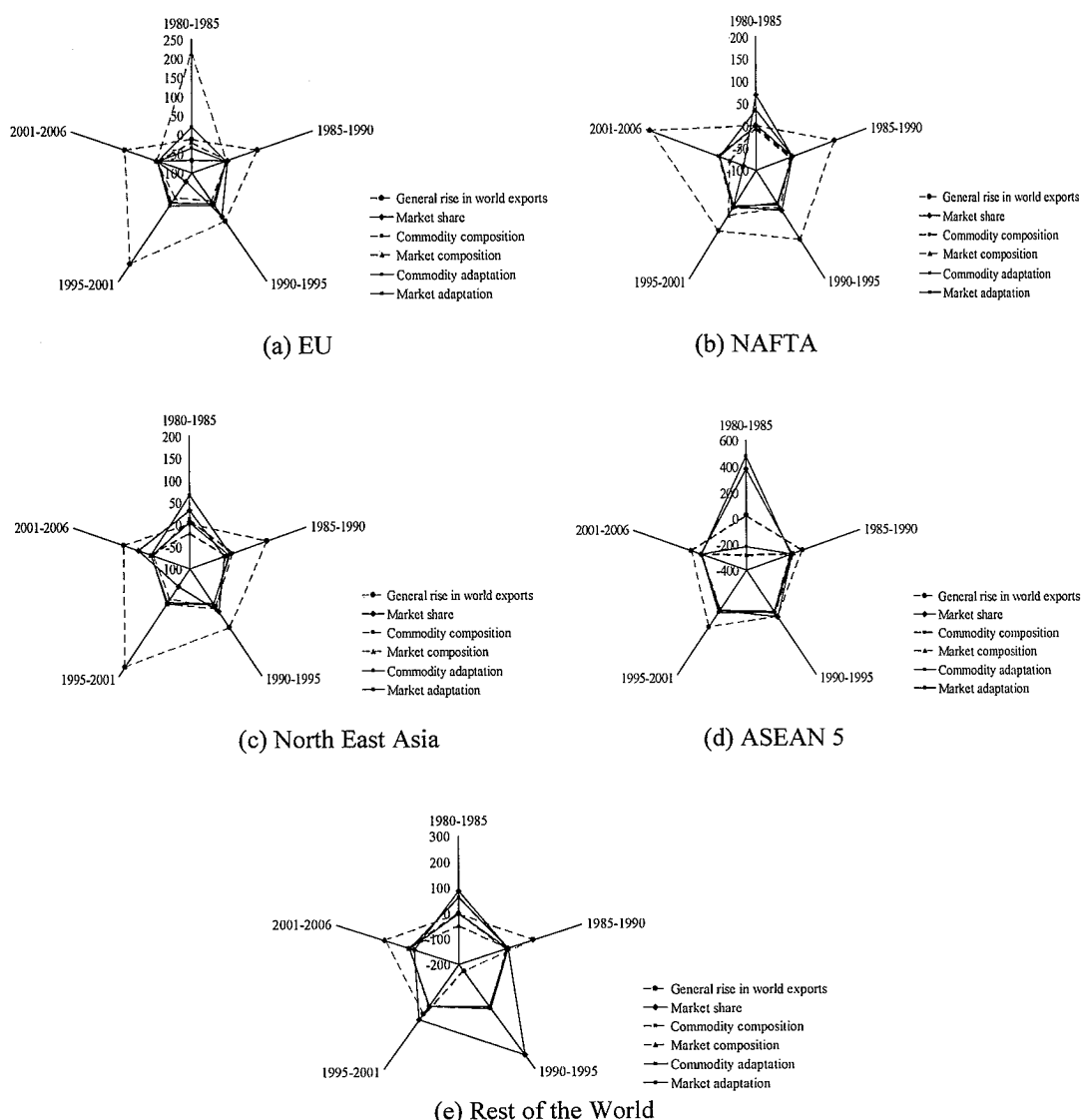
Table 8.1 The CMS Analysis: Some Regions

Regions	Change in Export (\$ US)	Due to (%)					
		General rise in world exports	Market share	Commodity composition	Market composition	Commodity adaptation	Market adaptation
EU							
1980-1985	-42,312,516,458	-12.5	-66.5	-20.4	213.0	21.0	-34.5
1985-1990	565,284,106,231	92.1	4.1	3.1	1.3	-0.3	-0.3
1990-1995	985,560,243,598	57.2	41.4	0.7	-7.5	1.5	6.7
1995-2001	255,376,839,742	193.9	-73.6	-5.0	-19.8	-0.5	4.9
2001-2006	2,132,901,664,724	95.4	2.3	-0.5	3.0	0.0	-0.2
NAFTA							
1980-1985	229,064,546,136	0.3	69.6	-1.5	-6.0	2.4	35.3
1985-1990	252,110,703,572	113.8	-0.5	-3.9	-7.7	-0.8	-1.0
1990-1995	307,513,205,593	91.0	12.8	3.0	5.7	-4.6	-8.0
1995-2001	296,865,124,180	68.3	0.9	4.6	24.3	-0.9	2.8
2001-2006	524,521,576,640	190.7	-66.2	3.7	-28.2	-0.1	0.1
North East Asia							
1980-1985	83,950,312,412	1.8	31.8	12.7	-18.0	4.3	67.4
1985-1990	245,965,384,960	100.0	-11.2	10.8	-5.0	0.8	4.6
1990-1995	394,419,248,361	64.7	20.5	5.2	11.0	-0.1	-1.3
1995-2001	120,698,001,433	175.7	-51.0	-15.0	-2.7	-1.0	-5.9
2001-2006	1,250,523,763,181	70.4	32.9	-4.4	1.6	-0.9	0.3
ASEAN5							
1980-1985	2,298,828,307	26.6	381.0	-289.9	-281.0	-217.7	480.9
1985-1990	70,278,175,887	95.5	4.7	-16.5	16.7	7.1	-7.5
1990-1995	172,246,567,596	41.4	46.6	-4.1	15.1	3.4	-2.4
1995-2001	51,798,578,630	142.8	-14.8	7.0	-25.8	4.4	-13.7
2001-2006	348,114,593,172	90.7	7.0	-0.9	2.6	0.4	0.1
Rest of the world							
1980-1985	-69,534,603,370	-17.9	-165.5	97.5	317.8	2.1	-134.0
1985-1990	1,296,565,534,480	96.3	8.4	-1.7	-6.1	0.0	3.0
1990-1995	1,206,765,438,781	109.4	3.2	0.1	-15.4	-0.8	3.5
1995-2001	1,001,811,398,856	89.7	5.5	2.9	0.3	0.4	1.3
2001-2006	3,832,094,025,864	108.5	-10.1	1.0	0.5	0.6	-0.5

Source: UN-COMTRADE, *author's calculation*

Table 8.1 and Figure 8.5 show the CMS analysis for the five regions i.e. the EU, the NAFTA, the North East Asia, the ASEAN5 and the rest of the world. It is clearly shown that during the period 1980-1995, the exports of all regions were not caused by the general rise in world exports. The increases of exports were caused by other factors. In the case of the EU, the increase in her exports was mainly caused by the market composition effect. Meanwhile, the NAFTA's increasing exports were mainly due to the market share and market adaptation effects. The increase in exports of the North East

Asian region was largely caused by the market adaptation effect. However, in the case of the ASEAN5, all the effects were very high but they are in the opposite direction. It implies that during the period 1980-1985, the export performance of the ASEAN5 was so dynamic.



Source: UN-COMTRADE, author's calculation

Figure 8.5 The CMS Analysis: Some Regions

Since 1985, it is clearly shown that the general rise in world exports has dominated all regions' exports performance. This fact has supported the constant-share

norm. All regions have relied on the general rise in world exports. However, massive proliferation of regionalization and economic integration in the early 1990s caused the increases in intra-regional trade. The EU had been finally completed in 1993 under the Maastricht Treaty after the long process of integration; the NAFTA came into effect in 1994. The ASEAN Free Trade Area (AFTA) was started in 1992 through the Common Effective Preferential Tariff (CEPT). Through trade creation and trade diversion, the realizations of those economic integrations have changed exports destinations, where intra-regional trade played important roles as will be mentioned in Chapter 9. As the results, during the period 1990-1995 the general rise in world exports had smaller portions in affecting those regions' export performance i.e. 57.2% in the EU, 64.7% in the North East Asian region, and 41.4% in the ASEAN5. This was followed by the increase in the market share effect i.e. 41.4% in the EU, 20.5% in the North East Asian region, 46.6% in the ASEAN5. The NAFTA has smaller effect from the general rise in world exports i.e. 68.3% during the period 1995-2001 just after the establishment. This was followed by the increase in the market composition effect.

However, the general rise in world exports has dominated the regions' exports performance since 2001. Again, the constant share norm works. From these figures, it might be firmly asserted that the establishments of economic integration affect the exports performance in such a short period. The increasing intra-regional trade (trade creation and trade diversion) gives impacts on regions' trade performance right after the establishment of economic integration. The constant share norm will work again afterward. The EU, the North East Asia region and the ASEAN5 had decreases in the

market share effect and increases in the general rise of world exports for the period 1995-2005.

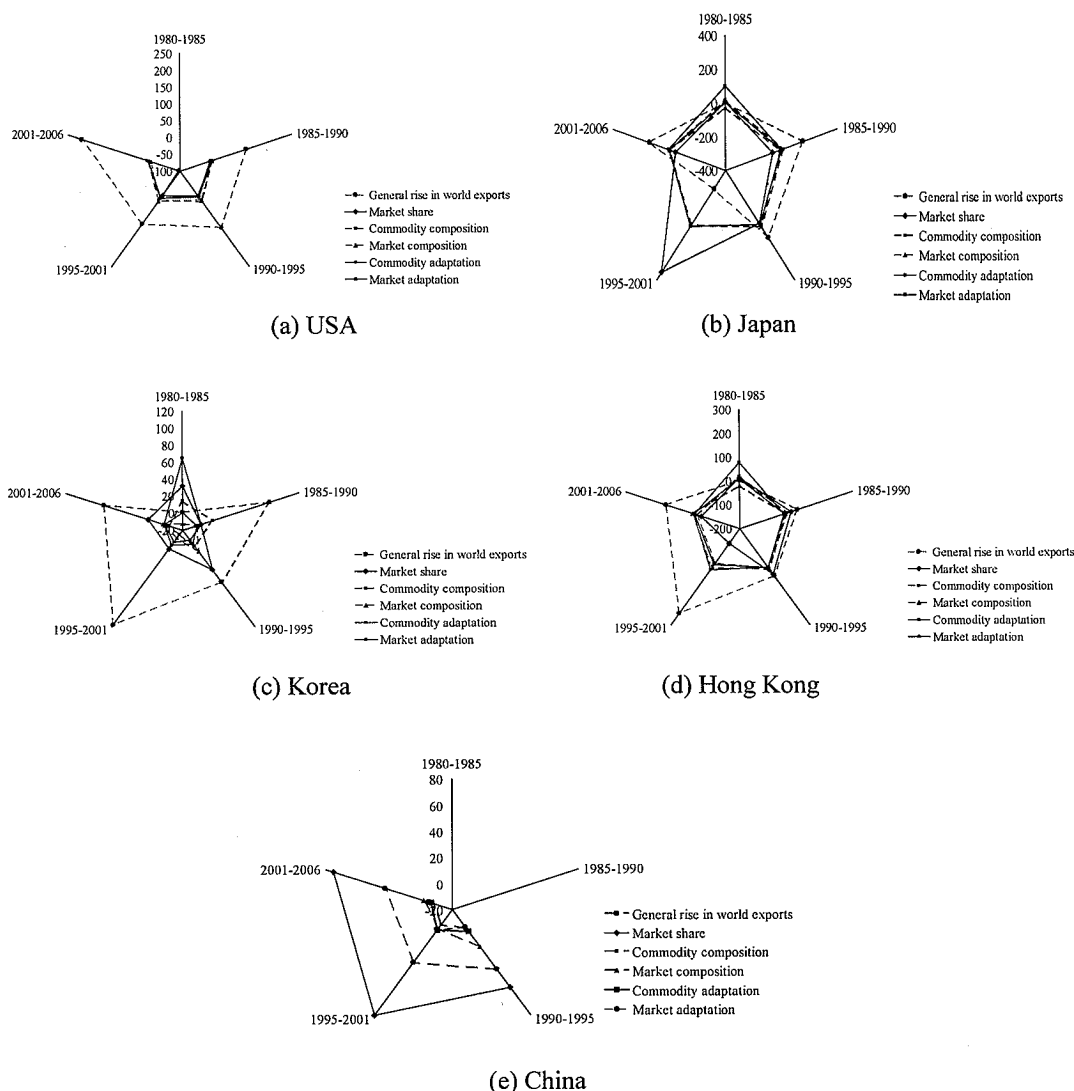
Table 8.2 The CMS Analysis: USA and North East Asian Economies

Countries	Change in Export (\$ US)	Due to (%)					
		General rise in world exports	Market share	Commodity composition	Market composition	Commodity adaptation	Market adaptation
USA							
1980-1985							
1985-1990	186,345,160,224	108.1	-5.8	1.1	-0.9	-0.8	-1.6
1990-1995	190,098,861,680	105.9	-6.7	10.9	6.9	-5.6	-11.5
1995-2001	148,041,156,897	93.6	-11.3	8.5	10.7	-1.8	0.3
2001-2006	306,023,386,745	207.6	-95.8	1.8	-9.5	-1.8	-2.3
Japan							
1980-1985	46,094,286,739	2.6	3.9	14.9	-25.1	2.7	101.0
1985-1990	111,046,176,355	154.5	-60.8	16.3	-8.6	-3.5	2.1
1990-1995	155,989,910,885	94.3	-13.2	10.9	9.1	-0.7	-0.4
1995-2001	-39,573,750,448	-265.9	343.4	9.1	-2.3	8.6	7.1
2001-2006	243,361,449,419	144.1	-43.7	0.6	-5.1	0.6	3.6
Korea							
1980-1985	12,176,616,353	1.4	32.1	14.2	-12.5	0.3	64.5
1985-1990	34,732,846,170	85.1	2.6	16.1	-3.3	-2.9	2.4
1990-1995	60,040,778,560	55.5	37.2	2.9	10.7	-0.2	-6.2
1995-2001	25,378,033,898	117.1	6.3	-14.0	-8.3	1.8	-2.9
2001-2006	175,022,762,746	74.7	21.1	-3.7	3.4	2.4	2.0
Hong Kong							
1980-1985	10,353,759,326	1.8	12.5	18.9	-19.0	8.4	77.4
1985-1990	52,332,449,709	56.0	28.8	12.8	3.8	-0.4	-1.1
1990-1995	91,480,453,948	46.2	36.5	4.2	10.5	0.5	2.1
1995-2001	17,195,377,021	240.2	-122.0	-21.3	2.0	14.4	-13.2
2001-2006	131,602,652,422	126.2	-28.8	-12.1	8.2	5.0	1.5
China							
1980-1985	15,032,307,052						
1985-1990	47,059,084,449						
1990-1995	86,584,288,820	36.8	53.7	-2.6	14.9	0.4	-3.2
1995-2001	117,422,528,269	30.1	80.0	-6.1	-2.2	-0.7	-1.1
2001-2006	702,837,392,423	32.9	74.5	-4.7	2.2	-3.4	-1.5

Source: UN-COMTRADE, *author's calculation*

Table 8.2 and Figure 8.6 show the CMS analyses for the North East Asian countries (Japan, Korea, Hong Kong and China) and the US. The analyses for China in the periods 1980-1985 and 1985-1990 as well as for the US in the period 1980-1985 are not provided due to the unavailability of the data. Similar to the previous analyses for the East Asian region, the exports performances of Japan, Korea and Hong Kong have been

mainly caused by the constant-share norm (general increase in world exports) since 1985 with the smaller portion during 1990-1995.



Source: UN-COMTRADE, *author's calculation*

Figure 8.6 The CMS Analysis: USA and North East Asian Economies

As depicted in Figure 8.3, Japan had significant fluctuations in exports during the period 1990-1995. If we compare the exports value in 1995-2001, there was a decrease in exports by US \$ -39,573,750,448. We have to be careful in interpreting the effects in this case. The general rise in world exports contributed in the increase of Japan's exports by

265.9% and the market composition also positively contributed to it by 2.3%. However, the market share, commodity composition, commodity adaptation and market adaptation effects gave relatively stronger impacts on the decrease of Japanese exports.

Table 8.3 The CMS Analysis: ASEAN5

Countries	Change in Export (\$ US)	Due to (%)					
		General rise in world exports	Market share	Commodity composition	Market composition	Commodity adaptation	Market adaptation
Singapore							
1980-1985	3,470,348,201	5.1	146.0	-8.7	-75.3	-53.1	86.0
1985-1990	29,870,082,224	74.6	21.7	-2.2	8.5	1.0	-3.6
1990-1995	65,547,210,386	41.2	40.2	1.4	11.6	6.0	-0.3
1995-2001	3,490,635,025	804.9	-554.9	114.0	-187.6	-12.3	-64.1
2001-2006	150,047,157,087	70.5	25.3	0.8	2.6	0.1	0.7
Indonesia							
1980-1985	-3,322,178,480	-6.1	38.0	128.5	38.8	26.0	-125.2
1985-1990	7,088,612,816	255.8	-144.2	-76.7	53.9	35.1	-23.9
1990-1995	19,742,639,595	66.7	40.6	-26.0	31.0	1.7	-14.0
1995-2001	10,898,869,340	99.0	41.2	-10.1	-17.3	-0.8	-11.9
2001-2006	44,481,783,995	110.0	-14.4	-4.7	9.0	1.5	-1.4
Malaysia							
1980-1985	2,693,190,560	4.4	228.5	-52.7	-50.3	-82.0	52.2
1985-1990	13,815,331,786	110.4	-9.9	-30.6	30.4	12.8	-13.1
1990-1995	44,324,940,200	34.1	51.7	-5.5	18.8	4.0	-3.1
1995-2001	14,226,337,763	123.2	0.6	9.0	-23.8	4.5	-13.5
2001-2006	72,664,743,931	105.3	-2.3	-1.3	0.6	-0.1	-2.2
Thailand							
1980-1985	616,301,097	9.7	154.6	-63.8	-134.7	-40.5	174.7
1985-1990	15,947,077,204	43.6	58.7	-7.2	5.3	1.7	-2.1
1990-1995	33,370,621,437	35.4	61.4	-3.5	8.4	-1.5	-0.2
1995-2001	8,479,712,660	158.1	-33.5	2.6	-25.1	2.3	-4.4
2001-2006	65,660,993,411	85.9	10.6	-0.3	2.1	0.4	1.2
the Philippines							
1980-1985	-1,158,833,071	-4.6	185.7	24.2	31.9	-13.8	-123.4
1985-1990	3,557,071,857	127.0	-26.0	-3.7	9.6	3.4	-10.2
1990-1995	9,261,155,978	45.3	27.6	8.5	12.2	3.2	3.2
1995-2001	14,703,023,842	28.2	67.7	-4.9	4.1	13.4	-8.6
2001-2006	15,259,914,748	183.1	-81.0	-7.3	-4.2	3.4	5.9

Source: UN-COMTRADE, *author's calculation*

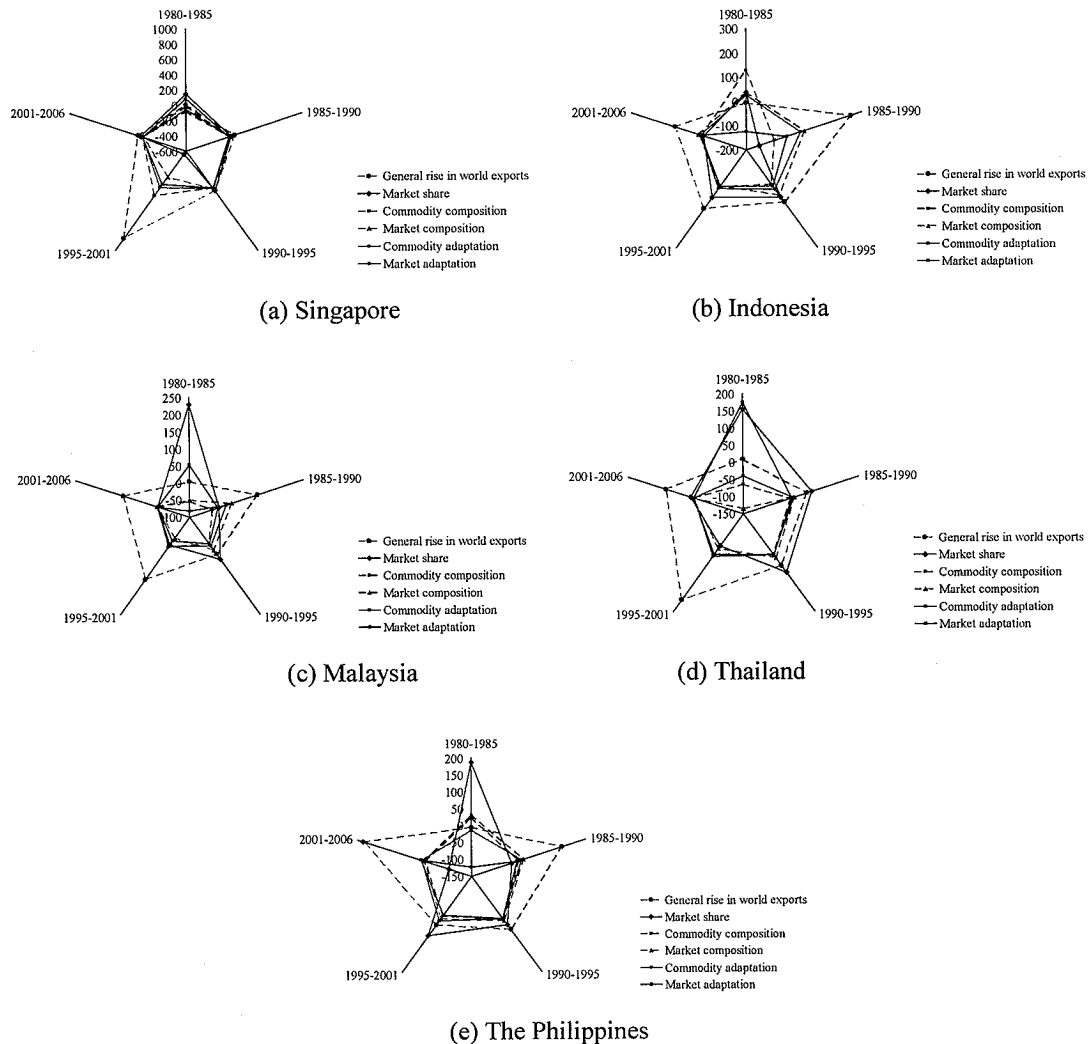
The increase in Chinese exports has different reasons compared with those of the North East Asian countries. The increase in Chinese exports has more relatively caused by the market share effect. For the three periods of observation, the general rise in the

world exports can only explain around 30% of the increase in Chinese exports. More than 50 % of the increase in Chinese exports has been explained by the market share effect.

From Table 8.3 and Figure 8.7, the following two facts could be pointed out. *First*, the constant-norm share strongly applies in the case of the ASEAN5 countries since 1985. It means that only the export performance of the ASEAN5 countries follows the general trend in the world exports since 1985. Only in the period 1980-1985, the constant share norm did not take place significantly. During this period, there were price declines in oil and *primary* products. Many countries including the ASEAN5 countries had to restructure their exports. As a result, the market shares and market adaptation effects took greater portions in pushing up the ASEAN5 countries' exports. In contrast, the commodity composition, market composition and commodity adaptation effects have negative contribution upon the ASEAN5 countries' exports. In the case of Indonesia, she had a decrease in exports during 1980-1985. This decrease was mainly caused by the commodity composition effect, since Indonesian exports strongly relied on oil sectors. For this reason, Indonesia is sometimes called as 'oil economy' (Booth, 1998).

Second, massive proliferation of regionalization and economic integration in the early 1990s caused the changes in direction of trade. The ASEAN Free Trade Area (AFTA) was started in 1992 through the Common Effective Preferential Tariff (CEPT). As mentioned in the above, through trade creation and trade diversion, the realizations of economic integrations – the AFTA in the case of the ASEAN5- have changed exports destinations, which intra-regional trade may take place in the larger portion. As the results, during the period 1990-1995, the general rise in the world exports had smaller portion in affecting the regions' export performance compared with the previous period

1985-1990. In general, the decreasing portion of the effect of general rise in the world exports was followed by the increasing portion of market share and market composition effects.



Source: UN-COMTRADE, *author's calculation*

Figure 8.7 The CMS Analysis: ASEAN5

However, the general rise in world export again have had greater portion since 1995 for all the ASEAN countries excepting the Philippines, which seems to be closely related with the growing NAFTA market. Whether the starting up of the AFTA through the Agreement on the Common Effective Preferential Tariff (CEPT) scheme has

intensified the intra-ASEAN trades is still questionable. Elliott and Ikemoto (2002) find that trade flows were not considerably affected in the years soon after the signing of the AFTA agreement. In addition, the outward-looking policies conducted by the ASEAN countries were also not significantly negatively affected but rather encouraged by the AFTA process. Trung and Hashimoto (2005) find that the AFTA has only produced the trade creation among its members.

8.5. Conclusions

The world exports have increased drastically since the world liberalization has taken place. This chapter analyzes the factors underlying countries' changes in exports using the Constant Market Share (CMS) method. *Firstly*, the CMS concepts are comprehensively described, especially by the works of Leamer and Stern (1970), Richardson (1971a, 1971b) and Fagerberg and Sollie (1987). This research finds that the former two and the later works have different points of view. Leamer and Stern (1970) as well as Richardson (1971a, 1971b) focus their analyses on factors underlying a country's changes in exports. Meanwhile, Fagerberg and Sollie (1987) focuses on factors underlying country's changes in shares in the world export. *Secondly*, we propose the *new version* of the CMS, which breaks down the change in a country's exports into six effects instead of two (by Tyszynski (1951)), four (by Leamer and Stern (1970) and Richardson (1971a, 1971b)), and five (by Fagerberg and Sollie (1987)). The six effects are: (1) general changes in world exports, (2) market share effects, (3) commodity composition effect, (4) market composition effect, (5) commodity adaptation effect, (6) market adaptation effect. *Thirdly*, this research applies the *new version* of CMS to analyze the changes in exports of some regions (the EU, the NAFTA, the North East Asia

and the ASEAN5) and the East Asian countries for the four periods of analysis i.e. 1980-1985, 1985-1990, 1990-1995, 1995-2001 and 2001-2006.

Several conclusions are withdrawn. *First*, the constant share norm seems powerful in explaining a country's exports performance since the mid 1980s. The general rise in world's exports is the main source of the increase of a country's exports. Before the mid 1980s, the pattern of exports was unpredictable as *this research finds out*. For example, during 1980-1985 the decrease of the EU exports was mainly caused by the market share and market adaptation effects. In contrast, the increases of exports of the NAFTA, the North East Asian region and the ASEAN5 were mainly affected by the market share and market adaptation effects. The constant share norm also applies for industrial countries in East Asia excepting China. In the case of China, the general rise in world export can only explain about 30% of the Chinese change in exports. The more dominant factor underlying Chinese exports has been the market share effect i.e. 53% during 1990-1995, 80% during 1995-2001 and 74.5% during 2001-2006. It implies that the general rise in world exports is less powerful in explaining Chinese exports.

Second, the proliferation of regionalism and economic integrations in the beginning 1990-s caused the change in trade pattern. Intra-regional trade has increased significantly. Both trade creation and trade diversion occur. As a result, the power of the constant share norm in explaining a country's exports performance decreased during 1990-1995. As far as intra-regional trade increased, the market share and market composition effect become dominant factors underlying country's exports. However, this research finds that the change in trade pattern only happened in the short period (in the

beginning of economic integration) i.e. 1990-1995 in the cases of the EU, the North East Asia and the ASEAN5 and 1995-2001 in the case of the NAFTA.

Chapter 9

Intra-regional and Intra-industry Trade

9.1. Introduction

The Heckscher-Ohlin model in international trade imposes very strict assumptions¹. Two most important ones are that production of each commodity follows constant returns to scale (CRS) and the markets for commodities and factors are under perfect competition. However, those strict assumptions are difficult to fulfill in the real world. Several new approaches relaxing the assumptions have emerged including the imitation lag hypothesis (Posner, 1961), the flying geese model (Akamatsu, 1961, 1962), the product cycle theory (Vernon, 1966), the Linder theory (Linder, 1961), the gravity model (Tinbergen, 1962) the Krugman model (Krugman, 1979), and the reciprocal dumping model (Brander, 1981; Brander and Krugman, 1983), among others.

The existence of widespread economies of scale can be obtainable from different sizes of plants. Market distortions, which are represented by tariff and non-tariff barriers, still exist widely. Starting from the period 1960-s, the discourse about economies of scale and imperfect competition in the theory of international trade has attracted much attention. Verdoorn (1960), Balassa (1963, 1967) and Grubel (1967), among others, examine the effects of tariff reductions on the pattern of specialization. In this context, the concepts of intra- and inter-industry trade become significant to be considered. The intra-industry

¹ Heckscher-Ohlin model assumes two countries-two homogenous goods-two homogenous factors of production (2x2x2 model), identical technology, constant returns to scale (CRS), different factor intensities, identical tastes and preferences (utility functions), perfectly competitive markets, perfect mobility of factors of production within each country and their perfect immobility between the two countries, zero transportation costs, and no trade barrier or no policy restriction.

trade and inter-industry trade refer to the trade in the same industry and among different industries, respectively.

There have been changes in the patterns of world trade due to the development of technology in transportation and communication (information technology, IT) and much lowered trade barriers. The world has thus become 'borderless'. Transaction costs in international trade have greatly decreased. Searching countries' comparative advantage may not focus only on final products anymore but also on intermediate products. International production fragmentation has become an interesting phenomenon² and led to *de facto* economic integration in East Asia (Fouquin *et al.*, 2006). It is defined as cross-border dispersion of component production/assembly within the vertically integrated production process, where each country specializes in particular stage of the production sequence (Athukorala and Yamashita, 2006). The international production sharing is strongly supported by the belief that the most important determinant of productivity (economies of scale) or unit costs is not the size of plant but how production is organized within a plant of a given size (Verdoorn, 1960).

Having this large number of production sharing activities, East Asian region is sometimes thought to have achieved *de facto* economic integration. Intra-regional trade has increased, especially in parts and components industries. Assembly activities have also increased considerably in the region. Gaulier *et al.* (2006) notes that vertical production networks in the region have formed a 'triangular trade' pattern, where the multinational corporations (MNCs) use China as an export base for the final assembly, in order to export final goods to the United States (US) and the European Unions (EU).

² The alternative names are frequently used such as 'vertical specialization' (Hummels *et al.*, 2001; Yi 2003), 'slicing the value chain' (Krugman 1995).

As far as regionalism, trade liberalization, and economies of scale are concerned, intra-industry trade and intra-regional trade become an important issue in East Asia. Chapter 5 concludes that the de-specialization process and the convergence in patterns of comparative advantages among countries in the region do exist. This empirical conclusion strongly indicates the increasing intra-industry trade in the region. Chapter 7 concludes that the ‘flying geese’ pattern has got recognition, starting with *unskilled labor*-intensive industries in the first round, *human capital*-intensive industries in the second round and *technology*-intensive industries potentially in the next round.

This chapter aims to examine the phenomenon of intra-industry trade and intra-regional trade in East Asia. Specifically, this chapter is addressed to answer two questions. *First*, has the intra-regional trade had increasingly bigger portion than the inter-regional trade in the region? Spirit of regionalism and trade liberalization through preferential trade agreements (PTA) or economic partnership agreements (EPA) among countries can push trade flows in the region. Trade creation and trade diversion considerably affect the trade pattern in the region. *Second*, has the intra-industry trade been stronger in intra-regional trade rather than in inter-regional trade?

The rest of this chapter is organized as follows. Section 9.2 describes the methodology. Section 9.3 shows trends in intra-regional trade and inter-regional trade in East Asia, the European Union (EU), the North American Free Trade Area (NAFTA) and Rest of the World (ROW). Section 9.4 represents intra-industry trade and inter-industry trade in the East Asian region. Section 9.5 describes several policy implications. Finally, concluding remarks are presented in Section 9.6.

9.2. Methodology

9.2.1. Data

Similar with the previous chapters, this chapter also uses data on exports and imports by commodities, by exporter countries and by importer countries taken from UN-COMTRADE. The classification of commodities follows 3-digit SITC Revision 2, consisting of 239 groups of products (SITC). In analyzing intra- and inter-industry trade in East Asia, we focus on nine exporters as well as importers i.e. Japan, Korea, Hong Kong, China, Singapore, Indonesia, Malaysia, Thailand and the Philippines. The years 1980, 1985, 1990, 1995, 2000 and 2006 are chosen for the same reasons with the previous chapters.

9.2.2. Trade by industry and trade by region

Many researchers have analyzed the phenomena of intra-industry trade. However, they give a little attention on regional aspects. This chapter, therefore, combines trade by industry and trade by region. Trade by industry consists of intra-industry trade (IIa) and inter-industry trade (IIe). Meanwhile, trade by region comprises of intra-regional trade (IRa) and inter-regional trade (IRe). Figure 9.1 shows the four possible combinations i.e. (A) Intra-industry trade in intra-intra regional trade, (B) Intra-industry trade in inter-regional trade, (C) Inter-industry trade in intra-regional trade, (D) Inter-industry trade in inter-regional trade.

Trade Pattern		Trade by REGION	
		Intra-Regional Trade (IRa)	Inter-Regional Trade (IRe)
Trade by INDUSTRY	Intra-Industry Trade (IIa)	A Intra-Industry Trade Intra-Regional Trade (IIa-IRa)	B Intra-Industry Trade Inter-Regional Trade (IIa-IRe)
	Inter-Industry Trade (Ile)	C Inter-Industry Trade Intra-Regional Trade (Ile-IRa)	D Inter-Industry Trade Inter-Regional Trade (Ile-IRe)

Figure 9.1 Trade Pattern: by Industry and by Region

This chapter analyses trade by regions i.e. the East Asia (EA consisting the nine East Asian countries), the European Union (EU) and the North American Free Trade Area (AFTA). The three regions have very big shares in the total world trade. In 2006, almost 83% of the world trade was dominated by the three regions. Intra-regional trade is trade within region; meanwhile, inter-regional trade is trade among countries in the different regions. For example, intra-regional trade of East Asia is trade among countries in East Asia; and inter-regional trade of East Asia is trade between East Asian countries and non-East Asian countries. Their shares in the total exports or imports describe the importance of intra-regional trade and inter-regional trade. The share of intra-regional trade is formulated as follows:

$$S_a = \frac{IR_a}{IR_a + IR_e} * 100 \quad (9.1)$$

The share of inter-regional trade is expressed as follows:

$$S_a = \frac{IR_e}{IR_a + IR_e} * 100 \quad (9.1)$$

Trade by industry consists of intra- and inter-industry trade. This research uses the definition of industry given in the 3-digit SITC Revision 2. At the 3-digit level of

aggregation of the SITC, the resultant aggregates of internationally trade goods roughly match with the definition of ‘industries’, as the concept is used commonly in economic empirical analysis (Grubel and Lloyd, 1975). Accordingly, intra-industry trade is defined as trade in the same industry or in the same group of products given in the SITC. In contrast, inter-industry trade is trade in the different industry or in the different group of products given in the SITC. This research only focuses on intra- and inter-industry of individual countries in East Asia.

9.2.3. The measurement of intra- and inter-industry trade

We apply a formula of inter-industry trade (IIe) and intra-industry trade (IIa) by Grubel and Lloyd (1975)³. However, we consider the export destinations (in the case of exports, X) or the region source of imports (in the case of imports, M) to incorporate intra-regional trade or inter-regional trade (shown by subscript k) in the analysis. Inter-industry trade is defined as net exports or imports of an industry, $|X_{ijk} - M_{ijk}|$. Meanwhile, intra-industry trade is defined as the value of exports of the industry, which is exactly matched by the imports of the same industry, $(X_{ijk} - M_{ijk}) - |X_{ijk} - M_{ijk}|$. It is clear that intra-industry trade is the value of total trade $(X_{ijk} + M_{ijk})$ remaining after subtraction of the net exports or imports of the industry $|X_{ijk} - M_{ijk}|$. For comparative study, it may be useful to describe inter- and intra-industry trade as the share in the total trade. Comparisons

³ There are other measurements of intra-industry trade such as the ones proposed by Verdoorn (1960),

$$U_{ij} = \frac{X_{ij}}{M_{ij}}; \text{ Balassa (1966), } \bar{D} = \left(\frac{1}{n} \right) \sum_i \left[\frac{|X_{ij} - M_{ij}|}{X_{ij} + M_{ij}} \right]; \text{ and Michaely (1962), } \bar{E}_{ij} = \sum_i \left[\frac{X_{ij}}{\sum_i X_{ij}} - \frac{M_{ij}}{\sum_i M_{ij}} \right] \text{ or}$$

$$\bar{F}_{ij} = 1 - \frac{1}{2} \sum_i \left| \frac{X_{ij}}{\sum_i X_{ij}} - \frac{M_{ij}}{\sum_i M_{ij}} \right|; \text{ Linneman (1966), } G_{ij} = \frac{\sum_i (X_{ij} M_{ij})}{\left(\sum_i X_{ij}^2 \sum_i M_{ij}^2 \right)^{\frac{1}{2}}}, \text{ among others. See Grubel and Lloyd (1975)}$$

for the discussion of each measurement.

regarding different industries and countries will be easier. Inter-industry trade is formulated as (in the share of total trade):

$$Ile_{ijk} = \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} * 100 \quad (9.3)$$

and intra-regional trade is expressed as follows (in the share of total trade):

$$\begin{aligned} Ila_{ijk} &= \frac{(X_{ijk} + M_{ijk}) - |X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} * 100 \\ &= \left(1 - \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})} \right) * 100 \end{aligned} \quad (9.4)$$

where i, j and k are industry (SITC), country, the exports destinations or the sources of imports, respectively. As far as this research only focuses on trade in the East Asian region, k can be the East Asian region (intra-regional trade) or the non-East Asian regions (inter-regional trade). X_{ijk} is the country j's value of exports of the industry i to the region k; meanwhile M_{ijk} is country j's value of imports of the industry i from the region k. The indexes of both intra- and inter-industry trade range from 0 to 100 (%). In an industry, when the exports exactly equal imports, Ila is 100. When there are exports but no imports, or vice versa, Ila is 0⁴.

9.2.4. Adjustment of FOB or CIF

In the real world, exports and imports are valued using different measurements. Exports are measured by FOB (free on board), meanwhile imports are measured by CIF (cost, insurance and freight). Theoretically, the values of exports and imports in the intra-regional trade must be the same. For example, the values of exports and imports in the intra-regional trade in the East Asia must be the same. In fact, they are different due to

⁴ Neither exports nor imports exist; the measures Ila and Ile (as portion of total trade) are not defined. However, if it is not described as portion of total trade, the inter-regional trade $|X_{ijk} - M_{ijk}|$ and the intra-regional trade $(X_{ijk} + M_{ijk}) - |X_{ijk} - M_{ijk}|$ are zero.

evaluations made by FOB and CIF. To measure intra- and inter-industry trade, therefore, both exports and imports should be valued consistently in FOB or in CIF (Grubel and Lloyd, 1975). Of the two, FOB valuations are preferable because they measure the value of commodities produced in each industry, excluding the value added by international transporters of the home countries or of a third foreign country.

The UN-COMTRADE records exports in FOB and imports in CIF. Therefore, this research makes adjustments to the imports values from CIF to FOB by employing the procedures as follows⁵. *First*, using data of exports and imports 3-digit SITC for intra-regional trade (trade among East Asian countries) and inter-regional trade (trade between East Asian countries and ROW), the adjustment coefficients are calculated:

$$\alpha_{ikl} = \frac{X_{ikl}}{M_{ikl}} \quad (9.5)$$

where α_{ikl} is the region's k adjustment coefficient industry i for region l. X_{ikl} and M_{ikl} are region k's exports value for region l and import value from region l, respectively. Therefore, if l equals k, α_{ikk} is the adjustment coefficient for intra-regional trade. In contrast, if l is different from k, α_{ikl} is the adjustment coefficient for inter-regional trade.

Second, from the fact that exports are in FOB and imports are in CIF, it is the case that $\alpha_{ikl} = \frac{X_{ikl}}{M_{ikl}} \approx \frac{FOB_{ikl}}{CIF_{ikl}}$ or $CIF_{ikl} \approx \frac{FOB_{ikl}}{\alpha_{ikl}}$. Therefore, country j's (which belongs to region k) imports of industry i from region l can be expressed in term of FOB by applying the following formula:

$$M_{ijl}^{FOB} = \frac{M_{ijl}}{\alpha_{ijl}} \quad (9.6)$$

⁵ As Grubel and Lloyd (1975) do not give any procedure they took in the adjustment from CIF to FOB values, we follow our own procedure. In the case of IMF's adjustment, only the ratios CIF/FOB are given (Appleyard and Field, 2001; IMF, 1996). Some improvements have been made upon the IMF's procedure.

Substituting (9.6) into (9.3) and (9.4), the inter-industry and intra-industry trade in the inter-regional and intra-regional trade are formulated as follows (country j belongs to the region k):

- Inter-industry trade in inter-regional trade:

$$\Pi e_{ijl} = \frac{\left| X_{ijl} - \frac{M_{ijl}}{\alpha_{ikl}} \right|}{\left(X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}} \right)} \times 100 \quad (9.7)$$

- Inter-industry trade in intra-regional trade:

$$\Pi e_{ijk} = \frac{\left| X_{ijk} - \frac{M_{ijk}}{\alpha_{ikk}} \right|}{\left(X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}} \right)} \times 100 \quad (9.8)$$

- Intra-industry trade in inter-regional trade:

$$\Pi a_{ijl} = \left(1 - \frac{\left| X_{ijl} - \frac{M_{ijl}}{\alpha_{ikl}} \right|}{\left(X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}} \right)} \right) \times 100 \quad (9.9)$$

- Intra-industry trade in intra-regional trade:

$$\Pi a_{ijk} = \left(1 - \frac{\left| X_{ijk} - \frac{M_{ijk}}{\alpha_{ikk}} \right|}{\left(X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}} \right)} \right) \times 100 \quad (9.10)$$

9.2.5. The aggregation

All calculation results of (9.7), (9.8), (9.9) and (9.10) for all East Asian countries are presented in the Appendix (A.9.1). Those figures in the Appendix represent intra- and inter-industry trade for all individual industries 3-digit SITC Revision 2. To give simple

analysis, at a given level of aggregation, this research examines the distribution of those figures among all individual industries. The most useful statistic for summarizing the distribution of those individual measures is the mean. We apply the weighted average. The weights are the relative size of exports plus imports of each industry in the total value of exports plus imports of the set of n industries (in this research n=239 SITC). Therefore, in the weighted average (9.7), (9.8), (9.9) and (9.10) are:

- Inter-industry trade in inter-regional trade:

$$\overline{\Pi e_{ijl}} = \frac{\sum_i^n \Pi e_{ijl} (X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}})}{\sum_i^n (X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}})} \quad (9.11)$$

- Inter-industry trade in intra-regional trade:

$$\overline{\Pi e_{ijk}} = \frac{\sum_i^n \Pi e_{ijk} (X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}})}{\sum_i^n (X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}})} \quad (9.12)$$

- Intra-industry trade in inter-regional trade:

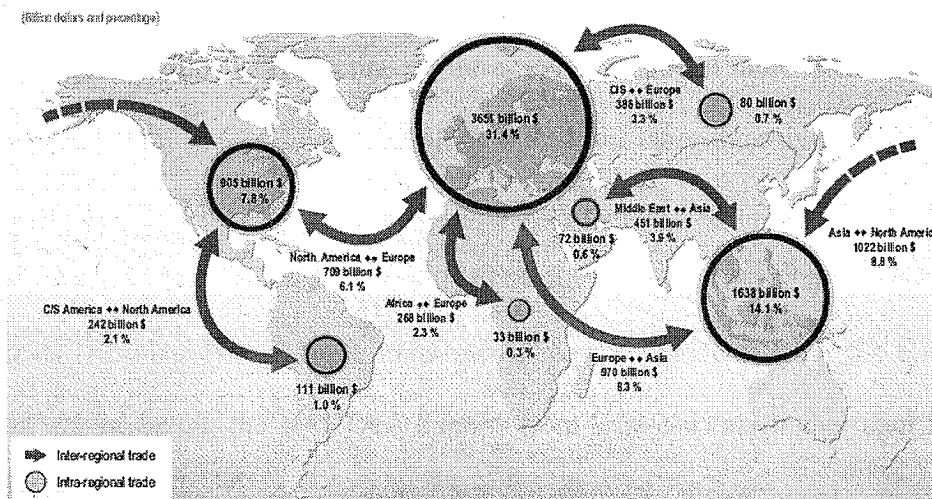
$$\overline{\Pi a_{ijl}} = \frac{\sum_i^n \Pi a_{ijl} (X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}})}{\sum_i^n (X_{ijl} + \frac{M_{ijl}}{\alpha_{ikl}})} \quad (9.13)$$

- Intra-industry trade in intra-regional trade:

$$\overline{\Pi a_{ijk}} = \frac{\sum_i^n \Pi a_{ijk} (X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}})}{\sum_i^n (X_{ijk} + \frac{M_{ijk}}{\alpha_{ikk}})} \quad (9.14)$$

9.3. Trends in the Intra- and Inter-regional Trade

International trade between two countries depends on the complementarities of the two countries. Many empirical researches using the gravity model commonly suggest that the most important trade partners of a specific country are countries with short-geographical distance, large economic distance (gap of GDP), relatively similar language, etc. Therefore, neighbor countries with large number of complementarities are potential trade partners. Geographical distance is still a barrier (Ng and Yeats, 2003). Figure 9.2 shows selected inter- and intra-regional trade flows in 2006. Inter-regional trade flows among North America, Europe and Asia account for only 23% of the world trade. Meanwhile, intra-regional trade flows of the three regions take 53% of the world trade and almost two thirds of the total trade of these regions (WTO, 2007). Europe's intra-regional trade represents the highest share (31%), followed by Asia (14%) and North America (8%). Intra regional trade for other regions (Commonwealth of Independence States, South and Central America, Middle East and Africa) account only for 2.5% of their total exports.



Note: CIS = Commonwealth of Independence States

Source: WTO (2007)

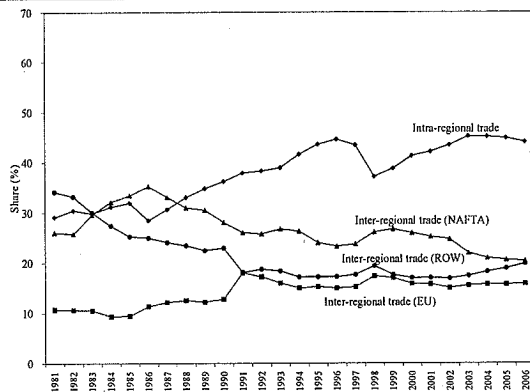
Figure 9.2. Selected Inter- and Intra-regional Trade Flows, 2006

International trade also depends on the cooperation among countries. Regionalism and economic integration have proliferated since 1980-s and 1990-s. The special treatments among member countries in the region, to some extent, encourage intra-regional trade through trade creation and trade diversion (Viner, 1950). Figure 9.3 shows trends in the intra- and inter-regional trade flows (based on exports and imports data) in the East Asian region, the NAFTA, the EU and the rest of the world (ROW). Intra-regional trade in the EU (in both exports and imports) was very high around 66% for 1991-2006. In the early 1980, inter-regional trade flows of the East Asia and the NAFTA were around 70% of their total trade flow, meanwhile intra-regional trade was only around 30%. However, there have been upward trends in the intra-regional trade of the both regions. In exports, the NAFTA had slightly higher increases in intra-regional trade compared with the East Asia. The NAFTA recorded intra-regional trade around 54%; meanwhile the East Asia had intra regional trade about 44% in 2006. However, in the case of imports, the East Asia had higher intra-regional trade (i.e. about 49% in 2006) than that of the NAFTA (i.e. about 34% in 2006).

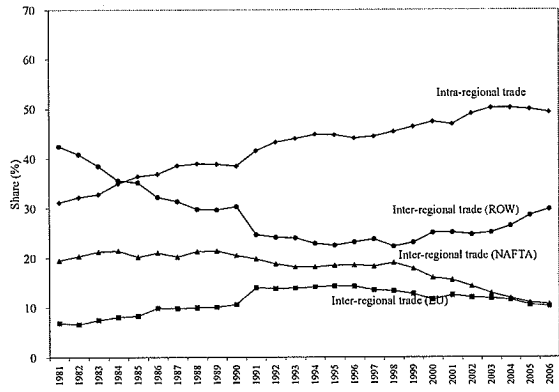
In the case of East Asia and the NAFTA, increasing intra-regional trade flows in exports have been followed by increasing intra-regional trade in imports. Reallocation of industries (especially low level of technology industries, labor-intensive industries) from the US and Japan to Mexico have created higher exports of these products from Mexico to mainly the US. The Japanese investments to the US are mainly ‘anti-trade’ type of investments (Kojima, 1995). These investments required products from the East Asian countries. As the result, the NAFTA’s imports from East Asia are higher than from the EU or ROW.

Trade Flows

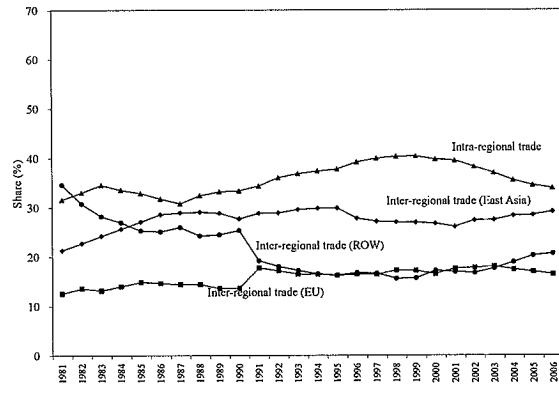
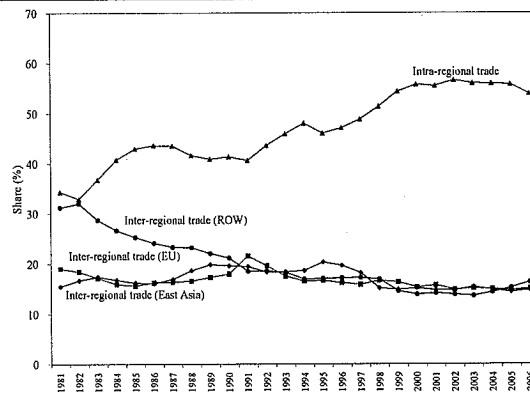
Exports



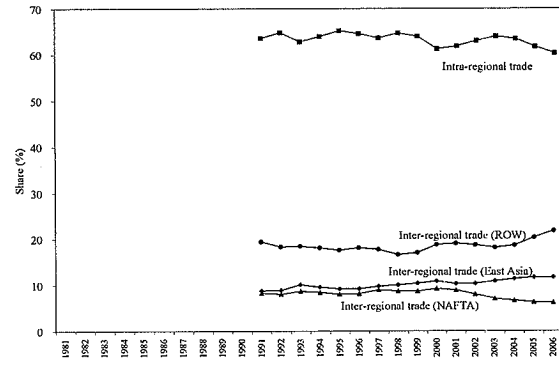
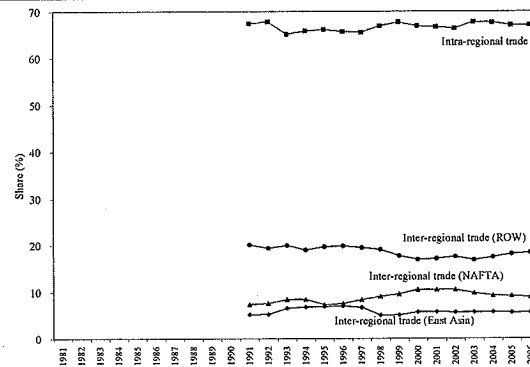
Imports



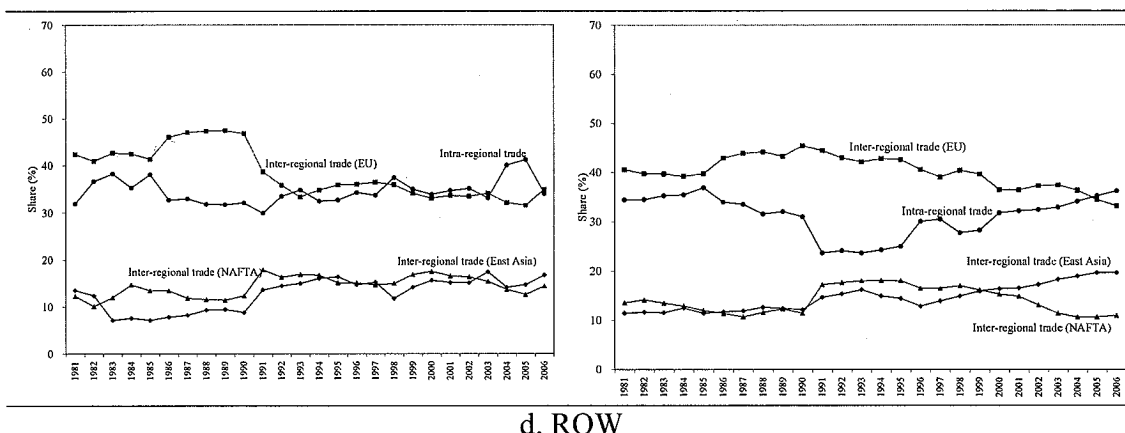
a. East Asia



b. NAFTA



c. EU



d. ROW

Source: UN-COMTRADE. Author's calculation

Figure 9.3 Intra-regional and Inter-regional Trade: East Asia, EU and NAFTA

9.4. Trends in the Intra- and Inter-industry trade

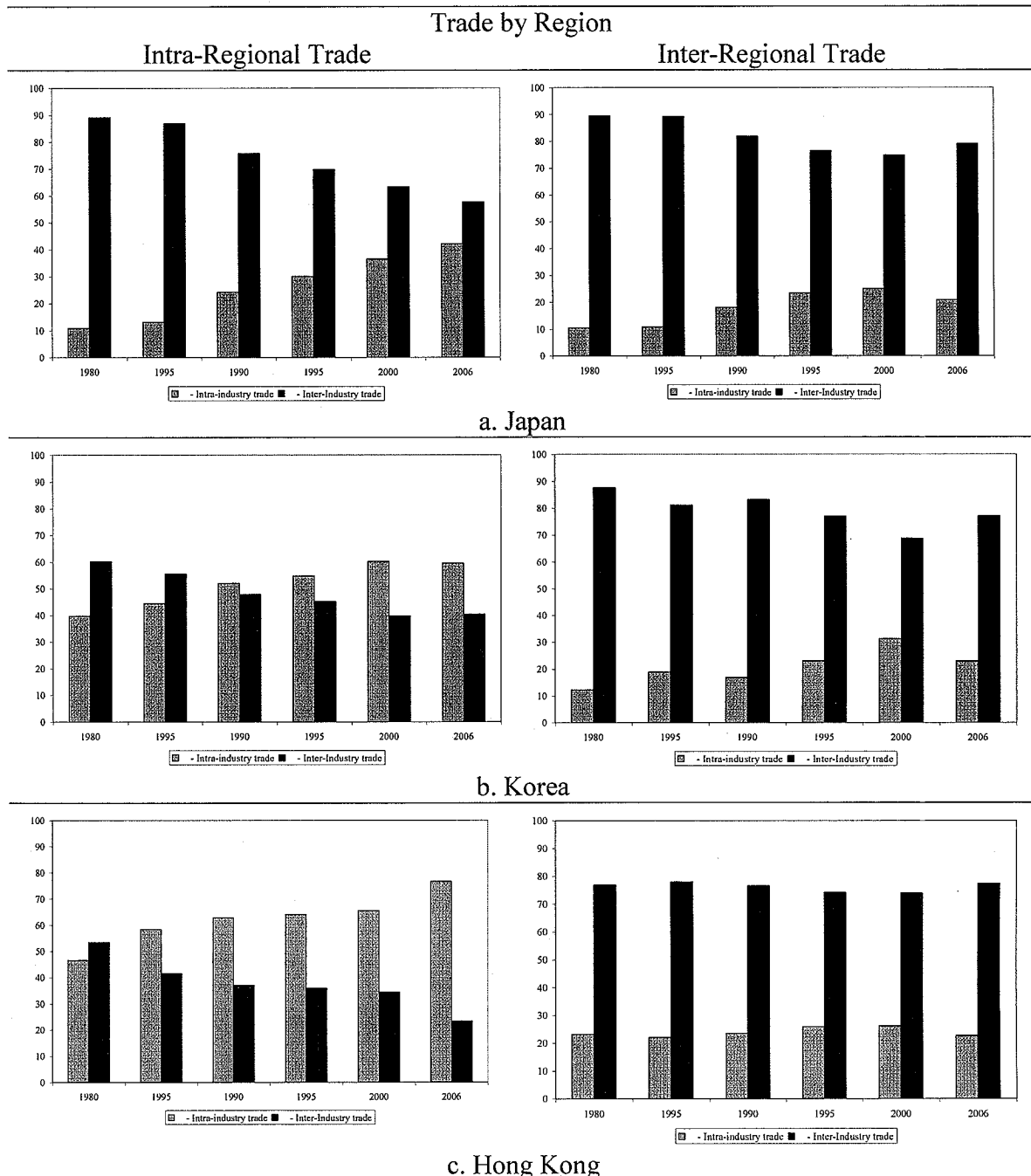
Theoretically, when countries have constant marginal rates of transformation (shown by the straight-line production possibility frontier, PPF) countries will have full specialization i.e. produce only products with comparative advantage and import products with comparative disadvantage. In contrast, when countries have different rates of transformation (shown, for example, by concave PPF), countries might have fraction of specialization i.e. might produce and simultaneously import the same products. It is difficult to find a country with full specialization. Brunei Darussalam might be the case. She specialized only in oil products and imports almost all of traded products.

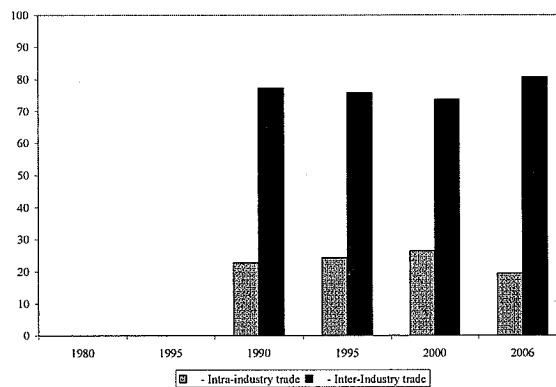
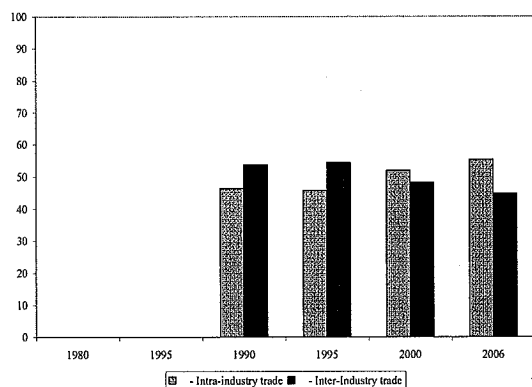
Market forces affect trade patterns. Trade in the different industry (inter-industry trade) might increase due to homogeneity of products, imperfect competition and economies of scale. The homogeneity of products means that products from, say, countries A and B are perfect substitutes. As they are not differentiated, countries A and B will compete with each other on that product; those two countries must eventually determine the product with comparative advantage. Countries will have trade in the

different products. Imperfect competition always means the existence of ‘market power’ (Samuelson and Nordhaus, 2001: p.183). For example in the monopoly market, the supplier has ‘market power’ to set the price of product. Imperfect competition might happen due to government regulations or policy such as trade barriers (tariff or non-tariff barriers) and industrialization of import substitution, etc. To protect the infant industries in the imports substitution strategy, a government commonly impose very high tariff on the imports. The government also gives incentives such as tax exemption, input subsidy, credit, etc. Since domestic markets are supplied by the infant industry, countries are obliged to have inter-industry trade. Imports substitution strategy is commonly implemented by East Asian countries in 1960-1970s (Masuyama, 1997). There are sources of economies of scale in a given industry: size of plants, length of production runs and size of firm (Grubel and Lloyd, 1975). Industry, for example in the technology intensive industry, with very high initial investment will create large size of firms. Then, advanced countries will have comparative advantage in this industry. Meanwhile, less developed countries will have comparative advantage in the industries with low economies of scale. Inter-industry trade happens between advanced countries and less-developed countries.

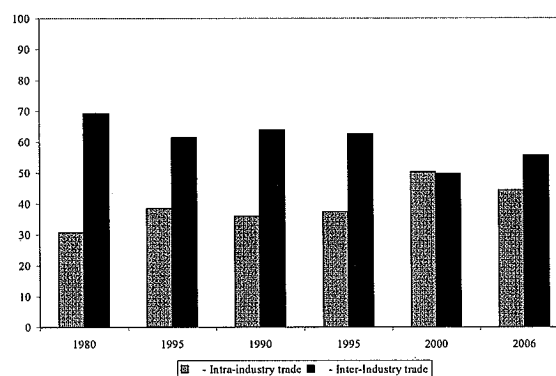
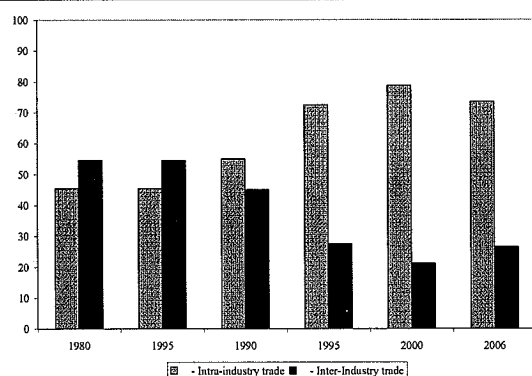
Figure 9.4 shows trends of intra-industry trade and inter-industry trade in both intra-regional trade (left hand side) and inter-regional trade (right hand side) in East Asian countries. From this figure, we can draw the following three conclusions. *First*, in the past, inter-industry trade dominated international trade both in intra-regional trade and in inter-regional trade. It supports the mainstream international economics saying that country specializes in product with absolute and comparative advantage such that inter-industry takes place. The traditional international trade theory, for example Heckscher-

Ohlin-Samuelson (HOS) model, fails to account for intra-industry trade. Therefore, several models were developed in the 1980s to provide theoretical basis for the trade in similar goods.

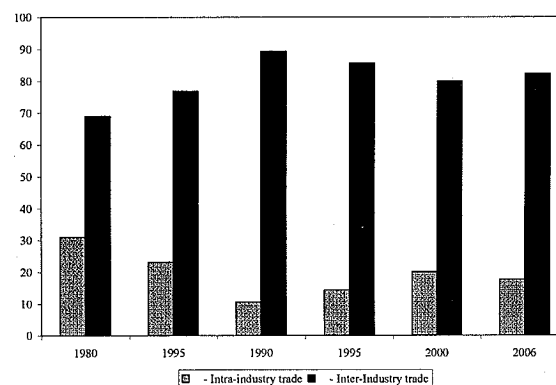
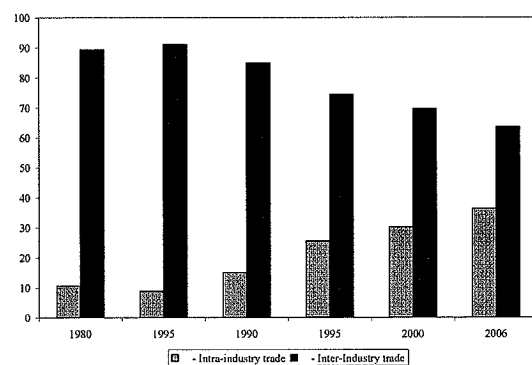




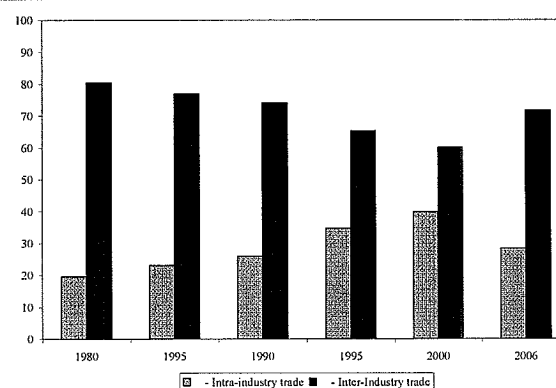
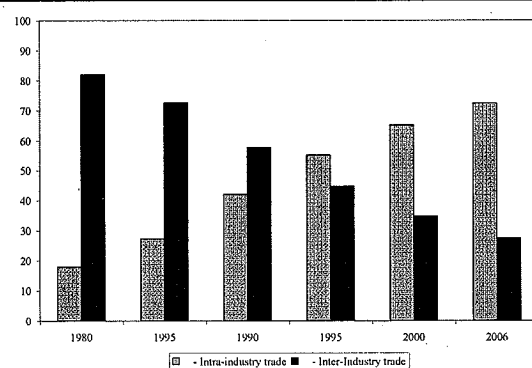
d. China



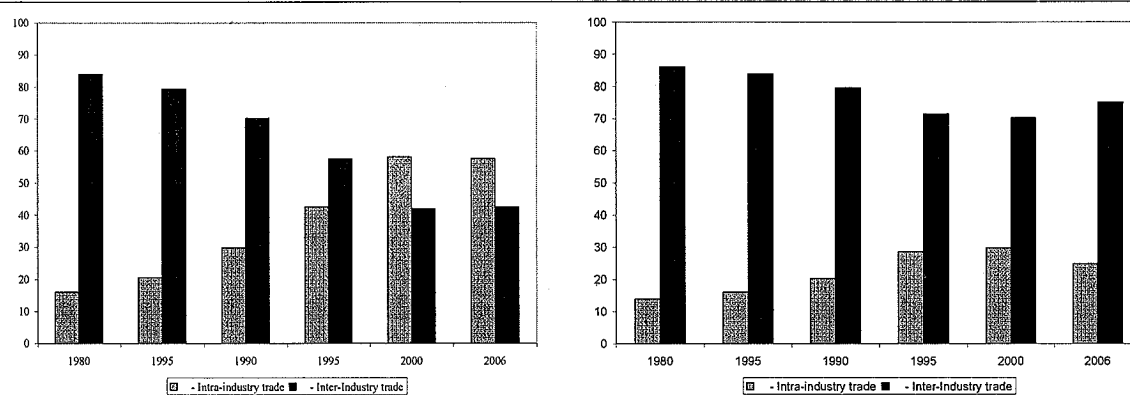
e. Singapore



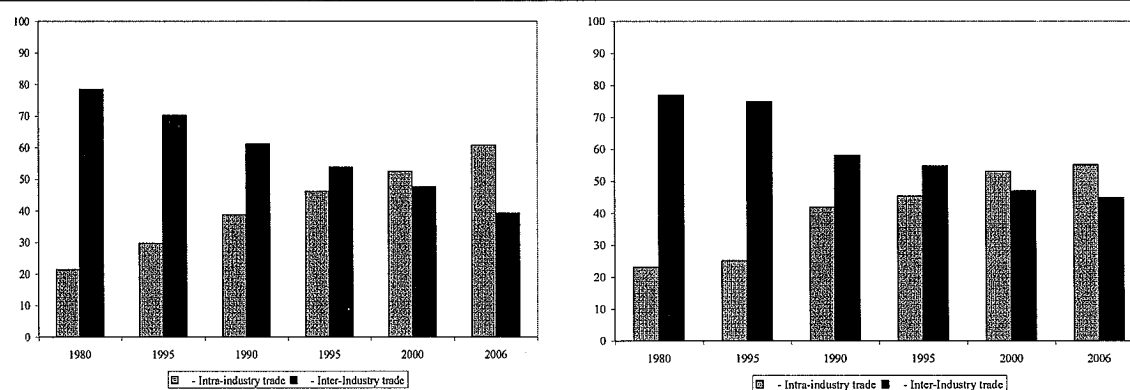
f. Indonesia



g. Malaysia



h. Thailand



i. the Philippines

Source: UN-COMTRADE. Author's calculation

Figure 9.4 Intra-industry and Inter-industry Trade: East Asian Countries

In the real world where trade is constrained by significant tariffs, an industrial core is likely to develop in every country to supply domestic market regardless of the initial allocation of factors. In the past, all East Asian countries implemented 'double track' (Hiratsuka, 2006) strategy i.e. protecting domestic industry and promoting exports. In East Asia, the portion of inter-industry trade has also declined since 1980s. Until 2006, inter-industry trade has still dominated inter-regional trade of the East Asian countries, excepting the Philippines. Inter-industry trade has covered around 70% of inter-regional trade.

Only Singapore and the Philippines have less than 50% of the inter-regional trade covered by inter-industry trade. In the case of the Philippines, intra-industry trade has

bigger portion than inter-industry trade in inter-regional trade since 2000. It might not be very surprising since this country also closely engages in trade with other countries other than East Asian countries, especially the US and the EU. About 53% of the Philippines' exports went to the EU and US in 1995 and it became 35% in 2005. In the case of Japan and Indonesia, the dominance of inter-industry trade still exists. Since Japan as the most industrialized country in the region and as leader in the flying geese formation, Japan has strict specialization in technology intensive industry. Therefore, Japanese inter-industry trade is more dominant than its intra-industry trade in both intra- and inter-regional trade. Strict specialization creates more inter-industry trade than intra-industry trade. The same reason is also applied in the case of Indonesia, which relies mainly on oil exports, *primary* products and *natural resource*-intensive industries.

Second, the increase of intra-industry trade in intra-regional trade is much higher than that in inter-regional trade. It is sometimes claimed that *de facto* economic integration has occurred in East Asia. In an integrated zone (*de facto* integration like East Asia), and when transportation cost are not too high, production is concentrated to benefit from economies of scale. Trade liberalization may cause a significant reallocation of factors across countries in the region. Therefore, intra-industry trade in intra-regional trade increases in the higher rate than that in inter-regional trade. For an example, the European integration was accompanied by an increase in intra-industry trade between member countries. The European integration process shows that the observed increases in similar product exchanges could be a result of this regional economic integration.

Third, intra-industry trade can overtake inter-industry in intra-regional trade in the period of massive liberalization. Hong Kong saw this in 1985, Korea and Singapore in 1990, Malaysia in 1995, and Thailand, the Philippines and China in 2000. The East Asian

countries, as members of the World Trade Organization (WTO), are also required to reduce their trade protections such as tariff and non-tariff barriers (NTB). Trade liberalization is not only encouraged under the most favored nation (MNF) clauses, but also by very active bilateral, multilateral and multi-regional trade arrangements such as ASEAN+China Free Trade Zone, ASEAN+3 (China, Japan, Korea), etc. In this sense, the liberalization will bring efficient allocation of factors. Firms, especially multinational corporations (MNC), will search for locations for their investment with promising comparative advantage and economies of scale. As result, intra-regional trade is more likely increasing.

9.5. Policy Implications

As far as intra-industry trade in intra-regional trade in East Asia is concerned, trade liberalization among countries in East Asia is a very crucial issue. It is believed that trade liberalization can bring more efficient allocation of factors of production. Trade liberalization can be realized through tariff reduction and elimination of non-tariff barriers. Searching countries' comparative advantage and firms' economies of scale is easier in the competitive markets than in the distorted (imperfect) markets. However, Fruedenberg and Paulmier (2006) find that East Asia as a whole is protected region compared with the NAFTA and the EU. Ironically, East Asia discriminate against itself vis-à-vis these two major regions (see Table 9.1).

For All products (last row of Table 9.1), East Asia imposed higher tariff on commodities originating from East Asia itself (7.4%) than that from the NAFTA (5.5%) and the EU (7.2%). The EU imposed lower tariff on commodities originating from the

EU itself (1.9%) than that from the East Asia (7.6%) and the NAFTA (7.7%). Similarly, the NAFTA imposed lower tariff on commodities originating from the NAFTA itself (0.7%) than that from the East Asia (5.7%) and the EU (5.3%). Relatively higher tariffs have been imposed in the sensitive sector i.e. Agriculture, Food and beverages and Light industry. To encourage intra-industry trade, East Asia must reduce tariffs imposed on intra-regional trade since intra-industry trade in intra regional trade in East Asia has become increasingly significant. The tariffs at least must be the same with those of the EU and the NAFTA.

**Table 9.1 Tariff Barrier in EA, EU and NAFTA,
by sector, 2002 (ad valorem tariff equivalent (%))**

Sector	Importer Exporter	EA			EU			NAFTA		
		EA	NAFTA	EU	EA	EU	NAFTA	EA	EU	NAFTA
Agriculture		41.0	29.7	30.9	25.2	6.8	21.4	20.2	15.6	3.9
Light industry		26.8	8.3	12.8	4.9	0.0	2.2	8.7	9.6	0.1
Food and beverages		21.8	26.4	25.8	10.1	5.3	18.1	16.0	15.7	9.4
Textiles and clothing		7.3	7.6	7.8	6.2	0.0	4.9	10.9	9.7	0.1
Transportation machinery		4.6	2.8	8.6	3.4	0.0	6.8	3.3	2.9	0.0
Pottery products		2.9	3.6	4.4	1.4	0.1	2.9	5.7	5.6	0.5
Chemicals		2.4	3.0	2.7	0.8	0.0	4.9	4.1	4.2	0.2
Basic metals		1.8	2.6	2.3	1.5	0.5	4.0	3.0	2.7	0.3
Mining products		1.7	2.6	1.7	0.4	0.0	0.3	1.4	1.8	0.1
General machinery		1.5	1.9	2.5	0.3	0.0	1.3	1.1	1.7	0.0
Electrical machinery		1.4	1.5	2.2	1.0	0.0	1.3	2.5	3.2	0.1
Others		1.4	1.7	2.6	0.6	0.1	0.8	3.2	1.3	0.0
Wood and paper		1.4	1.3	1.5	0.4	0.0	1.0	1.0	1.0	0.0
Precision apparatus		1.2	1.3	2.0	0.3	0.0	1.1	1.3	2.1	0.1
All products		7.4	5.5	7.2	7.6	1.9	7.7	5.7	5.3	0.7

Note: EA = East Asia; EU = European Union (25 countries)

Source: Freudenberg and Paulmier (2006)

The increasing significance of intra-industry trade in intra-regional trade in East Asia indicates competitions among multinational corporations (MNCs) searching for countries' comparative advantages through foreign direct investment (FDI). FDI is affected by location, transaction cost and internalization advantages. Location advantages are determined by domestic market, the availability of suppliers and human resources, factors endowment, transportation cost (infrastructures), and the investment facilities measures (including tax incentive, subsidy, etc) provided by the governments. Transaction cost relates with contracts, which cover identification (i.e. concerning reward

and punishment, dispute, etc), implementation and monitoring. Advantages of doing international business activities are related with the ownership of firms. For instance, Thailand allowed foreign capital participation for exports in 1983, Malaysia and Indonesia followed to relax foreign capital participation in 1986, and the Philippines followed suit in 1991 (Hiratsuka, 2006). The flying geese pattern has been observed in the shifts of comparative advantages in East Asia through FDI. Japanese FDI, which goes to East Asian countries, is more 'pro-trade' type of FDI (Kojima, 1995).

Economic integration can encourage both intra-industry trade and intra-regional trade. However, it might be argued that the direction of economic integration in East Asia somehow different with that of the EU or that of the mainstream theoretical concept of economic integration by Balassa (1961), for example. Theoretically, there are five stages of economic integration i.e. Free Trade Area, Customs Union, Common Market, Economic Union, and Complete Economic Integration (Balassa, 1961). This concept of economic integrations gives more attention to institutional aspects. The EU is one example of *de jure* economic integration. We realize that only the ASEAN is the *de jure* economic integration in East Asia. In fact, *de facto* economic integration in East Asia is getting more significance since it is observed not only in the ASEAN countries but also among dominant players such as Japan, Korea and China. In theory, economic integration is reached if price equalization (factors and output) happens through free mobility of factors. However, *de facto* East Asian economic integration somehow is somehow different from the theory i.e. price equalization might be reached by reallocating the economic activities through FDI. It is true that the intra-industry trade in intra-regional trade in East Asia has significantly increased. However, factor prices, particularly wages, are still far from equalized due to the international immobility of labor. Therefore, in the

author's eyes it might be more appropriate to name it East Asian 'market integration', instead of East Asian economic integration. Whatever name is given to it, the more important thing is that economic co-operation among East Asian countries must be encouraged in the future based on the mutual understandings.

Intra-industry trade might be increased due to the existence of transport, storage and selling cost, differentiated products (with different inputs requirements, different economies of scale, differentiation by style, differentiation by quality), technological-gap, product cycle and foreign processing. Geographic dimension (including infrastructure) of marketing areas is determined by transport cost and the spatial distribution of consumers. Storage and selling cost create time advantages for the same products. For example, a product might be only needed during either summer or winter season. Differentiated product affects intra-industry trade because it creates a certain different image for the consumers. Technological-gap, product cycle and foreign processing are covered in the existence of the flying geese pattern in East Asia. It is understandable that Japan as the lead goose has more dominant inter-industry trade than intra-industry trade in both intra-regional trade and inter-regional trade. As the lead goose, Japan might have a strict specialization, therefore research and development (R&D) on that specialization can create more innovative and differentiated products. Those are the sources of dynamic comparative advantage in the region.

9.6. Concluding Remarks

The proliferation of regionalism has increased concerns over the changes in international trade pattern i.e. from inter-regional trade to intra-regional trade. Meanwhile,

trade liberalization, economies of scale and differentiated products encourage intra-industry trade rather than inter-industry trade. Many researches on trade by region and on trade by industry have been made. However, they analyze both trade by region and trade by industry, separately. This chapter, therefore, considers them simultaneously. *First*, original intra-industry trade and inter-industry trade measures by Grubel and Lloyd (1975) are slightly modified, incorporating regional trade. From this modification, four combinations are as follows: (1) intra-industry trade in intra-regional trade, (2) intra-industry trade in inter-regional trade, (3) inter-industry trade in intra-regional trade, and (4) inter-industry trade in inter-regional trade. *Second*, the modified analytical measures are then applied in the case of East Asian countries.

Three main conclusions are withdrawn. *First*, intra-regional trade increased significantly in the case of East Asia and the NAFTA. *Second*, the more significant intra-industry trade has reduced the dominance of inter-industry trade in East Asia. *Third*, intra-industry trade in intra-regional trade has higher increases than that in inter-regional trade. It suggests that more trade liberalization among East Asian countries is required to increase intra-industry trade in intra-regional trade in the region.

Chapter 10

Purchasing Power Parity Adjusted Non-Traded Goods

10.1. Introduction

The Purchasing Power Parity (PPP) theorem is one of the oldest and most studied topics in international economics. The theorem postulates that the exchange rate between two countries' currencies equals the ratio of the two countries' price level. The variation in prices between the two countries will be matched by the exchange rate; that is, the nominal exchange rate will reflect differences in inflation among countries. The theorem therefore predicts that the fall in a currency's domestic purchasing power (as indicated by an increase in the domestic price level) will be associated with the proportional currency depreciation in the foreign exchange market.

The empirical findings on the PPP theorem are still inconclusive. It is commonly believed that substantial deviations from PPP have occurred since the abandonment of the Bretton Woods system. Many empirical results confirm that the theorem is not a valid hypothesis about the relationship between nominal exchange rates and national price levels in the short term. However, the others have revealed that the theorem may, even in the short term, have considerable validity during very large changes in price levels. In the long term, the theorem has received substantial empirical support. The 'long-term' is used in the literature to indicate that temporary deviation may happen and the deviation will be stationary over a sufficiently long time horizon. In short, although there is little

empirical evidence to support the application in the short-term, many researches have contributed to the evidence of PPP theorem in the long term (Rogoff, 1996).

The PPP theorem might not hold for several determinants. One of the important determinants is productivity differentials that alter equilibrium relative prices between tradable and non-tradable goods. It is commonly called the 'productivity-bias hypothesis' or the Balassa-Samuelson effect after two seminal papers, which have placed the foundation for the structural models of inflation, were published by Balassa (1964) and Samuelson (1964). In addition, many studies from the mid-1980s onwards have also examined whether divergence from PPP and national price levels can be explained in terms of the Balassa-Samuelson effect (e.g. Rogoff, 1992; Asea and Mendoza, 1994). The literature does, however, provide a unanimous agreement on how to interpret the evidence. Froot and Rogoff (1995) note that the Balassa-Samuelson effect may be relevant in the medium-term, and that the spreading of knowledge, together the mobility of physical as well human capital generates a tendency toward absolute PPP over the very long-term. The existing empirical studies on the PPP-adjusted productivity-bias hypothesis have given mixed results. Balassa (1964), Obstfeld (1993), Hsieh (1982) and Ericsson and Irandoust (2004), among others, have supported the productivity bias. Those studies conclude that the deviation of real exchange rate is a function of the productivity-bias. In contrast, studies by Froot and Rogoff (1991), Rogers and Jenkins (1995), Mark and Choi (1997) and Faria and Ledesma (2003), among others, have little or no support for the productivity-bias hypothesis.

In this chapter, we examine the PPP theorem adjusted productivity-bias hypothesis in the cases of nine East Asian countries (Japan, Korea, Hong Kong, China,

Singapore, Indonesia, Malaysia, Thailand and the Philippines). With the various international policies and degrees of liberalization in East Asian countries, whether the PPP theorem adjusted productivity-bias hypothesis holds or not is an interesting topic to be investigated. Specifically, this chapter is addressed to answer two questions. *First*, does PPP not hold in the strong sense in the case of East Asian countries? *Second*, does the Balassa-Samuelson effect play a significant effect in causing deviations away from the PPP theorem?

The rest of this chapter is organized as follows. Section 10.2 reviews the literature on several types of PPP, empirical techniques, previous empirical findings on the PPP testing with different techniques, and Balassa-Samuelson effect. Section 10.3 explains the methodology. Section 10.4 shows the empirical results and analysis, and discusses stationary test of variables, analysis of PPP hypothesis in the nine selected East Asian countries. Here, we use the following three methods; univariate time series, multivariate regression and Johansen multivariate framework of cointegration. Policy implications and conclusions are presented in Sections 10.5 and 10.6, respectively.

10.2. Literature Review

10.2.1. Types of PPP

There are two types of PPP which have been developed over time i.e. absolute PPP and relative PPP. The absolute PPP hypothesis states that the nominal exchange rate between the currencies of two countries (E) should be equal to the ratio of the price levels of the two countries ($\frac{P}{P^r}$). It is formulated as:

$$E = \frac{P}{P^f} \quad (10.1)$$

where E is nominal exchange rate and is measured in units of domestic currency per unit foreign currency, P is the domestic price level, and P^f is the foreign price level. On the other hand, the relative PPP hypothesis states the exchange rate (E) should be proportionate to the price levels of the two countries. It is formulated as:

$$E = \theta \frac{P}{P^f} \quad (10.2)$$

where θ is a constant parameter.

10.2.2. Empirical techniques

Let us review the following five empirical studies on the PPP hypothesis. The empirical techniques in analyzing PPP can be divided into the five types; (1) naive techniques, (2) univariate time series, (3) multivariate cointegration techniques, (4) long-span and panel techniques; and (5) application of non-linear techniques (Officer, 1982; Froot and Rogoff, 1995; Sarno and Taylor, 2002; Calderón and Duncan, 2003). The following paragraphs briefly summarize the empirical techniques.

Naive technique. Very beginning studies apply the following basic linear equation or multivariable regression for testing PPP:

$$e_t = \alpha_0 + \alpha_1 p_t + \alpha_2 p_t^f + u_t \quad (10.3)$$

where e_t is the nominal exchange rate, p_t represents domestic prices and p_t^f denotes foreign price at time t . All variables are in logarithm form. Error term u_t is assumed to be white noise error terms (disturbances). Then, the ordinary least square (OLS) is applied to estimate the coefficients in equation (10.3). Since exchange rate and prices are non

stationary series, the inference obtained from the standard econometric techniques might not be valid. If u_t is non-stationary, any relationship obtained from equation (10.3) is 'spurious' (Gujarati, 1995). Therefore, this technique should be followed in examining the stochastic properties of the error term in equation (10.3).

Univariate Time Series technique. Univariate time series basically examine the behavior of series. Regarding the non-stationary problem in the naive technique, the univariate technique uses unit root and cointegration analysis on Real Exchange Rate (RER). Researchers who apply this technique always test whether RER is stationary or not. Respectively, if e , p and p^f denote the logarithm of foreign exchange, domestic price level and foreign price level, the long run PPP require that the equation $(e + p^f - p)$, which is called Real Exchange Rate, RER, in the logarithm form, must be stationary. In specific time (t), RER can be represented as follows (Enders, 1995):

$$RER_t = e_t + p_t^f - p_t \quad (10.4)$$

The unit root (stationary) test on the RER assumes the validity of the two conditions; firstly, symmetry ($\alpha_1 = -\alpha_2$ in equation (10.3)) and secondly, proportionality ($\alpha_1 = 1$ and $\alpha_2 = -1$ in equation (10.3)).

Multivariate Cointegration Technique. This technique applies cointegration test in examining the existence of long-run relationship between exchange rate and prices. If PPP holds, the sequence formed by the sum $(e + p^f)$ should be cointegrated with the p sequence. Let us denote $v = (e + p^f)$. Long run PPP affirms that there exists a linear combination of the form:

$$v_t = \theta_0 + \theta_1 p_t + u_t \quad (10.5)$$

Error term u_t is stationary and the cointegrating vector such that $\theta_1 = 1$ in equation (10.5). This technique applies not only single equation (Engle and Granger, 1987) but also Vector Autoregression (VAR) (Johansen, 1988).

Long-Span Research and Panel Data. This technique analyzes the behavior RER in the very long term. The main shortcoming of this technique is that the presence of real shocks may shift the RER permanently (Hegwood and Papell, 1998). Panel data is combination of time-series and cross-sectional ones.

Non-Linear Technique. This technique assumes that RER might have some sorts of non-linearity based on the following facts: (i) the slope coefficient of changes in the nominal exchange rate and inflation differential is always unity and it increases with the length of the observation interval, (ii) the PPP link become stronger under hyperinflation than weaken under modest inflation.

10.2.3. Previous findings by several researchers

The PPP literature illustrates mixed results. The empirical evidence might tend to accept the PPP theory in the long run. A variety of data sets and statistical (econometrics) techniques are available, though more recent researches focus on the application of unit root test and tests of cointegration. Abuaf and Jorion (1990) and Glen (1992, 1998) use long time periods, while Frankel and Rose (1996) and Lothian (1997) provide comparison across countries. Cheung and Lai (1993) and Razzaghipour *et al.* (2000) apply Johansen test of cointegration in several countries for a short period. Table 10.1 shows some empirical studies on PPP hypothesis.

Several studies have been made in the cases of East Asian countries. Razzaghipour *et al.* (2000) examine PPP for the South Asian nations i.e. Indonesia, the Philippines, Malaysia, Thailand, and Korea. They find that symmetry and proportionality restrictions have a little support in the unit root tests. However, the Johansen tests suggest that the foreign exchange rate and inflation rates are linked in the long run. By applying cointegration test and using exchange rates and price indices from 'end-quarter' observation over twenty years, Baharumshah and Ariff (1997:143) find that the PPP proposition does not hold for all selected five Asian economies i.e. Indonesia, Malaysia, the Philippines, Singapore and Thailand. The same results are also withdrawn when the Johansen-Juselius multivariate approach is applied.

More recently, Choudhry (2005) analyzes the effect of Asian currency crisis of 1997-1998 on the generalized PPP by using the monthly log of real exchange rates of the currencies of Thailand, Malaysia, Indonesia, the Philippines and Korea vis-à-vis the US dollar and the Japanese yen during 1990-2004. Tests are made for the periods before and after the crisis. Results from the Johansen method of multivariate cointegration confirmed a significant change in the relationship between the real exchange rate before and after the Asian currency crisis.

Table 10.1 Some Empirical Studies on the PPP Hypothesis

Author(s), Year	Sample/Journal	Empirical Method	Main Finding		
			PPP Hypothesis		Explanation
			Hold	Not Hold	
Frenkel (1978)	Economies with high inflation / Journal of International Economics 8: 169-91	Naive technique	√		
Frenkel (1981)	Economies with low and moderate inflation / European Economic Review 16:145-65	Naive technique		√	
Frankel (1986)	USA, annual data, 1969-1984 (dollar-poundsterling)	Univariate technique, OLS, AR(1) estimates	√		Autoregressive coefficient: 0.86
Huizinga (1987)	Carnegie-Rochester Conference Series on Public Policy 27:149-214	Univariate technique	√		
Taylor (1988)	Applied Economics 20:1369-81	Univariate technique		√	
Abauf and Jorion (1990)	10 developed countries, monthly data (1973.1-1987.12)	SUR AR(1) estimates and DF test	√		
Chowdhuri and Sdogati (1993)	Econometrica 28:591-605	Univariate technique	√		
Lothian and Taylor	3 developed countries	DF and PP test. AR(1) recursive	√	√	
Ender (1995)	Two periods: 1973-1986 and 1960-1971 data of Canada, Japan, Germany	DF		√	
Papell (1997)	20 developed countries, CPI monthly and quarterly data, US \$ dollar and German mark, 1973.1-1994.09	ADF and panel unit root test	√		Stronger conclusions when panel is larger, with the mark rather than US dollar, with monthly rather than quarterly data.
Ng and Perron (2001)	18 developed countries, quarterly data, 1973.1-1997.2	ADF and PP test		√	RER~I(1), except for Canada
Wallace and Selley (2005)	20 countries, including: Argentina, Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Japan, Mexico, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK and US	ADF, ADF-GLS, FS	√	√	PPP hold in the case of Argentina, Belgium, Brazil, Finland, Mexico, Sweden, UK, Australia, Germany, and Italy. France and Norway in the intermediate cases (the lower bound is very close to one). Other seven countries do not support PPP
Edison (1987)	USA, annual data, 1890-1978 (dollar-pound sterling)	Multivariate Cointegration technique (ECM)	√		
Taylor (1988)	Applied Economics 20:1369-81	Multivariate Cointegration technique		√	In the long run
Kim (1990)	10 developed countries, CPI and WPI annual data, 1791-1990	PP, Perron (1988), and cointegration test (Johansen 1992), and ECM	√		In general with both CPI and WPI
Edison and Pauls (1993)	Journal of Monetary Economics 31:165-87	PP, Perron (1998) and cointegration test (Johansen, 1992) and ECM	√		In general with both CPI and WPI
Mark (1990)	Journal of International Economics 28:115-36	Multivariate Cointegration technique		√	
Cheung and Lai (1993)	Journal of International Economics 34: 181-92	Multivariate Cointegration technique	√		In the long run
Ender (1995)	Two periods: 1973-1986 and 1960-1971 data of Canada, Japan, Germany	Multivariate Cointegration	√	√	Japan holds, Canada and Germany do not hold

Table 10.1. Continued.....

Culver and Papell (1999)	21 developed countries, quarterly data 1973.1-1996.4	ADS, KPSS and Shin (1994) test; cointegration test (Engle-Granger, Shin-KPSS)	√		RER~I(0) and cointegration among RER, domestic prices, and foreign prices
Razzaghipour et al (2000)	South East Asian Countries: Indonesia, Malaysia, Philippines, South Korea and Thailand; quarterly data 1971.4-1997.2	Multivariate and Johansen test		√	
Morales and Peruga (2002)	7 developed and developing countries, disaggregated price indexes, monthly data, 1975.1-1995.12	Bai and Perron (1998) structural break model and ECM	√		Relative PPP holds in general. Exchange rate adjusts in all sectors. Evidence of instability is larger in cointegration coefficients than in the adjustment coefficients.
Edison (1987)	Journal of Money, Credit and Banking 19:376-87	Long-span study	√		
Hegwood and Papell (1989)	5 developed countries, 2 annual-datasets:1900-72 and 1791-1990	Long-span study, ADF and Bai-Perron test for structural breaks	√		Industrial countries had at least 2 structural breaks during last 100-200 year. Quasi-purchasing power parity. RER~I(0) but with reversion to an occasionally changing mean
Lothian and Taylor (1996)	Journal of Political Economy 104:488-510	Long-span study	√		
Cuddington and Liang (2000)	USA, annual data, 1791-1990 (US dollar sterling, franc-sterling)	Long-span study: ADF and PP test. General-to-specific methodology	√		Dollar-sterling RER is trend stationary or I(1) with MA(5) error, but franc-sterling I(0)
Taylor (2002)	20 developed and developing countries (including Argentina, Brazil and Mexico: except Chile), annual data 1870-1990	Long-span study: Cointegration method and ADF-LS test	√		In the long run
Fujiki and Kitamura (2004)	Unbalanced panel data	Unbalanced panel data	√		PPP conditional on Balassa-Samuelson effect depends on crucially on the selection of models, sample periods and economies used for estimation
Michael, Nobay and Pell (1997)	5 developed countries, WPI monthly (1921.1-1925.5 and annual (1291-1992)	Non linear: ESTAR model			Reject linearity in favor of EAR process
Taylor, Peel and Sarno (2001)	USA, CPI monthly data, 1973.1-1996.12 (dollar-sterling, marc, franc, yen)	Non linear: ESTAR and Logistic ESTAR			Evidence of nonlinear mean reversion
Arghyrou et al (2005)	Czech Republic (1992:1-2003:11); Hungary (1991:6-2003:9), Poland (1991:6-2003:9), Slovakia (1993:3-2004:10) and Slovenia (1992:3-2003:1)	Non linear	√		Balassa-Samuelson effect is not universal

Source: summarized from some publications i.e.: Caderon and Duncan (2003), Enders (1995), Pappel and Prodan (2003), Fujiki and Kitamura (2004), Wallace and Shelley (2005), Razzaghipour *et al* (2000) and Arghyrou *et al* (2005). (A)DF denoted (Augmented) Dickey-Fuller; GLS denotes Generalized Least Square; FS denotes Fisher-Seater (1993) test, OLS denotes Ordinary Least Square; CPI denotes Consumer Price Index; WPI denotes Whole Price Index; EAR is Exponential Autoregressive; ESTAR is Exponential Smooth Transition Autoregressive, PP test denotes Phillips and Perron (1988) test; ECM denotes Error Correction Mechanism; RER denotes Real Exchange Rate; UR-test denotes Unit Root test; VECM denotes Vector Error Correction Model; SUR denotes Seemingly Uncorrelated Residual.

10.2.4. PPP and non-traded goods: Balassa-Samuelson effect

Theoretically, the structural model of inflation states that two economies with different growth rates of productivity will have different rates of inflation, even if the exchange rate does not change. In this case, the PPP hypothesis holds, but it has to be adjusted for the different rates of labor productivity¹. The structural model divides the economy into two sectors i.e. sector producing tradable goods (T) and sector producing non-tradable goods (N). It is assumed that the two sectors have Cobb-Douglas production function. Therefore, the productions of tradable and non-tradable goods are functions of inputs (capital (K) and labor (L)):

$$Q_T = \rho L_T^\phi K_T^{1-\phi} \quad (10.6)$$

$$Q_N = \rho L_N^\varphi K_N^{1-\varphi} \quad (10.7)$$

Labor is assumed to be perfectly mobile between the sectors. It implies nominal wage (ω) equalization:

$$\omega_T = \omega_N \quad (10.8)$$

The profit margin in two sectors is assumed to be constant, and workers are paid the value of their marginal product, which is expressed as:

$$\frac{\partial Q_i}{\partial L_i} = \frac{\omega_i}{P_i} \quad i=T, N \quad (10.9)$$

The ratio of marginal productivities to the ratio of average productivities under Cobb-Douglas production technology can be described as follows:

$$\frac{\partial Q_T / \partial L_T}{\partial Q_N / \partial L_N} = \frac{\phi \frac{Q_T}{L_T}}{\varphi \frac{Q_N}{L_N}} \quad (10.11)$$

¹ This chapter follows Rowland and Oliveros (2003) in deriving PPP adjusted the Balassa-Samuelson effect.

Inserting (10.8) and (10.9) into (10.10) yields:

$$\frac{P_N}{P_T} = \frac{\frac{\partial Q_T}{\partial L_T}}{\frac{\partial Q_N}{\partial L_N}} = \frac{\phi Z_T}{\phi Z_N} \quad (10.11)$$

where labor productivity (average product of labor) Z is defined as output Q divided by L (i.e. $Z_T = \frac{Q_T}{L_T}$ and $Z_N = \frac{Q_N}{L_N}$). Assuming that labor intensities are equal in the two sectors

($\phi = \phi$) and expressing equation (10.11) in the natural logarithm, it becomes:

$$p_N - p_T = z_T - z_N \quad (10.12)$$

where $p_N = \ln P_N$; $p_T = \ln P_T$; $z_T = \ln Z_T$ and $z_N = \ln Z_N$. Parallel with the structural model, it is assumed that the price level in the economy and the weighted average (convex combination) of the price level in the two sectors are equal, that is:

$$p = \tau p_N + (1 - \tau) p_T \quad 0 \leq \tau \leq 1 \quad (10.13)$$

where τ is the weight of non-tradable goods. Similarly, for the foreign economy this equation becomes:

$$p^f = \tau p_N^f + (1 - \tau) p_T^f \quad 0 \leq \tau \leq 1 \quad (10.14)$$

It is assumed that the weight of non tradable τ in the domestic and foreign economies is the same. It is assumed that PPP between prices in the tradable sectors of the two economies, which is stated as $\ln E = \ln \theta \frac{P_T}{P_T^f}$:

$$e = \psi + p_T - p_T^f \quad (10.15)$$

where $\psi = \ln \theta$. Equation (10.15) together with equations (10.13) and (10.14) can be expressed as follows:

$$\begin{aligned} e &= \psi + p - p^f - \tau bse \\ e &= \psi + (\tau p_N + (1 - \tau) p_T) - (\tau p_N^f + (1 - \tau) p_T^f) - \tau bse \end{aligned} \quad (10.16)$$

where

$$bsé = (p_N - p_T) - (p_N^f - p_T^f) \quad (10.17)$$

is called the Balassa-Samuelson effect.

10.3. Methodology

10.3.1. Data

Bilateral exchange rates *yen* (Japan), *won* (Korea), Hong Kong *dollar*, *Yuan* (China), Singapore *dollar*, *rupiah* (Indonesia), *ringgit* (Malaysia), *baht* (Thailand) and *peso* (the Philippines) vis-à-vis the United States dollar (USD) spanning from the first quarter (I) of 1970 to the third quarter (III) of 2007 are taken from *International Financial Statistics* published by the International Monetary Fund (IFS-IMF). However, this research uses the shorter periods for some countries due to availability of the data; China (1992:I-2002:III), Hong Kong (1993:I-2007:III), Singapore (1974:I-2007:III), Indonesia (1971:I-2007:III), Malaysia (1984:I-2007:III) and the Philippines (1993:I-2007:III).

There are three kinds of price indexes commonly employed in the literature. Researches that put great importance to the role of the non-tradable sector use the relatively narrow commodity, export or import price indexes. Other researches rely on the broader price indexes to reflect the price change in the economy, for such indexes as the Labor Cost Index. Those who believe a heavier weight needs to be placed on the tradable sector may use the Wholesale Price Index. For both domestic and foreign prices, this research uses the Consumer Price Index (CPI) as a proxy for the non-tradable goods price index and the Producer Price Index (PPI) as a proxy for the tradable goods price index.

The external price indices are represented by the US's CPI and PPI². Bilateral exchange rates, producer price index and consumer price index are standard choices in the literature (Frankel and Rose, 1996; Li 1999). Data on Balassa-Samuelson effect is calculated by applying equation (10.17). In the case of China, there is no data on CPI but the growth of CPI. To get the CPI data, this research uses the growth of CPI and gives 100 for the period 1991:4. Then, the CPI for the following quarters is calculated. She also does not have PPI, therefore this research applies Industrial Production Index in the case of China.

It is important to consider the Asian currency crisis in 1997. The domestic currencies were extremely depreciated against USD. Rao (2001) notes that from January 1997 to January 1998 *won* and *rupiah* vis-à-vis USD were depreciated by 100% and 500%, respectively. To consider this abnormal depreciation, this research excludes the period 1997:III-1998:IV from the analysis. This is taken in considering also the adjustment process of change in exchange rate regime from the manageable floating to independent floating in some countries, for example, Indonesia in July 1997 and Korea in November 1997.

² Ideally, the external price indices are calculated as weighted geometric averages of the price indices of the main East Asian countries' trading partners, since the US is only one of them. For examples, in 2005, Korean trade flows (exports + imports) were with East Asian countries (Intra-regional trade), European Union (EU) and the United State in the portions of 48%, 15.4%, 14.6% and 22%, respectively (based on Direction of Trade Statistics, DOTS-IMF, 2006). In the case of Indonesia, 67.8%, 12%, 11.5% and 8.7% of Indonesian trade flows were trades with East Asian countries, European Union (EU), the United State (US) and the rest of the world, respectively. Accordingly, a research may use Nominal Effective Exchange Rate (NEER) since it represents the ratio of an index of a currency's period average exchange rate to a weighted geometric average of exchange rates for the currencies of selected countries and the euro area (IMF, 2006). Unfortunately, data on NEER are not available in every country in East Asia. In addition, trades are commonly valued in USD. Isogai *et al.* (2002) finds that currency used for trade settlement in Korea and Indonesia are dominantly USD. In the case of Korea, they were 88% (of exports) and 82% (of imports) using USD; meanwhile 5% (of exports) and 11% (of imports) using Japanese Yen in 1998. In the case of Indonesia, they were 92% (of exports) and 78% (of imports) using USD; meanwhile 3% (of exports) and 8% (of imports) using Japanese Yen in 1998. Therefore, it is nicely consistent if this research uses bilateral exchange rates i.e. domestic currencies vis-à-vis the US dollar.

10.3.2. Estimation

This research analyzes the PPP hypothesis in the case of East Asian countries by using the first three methods as previously explained: univariate time series, multivariate regression and Johansen framework of multivariate cointegration. Basically, the univariate time series method tests whether Real Exchange Rate (RER) stationary series or not. If it is, the PPP hypothesis holds. This research applies Phillips-Perron (Phillips and Perron, 1988) test to analyze stationary of RER.

A multivariable regression model is also applied to analyze the existence of PPP adjusted with Balassa-Samuelson effect. As explained in the previous part, equation (10.16) can be expressed in the econometric model as follows:

$$e_t = \beta_1 + \beta_2(\beta_3 p_{N,t} + (1-\beta_3)p_{T,t}) + \beta_4(\beta_3 p_{N,t}^f + (1-\beta_3)p_{T,t}^f) + \beta_3 bse_t + u_t \quad (10.18)$$

where u_t is error term. This research follows some stages in estimating equation (10.18). *First*, the least squares (LS) method is applied to estimate the coefficients in equation (10.18). *Second*, since exchange rate and prices indexes have commonly periods of unusually large volatility followed by periods of relative tranquility (Enders, 1995; Gudjarati, 1995) this research tests of the existence of Autoregressive Conditional Heteroscedasticity (ARCH) effect, by applying ARCH Lagrange multiplier (LM) test (Engle, 1982) on u_t in equation (10.18). *Third*, once the existence of ARCH effect is concluded, the ARCH method is used to estimate the coefficients in equation (10.18)³. The existence of PPP can be examined by testing the null hypothesis (H_0) $\beta_2=1$, $\beta_3=0$ and

³ An ARCH (k) process can be written as:

$$\text{var}(u_t) = \sigma^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 u_{t-2}^2 + \dots + \alpha_p u_{t-k}^2$$

The generalized ARCH (GARCH(k,h)) process can be expressed as:

$$\text{var}(u_t) = \sigma^2 = \alpha_0 + \sum_{i=1}^k \alpha_i u_{t-i}^2 + \sum_{i=1}^h \phi_i \sigma_{t-i}^2$$

$\beta_4 = -1$. Accepting H_0 means that PPP holds. Meanwhile, standard individual significance test on the null hypothesis (H_0) $\beta_3 = 0$ can be used to analyze the existence of Balassa-Samuelson effect.

The Johansen multivariate framework of cointegration is a method for estimating the cointegrating relationship that exist between a set of variables as well as testing these relationship. This research also uses Johansen cointegration test in investigating whether there is a cointegrating relations between variables in the model i.e. $(e, p_N, p_T, p_N^f, p_T^f)$. Since Balassa-Samuelson effect (bse) is only a linear combination of the existing variables (p_N, p_T, p_N^f, p_T^f) as presented in the equation (10.17), it can not be included in the Johansen cointegration tests otherwise the singular matrix problem will be faced. Evidence for PPP is provided where the Johansen test yields at least one cointegrating vector between the five variables $(e, p_N, p_T, p_N^f, p_T^f)$. The application of this framework on the PPP relationship with the Balassa-Samuelson effect, as stated by equation (10.18), can be briefly explained as follows. A vector autoregressive model with maximum distributed lag length of m is defined (equation system):

$$\begin{bmatrix} e_t \\ p_{N,t} \\ p_{N,t}^f \\ p_{T,t} \\ p_{T,t}^f \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55} \end{bmatrix} \begin{bmatrix} e_{t-1} \\ p_{N,t-1} \\ p_{N,t-1}^f \\ p_{T,t-1} \\ p_{T,t-1}^f \end{bmatrix} + \begin{bmatrix} \mu_{11} & \mu_{12} & \mu_{13} & \mu_{14} & \mu_{15} \\ \mu_{21} & \mu_{22} & \mu_{23} & \mu_{24} & \mu_{25} \\ \mu_{31} & \mu_{32} & \mu_{33} & \mu_{34} & \mu_{35} \\ \mu_{41} & \mu_{42} & \mu_{43} & \mu_{44} & \mu_{45} \\ \mu_{51} & \mu_{52} & \mu_{53} & \mu_{54} & \mu_{55} \end{bmatrix} \begin{bmatrix} e_{t-2} \\ p_{N,t-2} \\ p_{N,t-2}^f \\ p_{T,t-2} \\ p_{T,t-2}^f \end{bmatrix} + \dots + \begin{bmatrix} \delta_{11} & \delta_{12} & \delta_{13} & \delta_{14} & \delta_{15} \\ \delta_{21} & \delta_{22} & \delta_{23} & \delta_{24} & \delta_{25} \\ \delta_{31} & \delta_{32} & \delta_{33} & \delta_{34} & \delta_{35} \\ \delta_{41} & \delta_{42} & \delta_{43} & \delta_{44} & \delta_{45} \\ \delta_{51} & \delta_{52} & \delta_{53} & \delta_{54} & \delta_{55} \end{bmatrix} \begin{bmatrix} e_{t-m} \\ p_{N,t-m} \\ p_{N,t-m}^f \\ p_{T,t-m} \\ p_{T,t-m}^f \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \\ u_{4t} \\ u_{5t} \end{bmatrix} \quad (10.19)$$

In the short version (matrix form), equation (10.19) can be expressed as:

$$Y_t = \sum_{i=1}^m \alpha_i Y_{t-i} + \epsilon_t \quad t=1,2,\dots,T \quad ; m = 1,2,\dots,m \quad (10.20)$$

$$\text{where } Y_t = \begin{bmatrix} e_t & p_{N,t} & p_{N,t}^f & p_{T,t} & p_{T,t}^f \end{bmatrix}^T = \begin{bmatrix} e_t \\ p_{N,t} \\ p_{N,t}^f \\ p_{T,t} \\ p_{T,t}^f \end{bmatrix} \text{ and } \alpha_i \text{ are } 5 \times 5 \text{ coefficient matrices and } u_t \text{ is}$$

a 4x1 vector of independent and identically distributed error terms. The distributed lag length m should be specified long enough for the residual not to be serially correlated. The cointegrating matrix α , which defines the long-term solution of the equation system, is defined as:

$$\begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} & \alpha_{15} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55} \end{bmatrix} + \begin{bmatrix} \mu_{11} & \mu_{12} & \mu_{13} & \mu_{14} & \mu_{15} \\ \mu_{21} & \mu_{22} & \mu_{23} & \mu_{24} & \mu_{25} \\ \mu_{31} & \mu_{32} & \mu_{33} & \mu_{34} & \mu_{35} \\ \mu_{41} & \mu_{42} & \mu_{43} & \mu_{44} & \mu_{45} \\ \mu_{51} & \mu_{52} & \mu_{53} & \mu_{54} & \mu_{55} \end{bmatrix} + \dots + \begin{bmatrix} \delta_{11} & \delta_{12} & \delta_{13} & \delta_{14} & \delta_{15} \\ \delta_{21} & \delta_{22} & \delta_{23} & \delta_{24} & \delta_{25} \\ \delta_{31} & \delta_{32} & \delta_{33} & \delta_{34} & \delta_{35} \\ \delta_{41} & \delta_{42} & \delta_{43} & \delta_{44} & \delta_{45} \\ \delta_{51} & \delta_{52} & \delta_{53} & \delta_{54} & \delta_{55} \end{bmatrix} \quad (10.21)$$

In short:

$$\alpha = -I + \alpha_1 + \alpha_2 + \dots + \alpha_m \quad (10.22)$$

where I is the 5x5 identity matrix. The Johansen procedure now continue with decomposing the matrix α into two $N \times m$ matrices π and η ,

$$\alpha = \pi \eta^T \quad (10.23)$$

The rows of the matrix η now define the cointegrating relationship among the five variables in the vector Y . The rows of the matrix π show how these cointegrating vectors are loaded into each equation in the system. Johansen, furthermore suggest a maximum likelihood estimation procedure to estimate the two matrices π and η together with test procedures to test the number of distinct cointegrating vectors. Linear parameter restriction of causality within the system can be tested by testing the matrix π . (All results of stationary tests and estimations are presented in the Appendix A.10)

10.4 Empirical Results and Analysis

10.4.1. Stationary test

In order to test the PPP hypothesis, it is necessary to identify whether the time series of exchange rate and price indexes are stationary or not. This research applies Phillips-Perron Test (PP). Table 10.2 describes the summary of stationary tests. By using the levels of significance; 1%, 5% and 10%, the PP-statistic is greater than the critical value for all variables. Therefore, the hypothesis H_0 of unit root is accepted and we can conclude that all variables (in the natural logarithm) are non-stationary series.

Table 10.2 Stationary Test (All variables in the logarithm form)

Country	Nominal Exchange Rate				Domestic Consumer Price Index				Domestic Producer Consumer Price Index				Balassa-Samuelson Effect			
	PP-Statistic	Level of Sig.	Critical Value	Conclusion	PP-Statistic	Level of Sig.	Critical Value	Conclusion	PP-Statistic	Level of Sig.	Critical Value	Conclusion	PP-Statistic	Level of Sig.	Critical Value	Conclusion
Japan	-1.806521	1%	-4.0241	Non – Stationary	-2.520662	1%	-4.0241	Non - Stationary	-3.173051	1%	-4.0259	Non - Stationary	-3.285603	1%	-4.0259	Non - Stationary
		5%	-3.4415			5%	-3.4415			5%	-3.4424			5%	-3.4424	
		10%	-3.1451			10%	-3.1451			10%	-3.1456			10%	-3.1456	
Korea	-1.622008	1%	-4.0241	Non – Stationary	-1.161057	1%	-4.0241	Non - Stationary	-1.822948	1%	-4.0241	Non - Stationary	-1.839837	1%	-4.0241	Non - Stationary
		5%	-3.4415			5%	-3.4415			5%	-3.4415			5%	-3.4415	
		10%	-3.1451			10%	-3.1451			10%	-3.1451			10%	-3.1451	
Hong Kong	-2.437252	1%	-4.1420	Non – Stationary	-2.514766	1%	-4.1458	Non - Stationary	-2.100240	1%	-4.1458	Non - Stationary	-1.230877	1%	-3.5625	Non - Stationary
		5%	-3.4969			5%	-3.4987			5%	-3.4987			5%	-2.9190	
		10%	-3.1772			10%	-3.1782			10%	-3.1782			10%	-2.5970	
China	-1.712293	1%	-4.2324	Non – Stationary	-0.027450	1%	-4.2324	Non - Stationary	-2.889510	1%	-4.2324	Non - Stationary	-0.090128	1%	-4.2324	Non - Stationary
		5%	-3.5386			5%	-3.5386			5%	-3.5386			5%	-3.5386	
		10%	-3.2009			10%	-3.2009			10%	-3.2009			10%	-3.2009	
Singapore	-0.482664	1%	-4.0320	Non – Stationary	-1.483607	1%	-4.0259	Non - Stationary	-2.114674	1%	-4.0278	Non - Stationary	-2.351029	1%	-4.0278	Non - Stationary
		5%	-3.4452			5%	-3.4424			5%	-3.4433			5%	-3.4433	
		10%	-3.1473			10%	-3.1456			10%	-3.1461			10%	-3.1461	
Indonesia	-1.786415	1%	-4.0259	Non – Stationary	-1.471201	1%	-4.0250	Non - Stationary	-1.272493	1%	-4.0673	Non - Stationary	-0.019434	1%	-4.0673	Non - Stationary
		5%	-3.4424			5%	-3.4419			5%	-3.4620			5%	-3.4620	
		10%	-3.1456			10%	-3.1453			10%	-3.1570			10%	-3.1570	
Malaysia	0.298155	1%	-4.0648	Non – Stationary	-2.562153	1%	-4.0648	Non - Stationary	-3.019255	1%	-4.0648	Non - Stationary	-4.050430	1%	-4.0648	Non - Stationary
		5%	-3.4608			5%	-3.4608			5%	-3.4608			5%	-4.0648	
		10%	-3.1564			10%	-3.1564			10%	-3.1564			10%	-4.0648	
Thailand	-0.856871	1%	-4.0241	Non – Stationary	-1.141396	1%	-4.0241	Non - Stationary	-1.994113	1%	-4.0241	Non - Stationary	-1.986484	1%	-4.0241	Non - Stationary
		5%	-3.4415			5%	-3.4415			5%	-3.4415			5%	-3.4415	
		10%	-3.1451			10%	-3.1451			10%	-3.1451			10%	-3.1451	
the Philippines	1.109802	1%	-4.1420	Non – Stationary	-2.844005	1%	-4.1420	Non - Stationary	-2.356043	1%	-4.1420	Non - Stationary	-0.304436	1%	-3.5598	Non - Stationary
		5%	-3.4969			5%	-3.4969			5%	-3.4969			5%	-2.9178	
		10%	-3.1772			10%	-3.1772			10%	-3.1772			10%	-2.5964	

Table 10.2 Continue....

Country	Foreign Consumer Price Index				Foreign Producer Price Index			
	PP-Statistic	Level of Sig.	Critical Value	Conclusion	PP-Statistic	Level of Sig.	Critical Value	Conclusion
Japan	-0.755594	1%	-4.0241	Non - Stationary	-2.133977	1%	-4.0241	Non -Stationary
		5%	-3.4415			5%	-3.4415	
		10%	-3.1451			10%	-3.1451	
Korea	-0.755594	1%	-4.0241	Non - Stationary	-2.133977	1%	-4.0241	Non -Stationary
		5%	-3.4415			5%	-3.4415	
		10%	-3.1451			10%	-3.1451	
Hong Kong	-1.680768	1%	-4.1458	Non - Stationary	-0.674490	1%	-4.1458	Non -Stationary
		5%	-3.4987			5%	-3.4987	
		10%	-3.1782			10%	-3.1782	
China	-1.993736	1%	-4.2324	Non - Stationary	-2.174408	1%	-4.2324	Non -Stationary
		5%	-3.5386			5%	-3.5386	
		10%	-3.2009			10%	-3.2009	
Singapore	-2.776486	1%	-4.0320	Non - Stationary	-3.379562	1%	-4.0320	Non -Stationary
		5%	-3.4452			5%	-3.4452	
		10%	-3.1473			10%	-3.1473	
Indonesia	-0.673537	1%	-4.0259	Non - Stationary	-1.955258	1%	-4.0259	Non -Stationary
		5%	-3.4424			5%	-3.4424	
		10%	-3.1456			10%	-3.1456	
Malaysia	-1.117514	1%	-4.0648	Non - Stationary	-1.296548	1%	-4.0648	Non -Stationary
		5%	-3.4608			5%	-3.4608	
		10%	-3.1564			10%	-3.1564	
Thailand	-0.755594	1%	-4.0241	Non - Stationary	-2.794056	1%	-4.0259	Non -Stationary
		5%	-3.4415			5%	-3.4424	
		10%	-3.1451			10%	-3.1456	
the Philippines	-2.004465	1%	-4.1420	Non - Stationary	-0.815231	1%	-4.1420	Non -Stationary
		5%	-3.4969			5%	-3.4969	
		10%	-3.1772			10%	-3.1772	

Source: International Monetary Fund, *International Financial Statistic* (IFS-IMF). Author's Calculation.

10.4.2. Univariate time series analysis

Time series analysis for PPP examines the behavior of an individual Real Exchange Rate (RER) series. This research applies the Phillips-Perron (PP) test to analyze the stationarity of RER. Table 10.3 summarizes the results of the PP-test. The PP-test statistic, level of significance and critical values are presented in columns (2), (3) and (4), respectively.

Table 10.3 PPP Test Based on Real Exchange Rate (RER)

Country (1)	PP test Statistic (2)	Level of Significance (3)	Critical Value (4)	Conclusion	
				RER stationary or non-stationary (5)	PPP Hold or not Hold (6)
1. Japan	-2.316662	1%	-4.0241	Non-stationary	Not Hold
		5%	-3.4415	Non-stationary	Not Hold
		10%	-3.1451	Non-stationary	Not Hold
2. Korea	-1.905949	1%	-3.4767	Non-stationary	Not Hold
		5%	-2.8815	Non-stationary	Not Hold
		10%	-2.5773	Non-stationary	Not Hold
3. Hong Kong	1.766085	1%	-3.5625	Non-stationary	Not Hold
		5%	-2.9190	Non-stationary	Not Hold
		10%	-2.5970	Non-stationary	Not Hold
4. China	-1.481158	1%	-3.6228	Non-stationary	Not Hold
		5%	-2.9446	Non-stationary	Not Hold
		10%	-2.6105	Non-stationary	Not Hold
5. Singapore	-2.337505	1%	-4.0320	Non-stationary	Not Hold
		5%	-3.4452	Non-stationary	Not Hold
		10%	-3.1473	Non-stationary	Not Hold
6. Indonesia	-2.088084	1%	-3.4779	Non-stationary	Not Hold
		5%	-2.8821	Non-stationary	Not Hold
		10%	-2.5776	Non-stationary	Not Hold
7. Malaysia	-0.440427	1%	-4.0648	Non-stationary	Not Hold
		5%	-3.4608	Non-stationary	Not Hold
		10%	-3.1564	Non-stationary	Not Hold
8. Thailand	-1.445808	1%	-3.4767	Non-stationary	Not Hold
		5%	-2.8815	Non-stationary	Not Hold
		10%	-2.5773	Non-stationary	Not Hold
9. the Philippines	-0.174259	1%	-4.1584	Non-stationary	Not Hold
		5%	-3.5045	Non-stationary	Not Hold
		10%	-3.1816	Non-stationary	Not Hold

Source: International Monetary Fund, *International Financial Statistic* (IFS-IMF)., *author's calculation*.

Since PP-test statistic is greater than the critical value of corresponding levels of significance used (1%, 5% and 10%), we accept the hypothesis (H_0) of unit roots and conclude that the series is not stationary. For all level of significance, we can conclude

that RER is not stationary. Therefore, based on univariate time series analysis of RER we can say that PPP hypothesis does not hold in the case of East Asian countries.

10.4.3. Multivariate analysis: Least Squares

The PPP holds when $\beta_2=1$, $\beta_3=0$ and $\beta_4=-1$ constraints are simultaneously fulfilled in the equation (10.18). Therefore, testing the existence of PPP basically means testing whether the requirements $\beta_2=1$, $\beta_3=0$ and $\beta_4=-1$ are fulfilled or not. To carry out the test, we follow four stages. *Firstly*, we estimate the model in the equation (10.18) by using the ordinary least squares (OLS) method. The estimation results are presented in part A of Table 10.4. The sign of estimates matches the PPP theory properly, excepting the case of Japan and Hong Kong.

Secondly, after getting the estimation results, we impose the restrictions or the null hypothesis (H_0) $\beta_2=1$, $\beta_3=0$ and $\beta_4=-1$ on the model to see whether PPP holds or not. We do the Wald-coefficient restriction test with the restrictions $\beta_2=1$, $\beta_3=0$ and $\beta_4=-1$ simultaneously⁴. The results of Wald-test (F-statistic) are presented in part B of Table 10.4. Since the F-statistic is greater than the critical value (at the levels of significance 1% and 5%), we can reject the hypothesis H_0 and conclude that the PPP does not hold in the case of East Asian countries. Korea, China, Singapore, Indonesia, Malaysia, Thailand, the Philippines and Indonesia provide evidence of the weak existence of PPP, which is shown by the positive value of β_2 (coefficient for domestic price) and negative value of β_4

⁴ See Gujarati (1995) for detail explanation about Wald coefficient restrictions test. Basically, the Wald test calculates the test statistic by estimating the unrestricted regression and the restricted regression- without and with imposing the coefficient restrictions specified by the null hypothesis, H_0 . The Wald statistic measures how close the unrestricted estimates come to satisfying the restriction under the null hypothesis. If the restrictions are in fact true, then the unrestricted estimates should come close to satisfying the restrictions.

(coefficient for foreign price) and the violation of the symmetric and proportionality restrictions. In the case of Japan and Hong Kong, the signs of the estimated coefficients were contradictory with the PPP hypothesis.

One reason strongly proposed for the deviation of PPP is the existence of productivity differentials ('productivity-bias hypothesis') between tradable and non-tradable goods. We impose the restriction or the null hypothesis (H_0) $\beta_3=0$ on the model to see whether Balassa-Samuelson effect exists or not. We do the Wald-coefficient restriction test with the restriction $\beta_3=0$. The results of Wald-test (F-statistic) are presented in part B of Table 10.4. Since the F-statistic is greater than the critical value (at the levels of significance 1% and 5%), we can reject the hypothesis H_0 and conclude that the Balassa-Samuelson effect exists in the case of East Asian countries excepting Japan, Hong Kong and the Philippines.

Fourth, we test the classical assumptions i.e. autocorrelation and heteroscedasticity by applying Breusch-Godfrey serial correlation LM test and White Heteroscedasticity test (cross term), respectively. The results are presented in part C of Table 10.4. All countries show autocorrelation and heteroscedasticity, excepting the Philippines that has no heteroscedasticity. ARCH LM test is then made. All countries confirm the existence of ARCH effect.

Table 10.4 Estimation Results and Hypothesis Testing: Least Squares (LS)

	Japan	Korea	Hong Kong	China	Singapore	Indonesia	Malaysia	Thailand	the Philippines
A. Estimation									
Constant (β_1)	4.612866**	6.896222**	2.295216**	4.756599	1.701035**	10.87004**	2.130584**	3.509414**	9.439379**
Coefficient of Domestic Prices (β_2)	-0.991813**	1.091581**	-0.061204**	0.276422**	0.243865**	0.917723**	1.633930**	1.164261**	1.768024**
Coefficient of BSE (β_3)	-433.6979	0.321637*	0.000733	0.171144**	-0.398875**	-0.675738**	-0.259818	-0.344140*	0.088880
Coefficient of Foreign Prices (β_4)	0.999924**	-1.089646**	0.007767	-0.947789	-0.500321**	-1.327416**	-1.823919**	-1.158134**	-3.015229**
R-squared	0.881278	0.901270	0.446698	0.770358	0.843926	0.986907	0.753459	0.821679	0.956374
B. PPP and BSE tests:									
Proportionality and symmetry $H_0: \beta_2=1, \beta_3=0, \beta_4=-1$ (F-statistics)	15912422*	14.65994**	36061.68**	231.0972**	195.3804**	142.9731**	34.04307**	29.68989**	20.13348**
Conclusion	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold
Balassa-Samuelson effect $H_0: \beta_3=0$ (z-statistics)	0.004113	6.611689*	0.006316	69.37227**	18.19620**	94.74031**	2.728694	4.197531*	1.086955
Conclusion	BSE does not exist	BSE exists	BSE does not exist	BSE exists	BSE exists	BSE exists	BSE does not exist	BSE exists	BSE does not exist
C. Classical assumption tests:									
- Autocorrelation ³									
LM test (F-statistic)	233.1635**	1105.146**	51.44209**	9.396010**	305.5572**	172.4317**	150.1523**	811.1989**	25.43390**
Conclusion	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation	Autocorrelation
- Heteroscedasticity ⁴									
White Heteroscedasticity (F-statistic)	5.951518**	7.954037**	10.35660**	6.469656**	8.666113**	13.26724**	13.94169**	4.221749**	1.836909
Conclusion	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	Heteroscedasticity	No Heteroscedasticity
- ARCH LM test									
F-statistic	233.1635**	562.8050**	29.43318**	31.84248**	248.3391**	155.8938**	116.4187**	381.7797**	11.81002**
Conclusion	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect	ARCH effect

Notes:*(**) denotes rejection of the hypothesis at the 5%(1%) level

Source: IFS-IMF, *author's calculation*.

10.4.4. Multivariate analysis: ARCH and GARCH

As indicated by Engle (1982) and Enders (1995), among others, time series like exchange rate and price indexes show commonly periods of unusually large volatility followed by periods of relative tranquility. Our anticipation on this matter by excluding the period of Asian financial crisis from the analysis still can not eliminate this nature of volatility. This is proved by the existence of ARCH effect as previously mentioned. Therefore, we estimate the equation (10.18) by using the ARCH method. Table 10.5 shows the results. The estimations (Part A), give the same sign with the LS estimations, which nicely match the PPP theory, excepting Japan and Hong Kong. Parts B and C of Table 10.5 represent the tests on PPP and the Balassa-Samuelson effect, and the residual test (ARCH LM test and Jarque-Bera Normal distribution test), respectively. The conclusion about the existence of PPP and the Balassa-Samuelson effect tests under the ARCH method are relatively similar with that under the LS method.

Table 10.5 Estimation Results and Hypothesis Testing: ARCH and GARCH¹

	Japan	Korea	Hong Kong	China	Singapore	Indonesia	Malaysia	Thailand	the Philippines
A. Estimation									
Constant (β_1)	4.586916**	7.545136**	2.298815**	2.903789	2.055269**	11.33702**	1.826409**	3.774185**	10.37400**
Coefficient of Domestic Prices (β_2)	-0.988994**	1.235045**	-0.066142*	0.289693**	0.144562**	0.941231**	1.597417**	1.111896**	1.719131**
Coefficient of BSE (β_3)	-327.5470	0.338779***	0.009231**	0.163341**	-0.456586**	-0.619072**	-0.230753	-0.753735**	0.040890
Coefficient of Foreign Prices (β_4)	1.000115**	-1.372841**	0.011792**	-0.545573	-0.468048**	-1.456538**	-1.721524**	-1.160216**	-3.173558**
R-squared	0.864664	0.890716	0.385081	0.752856	0.802600	0.981800	0.771129	0.796995	0.925373
B. PPP and BSE tests:									
Proportionality and symmetry $H_0: \beta_2=1, \beta_3=0, \beta_4=-1$ (F-statistics)	24477739**	71.93126**	17304891**	935.6101**	1536.558**	444.8464**	93.60865**	270.5490**	861.6984**
Conclusion	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold	PPP does not hold
Balassa-Samuelson effect $H_0: \beta_3=0$ (z-statistics)	0.013928	47.16661**	3.941037	241.9555**	56.09233**	473.8601**	4.636085*	42.42311**	1.192457
Conclusion	BSE does not exist	BSE exists	BSE does not exist	BSE exists	BSE exists	BSE exists	BSE exists	BSE exists	BSE does not exist
C. Residual test									
ARCH LM test	1.224178	3.598574	1.612845	0.651231	0.538784	2.426381	0.731372	0.113736	0.548166
F-statistic	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH	No ARCH
Conclusion	effect	effect	effect	effect	effect	effect	effect	effect	effect
Normal distribution test	6.657844**	9.990397***	44.45103***	5.002873	2.7277399	1.117568	2.034470	3.452714	0.155197
Jarque-Bera statistic	Not Normal	Not Normal	Not Normal	Normal	Normal	Normal	Normal	Normal	Normal
Conclusion	distribution	distribution	distribution	distribution	distribution	distribution	distribution	distribution	distribution
Model	GARCH (1,2)	ARCH(1)	GARCH (1,1)	GARCH (1,1)	GARCH (1,1)	ARCH(1)	GARCH (1,1)	GARCH (1,2)	ARCH(1)

Notes:*(**) denotes rejection of the hypothesis at the 5%(1%) level

Source: IFS-IMF, *author's calculation*.

10.4.5. Long-term equilibrium

This research uses Johansen cointegration test in investigating whether there is a cointegrating relations between variables in the model i.e. $(e, p_N, p_T, p_N^f, p_T^f)$. Since Balassa-Samuelson effect (bse) is only a linear combination of the existing variables (p_N, p_T, p_N^f, p_T^f) as presented in the equation (10.17), it can not be included in the Johansen cointegration tests, otherwise the singular matrix problem will be found. Evidence for PPP is provided where the Johansen test yields at least one cointegrating vector between the five variables $(e, p_N, p_T, p_N^f, p_T^f)$.

Table 10.6 shows a summary of the test for the number of cointegrating vector. The test are divided into a number of levels with test statistic for $r=0$ (no cointegrating vectors); $r=1$ (one cointegrating vector); $r=2$ (two cointegrating vectors); $r=3$ (three cointegrating vectors); and $r=4$ (four cointegrating vectors). The test follows the following procedure: if there is no cointegrating vector then none of hypotheses are rejected; if there is one cointegrating vector, $r=0$ is rejected but $r=1$ can not be rejected; if there are two cointegrating vectors, $r=0$ and $r=1$ are rejected but $r=2$ can not be rejected; if there are three cointegrating vectors, $r=0$, $r=1$ and $r=2$ are rejected but $r=3$ can not be rejected; and if there are four cointegrating vectors, $r=0$, $r=1$, $r=2$, and $r=3$ are rejected but $r=4$ can not be rejected. The results in Table 10.6 confirm that there is at least one cointegrating vector for each country and for each sub-sample for 1% or 5% levels of significance for all countries. It means that there are evidences of the long rung relationships between foreign exchange rate and the four price indexes $(e, p_N, p_T, p_N^f, p_T^f)$. This is supportive of the PPP hypothesis in the long run.

Table 10.6. Johansen Test (Trace Statistics) for Number of Cointegrating Vectors

	Japan	Korea	Hong Kong	China	Singapore	Indonesia	Malaysia	Thailand	the Philippines
r=0 (none)	27.7845**	104.3318**	106.1524**	148.6335**	95.81908**	102.8254**	89.92661**	92.37723**	124.6857**
r=1 (at most 1)	68.89705**	54.39773	63.85000*	86.21280**	49.56345	51.95094	55.76370*	44.64629*	80.54729**
r=2 (at most 1)	40.33943*	21.33503	34.56015	47.16040*	26.69840	17.40404	24.70146	20.72133	46.19249*
r=3 (at most 1)	12.36722	7.062148	19.92361	26.04861*	11.38232	6.886515	7.118632	9.654901	27.17620*
r=4 (at most 1)	0.361564	0.477565	8.433609	10.27728	0.000753	0.401800	0.005931	0.144724	11.47110
Cointegration Test Specification	Intercept, Quadratic deterministic trend	Intercept, Quadratic deterministic trend	Intercept, Linear deterministic trend	Intercept, Linear deterministic trend	Intercept, Quadratic deterministic trend	Intercept, Quadratic deterministic trend	Intercept, Quadratic deterministic trend	No intercept, No trend	Intercept, Linear deterministic trend

10.5. Policy implications

The statistical significance of the constant (β_1) in the equation (10.18) as presented in Table 10.5 and 10.6, indicates that some factors other than the Balassa-Samuelson effect also cause the deviation from PPP hypothesis. Theoretically, they include natural barriers (transportation cost), trade barriers (tariffs and other legal restrictions), imperfectly competitive markets and current account imbalances.

The inclusion of non-traded goods in the price indexes is often considered as the primary explanation for the deviations from PPP hypothesis. This research has empirically proved the existence of the Balassa-Samuelson effect in the cases of East Asian countries. Balassa (1964) and Samuelson (1964) argue that because non-tradable goods are included in price indexes, high income countries will have overvalued currencies relative to low income countries. This is caused by the differences in productivity across countries and sectors. Even in East Asian countries, the analysis of total factor productivity (TFP) shows different productivity across inputs (labor and capital) and countries. For example, in the case of Korea the contributions on output growth by labor, capital, human capital, foreign capital and technical progress are 10.5%, 49.8%, 11.4%, 1% and 27.3% for 1969-1990, respectively; meanwhile, in the case of Malaysia, they are 13.5%, 48.7%, 18.7%, 0.6% and 18.5%, respectively (Rao, 2001).

Natural barriers such as seas, mountainous areas and rivers will affect transportation cost (shipping cost, for example). Therefore, the transportation costs may drive a wedge between prices of the same good in different markets. A more important factor than the presence of natural barriers to trade is the trade impediments, i.e. tariffs

and other legal restrictions on trade. Mostly, every country restricts the importation of agricultural goods through the use of tariffs and quotas in order to protect its domestic agriculture sector. Not only agriculture sector, but also other sectors such manufactures are frequently protected by governments. By 2001, China, Indonesia, Malaysia, and the Philippines had average tariffs 17.48%, 8.43%, 10.2% and 7.6%, respectively (Athukorala, 2005a). Meanwhile, Thailand had average tariff 18.48% by 2002 and Vietnam had average tariff 16.65% by 2003.

In the presence of imperfect competition, traded good prices may not be equal across countries. To some extent, suppliers, producers or sellers have a certain degree of market power and then implement price discrimination strategies. Such inequalities will result in deviations from PPP. Markets in developing countries are sometimes criticized to have high protection. Several studies have been made to analyze effective rate of protection (ERP) in the East Asian countries. World Bank (1993) and Fane and Condon (1996) find that Indonesia had ERP 74%, 70%, 59% and 25% in 1975, 1987, 1990 and 1995, respectively. Meanwhile, World Bank (1993) and Panagariya (1994) find that Korea had ERP 40%, 55%, 67%, 80% and 28% in 1970, 1975, 1980, 1985 and 1988, respectively. This will be further elaborated in Chapter 11.

Another reason for the deviation from PPP hypothesis is that exchange rates reflect international trade not only in goods and services, but also in financial assets. The PPP-based approach for evaluating exchange rates considers only the role of international commodity trade. However, trade in assets is arguably just as important as international commodity trade (if not more important) in determining supply and demand for currencies. Cross-country asset flows are, in turn, closely related to positions of trade

balance and imbalance among nations. Current account imbalances can be seen as reflection of discrepancies between domestic investment and savings. As these imbalances generate changes in demand and supply for assets denominated in various currencies, exchange rates might sometimes deviate significantly from PPP.

The deviation from PPP poses important issues for macroeconomic measurement, linkages and policy, such as real income comparisons, interest rate linkages and exchange rate policy. We have the following four implications. *First*, with strict PPP based on the law of one price, the purchasing power of a given income in one country and currency can be compared with the purchasing power of the income of any other country by simply measuring incomes in a common currency. Such deviation from PPP implies biases in comparisons. The real incomes of less developed countries frequently are underestimated when actual exchange rates are used to make the comparison. The low price of non-tradable goods in less developed countries (due to the productivity differential) yields for less developed countries true purchasing power of income significantly above what exchange rate-converted income suggests.

Second, under PPP the real exchange rates, which show a country's competitiveness, are constant. Violating PPP implies the competitiveness, in the cases of East Asian countries, can be intervened by two instruments i.e. exchange rate and domestic price increase. Choices of exchange rate system become an important issue i.e. flexible, peg to composite basket, fixed or other systems. If exchange rate can be maintained stable – regardless of the exchange rate system implemented- then a country might mainly focus on stabilizing domestic prices.

Third, failure of one price for one commodity and the violation of PPP imply welfare loss due to inefficiency associated with payment of different prices by consumers in different locations for the same good. In a country with overvalued domestic currency, consumers pay less for imported products. *Fourth*, the difference between PPP and exchange rate must be eliminated. Overvaluation or undervaluation of a currency might invite the speculative attacks and frequently affect the domestic economic stability. Exchange rate fluctuations in the short period are influenced by news. Domestic political issues, announcements on interest rate changes, ideas of economists on business cycles and so on are factors that may cause exchange rates fluctuations in the short run. PPP, by comparison, describes the long run behavior of exchange rates. The economic forces behind PPP will eventually equalize the purchasing power of currencies. However, it may take many years.

10.6. Concluding Remarks

This research has examined the Purchasing Power Parity (PPP) hypothesis and the Balassa-Samuelson effect in the nine selected Asian countries i.e. Japan, Korea, Hong Kong, China, Singapore, Indonesia, Malaysia, Thailand and the Philippines. Here, we apply three widely used methods: univariate time series of Real Exchange Rate (RER), multivariate regression, and Johansen framework of multivariate cointegration. Three conclusions are withdrawn. *First*, the PPP hypothesis does not hold in the strong sense in the case of all the selected East Asian countries excepting Japan and Hong Kong. *Second*, the relative non-traded goods prices play significant role in causing deviation away from

PPP. *Third*, the Balassa-Samuelson effect does exist in the case of East Asian countries, excepting Japan, Hong Kong and the Philippines. Several factors might cause the deviation from PPP hypothesis, such as non-traded goods (Balassa-Samuelson effect), natural barriers (transportation cost), barriers of trade (tariffs and other legal restrictions), imperfect competition and current account imbalances.

Chapter 11

Structure of Protection in Manufacturing Sector: Indonesian Case Study

11.1. Introduction

Trade and industrialization have been the engine of economic growth for East Asian expansion. Following the ‘flying geese’ (FG) formation (Akamatsu, 1961,1962), Japan had high economic growth based on exports in the 1960s and it was followed by the Newly Industrialized East Asian economies - Hong Kong, Taiwan, Singapore and the Republic of Korea - in the 1970s and 1980s, the ASEAN (Malaysia, Indonesia and Thailand) in the 1980s; and China in the 1990s. To promote exports, the governments of the East Asian countries provided various incentives such as duty rebates, credit facilities with preferential lending rates, duty free imports for manufacturing export products, one-stop services for investment, etc. Later, the governments have implemented more general incentives and instruments including controlled exchange rates, reforms of trade and investment regimes and macroeconomic policies (World Bank, 1998; Aswicahyono and Pangestu, 2000).

Indonesia has been implementing various trade and industrial policies since 1970s. Due to the ‘oil boom’, Indonesian government invested the oil revenue in expanding manufacturing sector from the 1970s up to the mid-1980s (Basri, 2002). Since Indonesian government adopted inward-looking policies, it pursued a strategy of import substitution for manufacture goods, hence higher protection levels. Consequently, many ‘infant industries’ required special treatments from the government such as subsidy and

protective barriers against foreign competition. From the time when the import substitution strategy was adopted, the manufacturing sector was highly protected by tariff and non-tariff barriers. This strategy was obliged to set aside because of decrease of the oil revenue in the mid-1980s.

On the contrary, the government made taxation and financial reforms. This made the government possible to reduce both tariff and import licensing requirement. Under such various industrial and trade policy reforms, trade protection has been reduced significantly since the mid-1980s (Basri, 2002; Hill, 1997). Decrease in oil price and the 1997 economic crisis have encouraged the government to implement more liberal industrial and trade policies suggested by the International Monetary Fund (IMF) as mentioned in section 11.2. As a member of the World Trade Organization (WTO) since January 1, 1995, the Indonesian government is required to reduce all bound tariffs to 40% or less over a 10-year period, subject to an exclusion list of products for which this commitment did not apply. Although the government had reduced tariffs long before 1995, the largest tariff reductions in Indonesia began in 1995. Tariffs on final goods had fallen from an average of 21% in 1995 to an average of 8% in 2001, with large variations across and within industries (Amiti and Konings, 2005).

The shifts in trade regime from a liberal to a protective one during the oil boom period and the swing back to a liberal one during the decrease in oil price and the economic crisis have been part of the Indonesian trade and industrial development processes. Thus, Indonesia provides an interesting case study of trade protection, especially in the manufacturing sector. The conventional cycle of trade protection states that protectionism is likely to become stronger during the weaker economic position of the country (Frey, 1985; Basri, 2002). To what level have the effective rate of protection

(ERP) been reduced? Which industries are highly protected? Compared with other countries, how fast is the Indonesian liberalization in the manufacturing sector? This chapter deals with the questions and focuses only on the structure of protection in Indonesian manufacturing sector. The rest of this chapter is organized as follows. Section 11.2 describes the evolution of industrial and trade policies in Indonesia, and pays more attention to the underlying political economy. Section 11.3 represents trends in the comparative advantage of Indonesian exports. Section 11.4 shows the methodology. Section 11.5 describes the results and analysis. Finally, concluding remarks are presented in Section 11.6.

11.2. The Evolution of Industrial and Trade Policies

Trade liberalization is sometimes compared to a two-edged sword, since it can create opportunities as well as threats for the domestic economic development. For example, governments provide some specific industries with protective trade barriers during the implementation of import substitution strategy. The opening up of markets not only offers welcome opportunities for the development of exports but also provides a competitive environment for international and domestic markets. The benefits or losses from the opening up of the markets depend very much upon the readiness of all domestic economic agents (producers and consumers) as well as the government. Trade liberalization and industrialization in East Asia follow the ‘flying geese’ (FG) formation (Masuyama, 1997; Kojima, 2000; Rao, 2001). Table 11.1 shows the industrial and trade policies in East Asian countries. Japan abandoned its import substitution policies by the early 1960s, while Korea and Taiwan shifted to export-promotion strategies since the

early 1970s. However, the Southeast Asian countries, including Indonesia, still pursued import substitution policies until the mid-1980s.

Table 11.1 Industrial and Trade Policies in East Asia

Countries	Periods				
	1950s	1960s	1970s	1980s	1990s
Japan	1950-58 Import Substitution	1959- Export orientation trade and foreign exchange Strategic Industries (comparative advantage)	1967 - Liberalization FDI	1970s Vision industries	Mid 1980s Deregulation
Hong Kong	1950- Export orientation (laissez faire, education, infrastructure, institutional support)		1979 Improved institutional support for industry		1990s Upgrade support for technology
Taiwan	1953-57 Import Substitution	1958-80 Export orientation		1981- Strategic industries 1986- Liberalization	1990s Information industry
Korea		1961-72 Export Orientation	1973-79 Import Substitution (heavy industry)	1980- Liberalization (trade, investment and finance)	Mid 1980s Innovation oriented 1990s Deregulation 1990s Internationalization
Singapore	1950s Import substitution	1960s Export orientation			1990s Strategic industries (high tech and services) Regionalization
Thailand		1961-71 Import Substitution	1971-86 Export industries	1986- Export Orientation (technology-intensive industries)	
Malaysia	1950-70 Import Substitution (moderate)		1971-85 Added Export Orientation	1986- Liberalization Export Orientation	
Indonesia		1967-73 New Order (Liberalization)	1974-85 Import substitution	1986- Export orientation liberalization 1990s Liberalization 1997 More liberalization (strengthened political stability)	
Philippines	1950-80s Import Substitution (strengthened)			1980s Liberalization (political instability)	
China		1965-76 Defense industries (inland heavy industrialization)	1977-78 Plant importation	1980s Coastline liberalization (light industries)	1990s Infrastructure high technology

Source: The World Bank (1993), Masuyama (1997) and Hill (1997)

Like the other East Asian countries, Indonesia has undertaken both import substitution and export-oriented industrialization policies, which have been closely related with her international trade performance. There have been at least five phases in

the development of industrial and international trade policies in Indonesia¹. *First*, the phase of very rapid growth in the period 1967-1973 was pushed forward by liberalization and her return to normal economic conditions. Getting transfer of power from the first president of Indonesia Soekarno (through the ‘*Supersemar*’ presidential letter of command signed by Soekarno on 11 March 1966), the second president Soeharto had to deal with the chaos of hyperinflation (around 630%), low economic growth (only about 0.5%), high unemployment, deficit of government budget (almost 200%), multiple exchange rates and direct control system (Dumairy, 1996; Tambunan, 2003). After the economic stagnation in the transition period (1966-1967) from the Old Order (*Orde Lama*) to the New Order (*Orde Baru*), output of manufacturing sector increased significantly by almost 9% in 1968, moreover it exceeded 14% in 1969 (Hill, 1997). The New Order regime promptly introduced a macroeconomic stabilization program and began liberalizing trade and investment based on the trilogy of development – ‘*Trilogi Pembangunan*’ - i.e. stability, growth and equity. Two most significant policies implemented in this first phase were the openness of her capital account and the establishment of the law that guaranteed foreign investors the right to repatriate both capital and profits.

Second, the phase of ‘inward-looking’ strategy (1973-1982) was dominated by the fact that the increase in prices of oil and non-oil commodity had raised the government revenue. Economic policies became inward-looking in the periods of non-oil commodity boom (1975-1979) and the oil boom (‘oil shock’ to the other non-oil producing countries) in 1973-1974 and 1979-1981, which tripled Indonesian terms of trade. From the Government Budget (*Anggaran Pendapatan dan Belanja Negara*, APBN) data, it is clear

¹ Hill (1997) notes first four of the five phases and the fifth one is the author’s addition.

that the government revenue depended heavily on oil revenue. Indonesia is sometimes called a ‘missed opportunities’ economy (Booth, 1998) referring to the fact that although Indonesia has abundant natural resources and fabulous variety of cultural tradition, the economy has been underperforming for long periods in her history. She missed an opportunity to achieve high economic performance during the oil boom period of 1973-1981. Bad governance (institutional or political spheres) in managing the opportunity of the oil boom has created other problems such as protectionism in international trade, infant industries, cronyism, conglomeration, corruption and nepotism.

Table 11.2 External Shocks and Policy Direction

Period	Change in External Environment External	Policy Direction		
		Macroeconomic Policy	Trade and Industrial Policy	Government Regulation
1974-81 Oil boom	Sharp increase in oil prices 1973; non-oil commodity boom 1975-79; second oil price increase	Maintenance of macroeconomic stability, although some inflation from lack of sterilization of oil revenue	Growing inward orientation (increasing import substitution)	Increasing share of public investment and state owned enterprise (SOE)
1982-85 First external shocks	Decline in oil prices; decline in commodity prices	Macroeconomic stabilization; fiscal austerity, devaluation and tight monetary policy	Strongly inward oriented; proliferation of non-tariff barriers	Continued reliance on SOE and regulation of market economy
1986-88 Second external shocks	Sharp decline in oil prices and continued decline in primary commodity prices; shocks on external debt due to yen appreciation	Continued macroeconomic stabilization; devaluation; tight monetary policy and balance budget	Shift to outward orientation	Deregulation of customs and imports, relaxation of investment regulations, reduced reliance of SOE and public investment
1988-92 Non-oil led economic recovery	Stable oil prices, further decline in prices of primary commodity	Maintenance of macroeconomic stability	Further shift to outward oriented economy	Deregulation extended to investment, finance and other areas initial steps towards SOE reform
1993-96 Continued deregulation and some ambivalence	Stable oil prices, some increase in commodity prices, increased competition from other developing countries	Maintenance of macroeconomic stability; increased flexibility of exchange rate and other instrument to assist monetary policy	Continued emphasis on exports, but some deviations to import substitution (petrochemical.) and local content (automotive)	Continued deregulation, improvement in financial sector supervision, substantive FDI deregulation
1997 – present Asian Economic Crisis, Commitment to IMF International and Multiregional commitments like AFTA, APEC and WTO	Sharp increase in oil price	Macroeconomic recovery	Deeper integration and accelerating trade liberalization, Elimination of non-tariff measure for agricultural product and measures to protect national car scheme, Removing all import license (for example: the national logistic agency, BULOG), open competition on rice import,	Continued deregulation, improvement in financial sector supervision, substantive FDI deregulation

Source: mainly adopted from Pangestu and Stephenson (1996) with some additional information from Vanzetti *et al.* (2005), Aswicahyono and Pangestu (2000), Amiti and Konings (2005) and Basri (2002).

Table 11.2 describes how the directions of economic policies of Indonesia were significantly steered by the external shocks, especially oil prices. The oil boom led to fundamental revisions of trade and industrial policies. It is argued that Indonesian industrial and trade liberalization has followed a statement of the supporters of deregulation and liberalization: ‘good times mean bad policies and bad times mean good policies’ (Fane, 1996). During the ‘oil boom’, the Indonesian government followed an inward-looking strategy i.e. state-directed industrialization or import substitution characterized by high but inefficient growth (Hill, 1997; Karseno, 1997).

In addition, the government used some of the oil revenue to speed up the industrialization process through extensive public investment and state owned enterprises (SOEs) in capital-intensive import substituting industries, which were extensively protected. From the political economic point of view, there were two politically competing groups of advisers to the President Soeharto i.e. the ‘economic nationalist’ and the ‘technocrats’ (Fane, 1996). The first group consisted of several sub-groups but the most dominant of which were the ‘engineers’ led by the Minister of Research and Technology, Dr B.J. Habibie. The group was eager to support self-sufficiency in food in general and rice in particular (*swasembada pangan*) and to promote advanced technology, capital intensive and large industries such as steel, cement, fertilizer, aeronautics, and petrochemical. Such industries must be state-owned, subsidized and protected from imports (Karseno, 1997). Beside Habibie’s department, this group also dominated the national oil company (*Pertamina*), the government agency for food procurement and marketing (*Badan Urusan Logistik*, BULOG) and the Ministry of Industry. Meanwhile, the ‘technocrats’, many of them who were academic staffs and professional economists, relied on market forces. This second group dominated the National Development

Planning Agency (*Badan Perencanaan dan Pembangunan Nasional*, BAPPENAS) and the Ministry of Finance. This group also had a significant influence in the Central Bank (*Bank Indonesia*, BI) (Fane, 1996). During the oil boom, the ‘economic nationalist’ got the president’s support. The government intervened in the market through direct state-owned banks that provided various subsidized credits for the favored clients and implemented somehow complex regulations aimed to promote industrial policy objectives (Vansetti *et al.*, 2005). The big increases of domestic income during this period was brought about by her liberal trade policies introduced in the late 1960s and introduction of higher tariffs and non-tariff barriers, and allocation of large amount of oil revenue to the SOEs.

Third, Indonesian first major trade reforms adopted in the mid-1980s due to the decline of oil prices in 1982-1985 led to a slowdown in GDP to about 4% and a huge deficit in the balance of payment (Dumairy, 1996). Decrease in oil price also affected government revenue significantly (adverse fiscal shocks) and this in turn affected the ability of the government to subsidize the economic nationalists’ projects (Fane, 1996). The influence of *Pertamina* decreased due to its lower contribution to the government revenue. In contrast, this had raised the relative influence of the ‘technocrats’, since the bargaining position of the Ministry of Finance was rising, because the tax reforms helped the ministry to make up for the loss of oil revenue. The decline of the oil price triggered the third phase, which was characterized by the main response on prudent macroeconomic management, financial (banking) reform and a large devaluation in 1983. The monumental tax reforms began in 1984 and trade reforms started in 1985².

² Deregulation in the taxation included Income Tax (in 1984), Value Added Tax (in 1985) and Property Tax (in 1986). Deregulation in trade covered reduction of trade tariff from 0-225% to 0-60% (March 1985), duty drawback and imported inputs (Presidential Decree No. 4/1985 about Custom Duties). Financial deregulation covered the

Fourth, the Indonesian government was obliged to realize the necessity of shift of industrial basis from oil export to manufacturing export, due to such external factors like sharp decline in oil price in 1986-1988, decline in primary commodity prices, the debt problem owing to yen appreciation and increased competition from other developing countries. This also led to the fourth phase of industrial and trade policies. Therefore, Indonesia has embarked upon a strategy of export-oriented industrialization or growth-oriented trade³ from 1986 to the present. Tariff ceilings were lowered to 60%, the number of tariff levels were reduced from 25 to 11 and several import licenses (which at their peak covered 43% of tariff lines) were converted into tariff equivalents (DFAT, 2000). Exports and private sector involvement have become the primary engines of industrial growth. Industrial policy has taken the form of deregulation, reform and improvement of the performance of non-oil and manufacturing sector. The purpose of those policies are to maintain the past rapid economic growth by shifting the engine of export from natural resource (especially oil), mostly monopolized by the government, to manufactured commodities in which the private sector has a bigger role (Karseno, 1997). However, Indonesian trade liberalization slowed down in the early 1990s and the simple average tariff rate remained steady. Tariff was raised on some chemical products and the national car scheme was established exempt from domestic luxury tax and protected by tariff and non-tariff measures (Vanzetti *et al.*, 2005).

devaluation of Indonesian currency *rupiah* 28% (March 1983), abolishment of control on interest rate and credit ceiling (June 1983).

³ Some examples of the policies are the change from import license to general import, elimination of non tariff barriers and continued tariff reduction (October 1986-January 1987); simplification of quota on textile (July 1987); continued deregulation on export-import system and foreign investment (December 1987); elimination of monopoly on plastic and steel import (November 1988); introduction of harmonized system (HS) of trade classification (January 1989). Financial deregulation covered abolishment of swap ceiling (October 1986), devaluation of *rupiah* by 31% (September 12, 1986), new bank establishment, reserve requirement from 15% to 2% and abolishment lending limit (October, 1986), share and derivative market (December 1987), financial service (December 1988).

Several observers - Karseno (1997) and Fane (1996), among others- argue that starting from the early 1990s, Soeharto regime implemented new regulations favoring main individual firms rather than the industries as a whole. Such policies have been both causes and consequences of the 'cronyism' in Indonesia. Several famous examples of them are as follows; (1) the national car '*Timor*' plan (by the private firm owned a President's son), (2) the heavily protected soybean crushing plant (controlled by the Salim group which is close to the President and the largest of Indonesian conglomerates), (3) special tariff protection given to the giant Chandra Asri petrochemical projects (a joint venture between Japanese and Indonesian investors-the two biggest shareholders are a President's son and a timber tycoon, Prajogo Pangestu), (4) private monopoly over the trade in cloves (*Badan Penyangga dan Pemasaran Cengkeh*, BPPC – a private firm owned by members of the President's family) (Fane, 1996).

Fifth, the shocks due to the total (financial, economic, social and political) crisis in 1997 made the Indonesian government adopt good macroeconomic and international policies. The government decided to have Indonesian economy deeply integrated with the world market and to accelerate trade liberalization. Trade reforms were intensified at the start of the International Monetary Fund (IMF) program, with the highlight on the gradual elimination of non-tariff measures for agricultural products and of measures to protect the national car scheme. The import tariffs on chemical products, iron and steel were reduced gradually to 5-10%. Various commodities such as wheat and wheat flour, soybean and garlic were freely imported under a General Importer license (Soesastro and Basri, 2005). During the crisis, the government committed itself to remove all import licenses including those previously outside the WTO program, to remove import-licensing requirements on commodities controlled by the national logistic agency (*Badan Urusan*

Logistik, BULOG), and to introduce competition against rice import. In addition, the liberalization has been also encouraged by the international commitments under the ASEAN-Free Trade Agreement (AFTA), Asia Pacific Economic Cooperation (APEC) and Preferential Trade Agreements (PTAs). To sum up, while the general trend since the 1997 crisis has been further liberalization, protection has recently increased in some areas of production. However, this increase in protection is not taking the form of highly visible tariff, but of non-tariff measures (Vanzetti *et al.*, 2005).

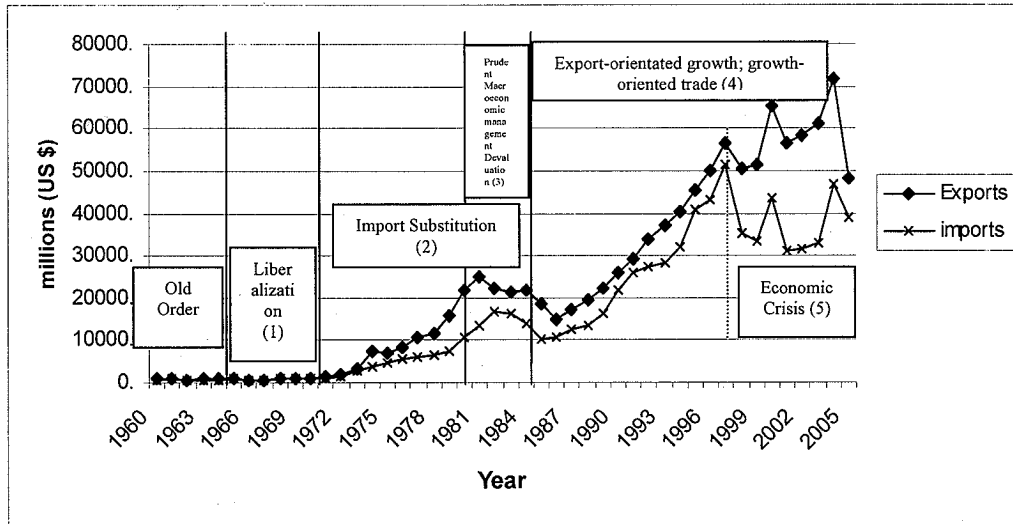
In the past, increase in oil price led to a rise in oil revenue for the government. However, the government has misallocated it to the inefficient industries or SOEs, which supported the inward-looking regime. Currently, the increase in oil price is not a 'windfall' anymore but a 'burden' for the government since more oil subsidies are required in the APBN. Following the statement of supporters of deregulation and liberalization: 'now, the increase in oil price (bad time) means more liberalization (good policies)'. Therefore, we argue that Indonesia should continue the liberalization process in the manufacturing sector. This will improve trade and economic development. By using the Computable General Equilibrium (CGE) INDORANI⁴, Widodo (2007) indicates that Indonesian trade liberalization in the manufacturing sectors will have positive impacts on stabilizing inflation, creating employment, increasing competitiveness and reducing pollution emission. Similarly, by applying a global general equilibrium, Vansetti *et al.* (2005) analyzes some scenarios where Indonesia's interests lie. The scenarios are: (1) '*Going back*' – increasing protection, particularly in sensitive

⁴ The CGE INDORANI model is an economy-wide and sector level static-comparative model of an applied general equilibrium model for the Indonesian economy. The model is derived from the ORANI model first developed by the IMPACT Project at Monash University, Australia (see Dixon *et al.*, 1977; Powell, 1991). It has been adjusted in terms of equations, closures, parameters, and data according to the current Indonesian economic conditions and behavior, which are unique in nature, for example, in the labor market, household breakdown, energy sectors, and regional breakdown.

sectors such as agricultural products, chemicals, motor vehicles, steel and textiles; (2) *'Standstill'* - remaining at the current level of protection while others liberalize; (3) *'Going forward faster'* with unilateral trade liberalization – Indonesia liberalizing while trading partners maintain their policies; (4) *'Going forward faster'* with liberalization via a bilateral agreement – a free trade agreement with the United States; (5) *'Going forward faster'* with trade liberalization via a regional – an expansion of ASEAN to include China, the Republic of Korea and Japan; (6) *'Going forward faster'* with trade liberalization via multilateralism – a WTO proposal as it may eventuate. Their analysis shows that *'Going back'* the increasing protection results in economic losses while *'Standstill'* and *'Going forward faster'* creates economic gains.

11.3. Trends in Comparative Advantage

Figure 11.1 shows the values of Indonesian exports and imports for 1960-2005 corresponding to the five phases of trade and industrial development described in the previous section. The values of exports and imports were very low during the Old Order (*Orde Lama*). The values increased during the early stage of import-substitution (1973-1982), decreased during 1983-1985 and increased significantly after 1986 when export-orientation policies took place. With several fluctuations, the positive trends in exports and imports have continued in the period after the 1997 economic crisis.



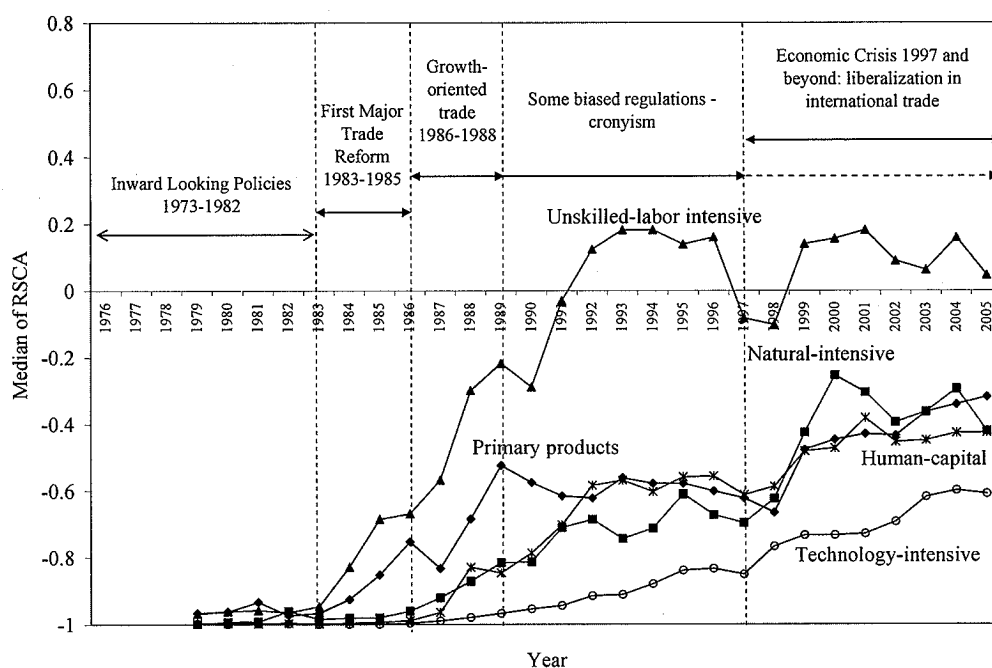
Source: IMF data base, *author's calculation*

Figure 11.1 The Value of Exports and Imports of Indonesia, 1960-2005

To show the impact of trade and industrial regimes on export performance, we plot the five phases of trade and industrial regimes and the comparative advantage index in Figure 11.2. The index of comparative advantage used in this chapter is the revealed symmetric comparative advantage (RSCA) by Laursen (1998). The RSCA is a simple transformation of the 'revealed' comparative advantage (RCA) index, which is formulated as $RCA_{ij} = (x_{ij} / x_m) / (x_{ij} / x_m)$, by Balassa (1965). x_{ij} represents total exports of country i in group of products j . Subscript r denotes all countries (the rest of world) without country i , and subscript n stands for all groups of products excepting group of product j . The RSCA index is formulated as $RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1)$. The values of RSCA lie between -1 and +1. $RSCA_{ij}$ greater than zero implies that country i has comparative advantage in group of products j , and $RSCA_{ij}$ less than zero implies that country i has comparative disadvantage in group of products j .

We calculate the RSCA based on data on exports by 3-digit the Standard International Trade Classification (SITC) Revision 2 consisting of 237 groups of products

obtained from the United Nations - Commodity Trade Statistics (UN-COMTRADE). We employ the classifications of products (industries) by the Empirical Trade Analysis (ETA)⁵. On the basis of the United Nations Conference on Trade and Development (UNCTAD) and the WTO classification using the SITC Rev. 3, the ETA distinguishes the following five main groups of products at the 3-digit level based on their factor intensities: (1) *primary* products (83 SITC), (2) *natural resource*-intensive products (21 SITC), (3) *unskilled labor*-intensive products (26 SITC), (4) *technology*-intensive products (62 SITC), (5) *human capital*-intensive products (43 SITC) (See Appendix 5.2 for the detailed classification). We calculate the median⁶ of RSCA for each product category and present it in Figure 11.2.



Source: UN-COMTRADE, author's calculation.

Figure 11.2 Trends in the Comparative Advantage, 1979-2005

⁵ See Empirical Trade Analysis at <http://people.few.eur.nl/vanmarrewijk/eta/> for further information.

⁶ Since the distribution of RSCA is skewed one, the median is a better measurement than the mean.

Figure 11.2 shows that during the inward-looking regime (1973-1982), Indonesian RSCA was very low. The oil boom might cause reallocation of resources from exportable goods industries such as manufacturing to the oil sector, through the 'Dutch disease'⁷ effect. However, Hill (1997) argues that the 'Dutch disease' did not happen for at least two reasons - the Indonesian government began to depart from its liberal trade policies and to recycle some parts of the oil revenue into the SOEs, which in fact were inefficient. Consequently, although the industrial output grew at around 3%, this was only for the domestic market. Meanwhile, during the first major trade reform (1983-1985), the comparative advantage of the two industries i.e. *unskilled labor*-intensive products (especially garments, textile, footwear and electronics) and *primary* products (dominantly oil and gas) increased significantly. A large devaluation of domestic currency *rupiah* in 1983 had raised the comparative advantage of *unskilled labor*-intensive products and *primary* products. Enormous investments in oil and gas allocated in the oil boom era resulted in the huge increase of 22% in manufacturing output in 1984 (Hill, 1997).

The increase in comparative advantage of *unskilled labor*-intensive products and *primary* products continued even faster during the period of growth-oriented trade regime (1986-1988). The comparative advantage of *natural resource*-intensive products and *human capital*-intensive products also increased significantly, while *technology*-intensive products increased moderately during this period. From 1985, the levels of

⁷ The term 'Dutch disease' is commonly used to describe the relationship between the exploitation of natural resources and a decline in the manufacturing sector. The increase in revenues from natural resources will deindustrialize a country's economy by the appreciation of domestic currency, which makes the manufacturing sector less competitive. Historically, the 'Dutch disease' describes the decline of the manufacturing sector in the Netherlands after the discovery of natural gas in the North Sea in the 1960s. The discovery has created the world's biggest Public-Private Partnership (P3) between the Dutch government, Esso (now: ExxonMobil) and Shell in 1963 ('The Dutch Disease' (November 26, 1977), *The Economist*, pp. 82-83).

protection had decreased and Indonesia shifted from import substitution to export orientation strategies, particularly in the manufacturing sector. Exports and the private sector had become the engines of economic growth. The annual rate of GDP growth was about 6.3% during 1985-1990 (Soesastro and Basri, 2005), while that of non-oil manufacturing output was more than 11% during 1985-1992 (Hill, 1997).

The trends of comparative advantage relatively slowed down for the early 1990-s until just before the economic crisis 1997. In *natural resource*-intensive product, exports of plywood (accounted almost 50% of the total exports of all manufacture in the mid-1980s) grew quite slowly, following the introduction of the log export ban. In *unskilled labor*-intensive products, garment and textile exports had faced quota limit under the Multifibre Arrangement (MFA). For the period after the economic crisis 1997, there have been upward trends in the comparative advantage excepting that of *unskilled labor*-intensive products, which seems to be difficult to increase since many competitors such as China and Vietnam have come into the market.

11.4. Methodology

11.4.1. Effective rate of protection

This research applies an effective rate of protection (ERP) measure in analyzing structure of protection in Indonesian manufacturing sector. The following five assumptions have been made to derive the ERP formula (Balassa, 1971). *First*, the elasticity of substitution among inputs is zero. It means that the inputs proportion of production is fixed. *Second*, production takes place under constant returns to scale. Output will increase proportionally with the increase of inputs. *Third*, factor prices are

unchanged. The factor markets are perfectly competitive, therefore individual producer and consumer are price takers. *Fourth*, transportation costs are nil. *Fifth*, both the foreign demand elasticity for the country's exports and the foreign supply elasticity of its import are infinite.

If α_{ij} and α_{ik} are the amount of material inputs (j) and primary inputs (k) used per unit of output (i), P_j and P_k are their world market prices, the world market price of output (P_i) is set to be unity, and r denotes the percentage excess of domestic world market prices, world market and domestic prices can be represented by equations (11.1) and (11.2), respectively:

$$\text{World market prices: } 1 = \sum_j \alpha_{ij} P_j + \sum_k \alpha_{ik} P_k \quad (11.1)$$

$$\text{Domestic prices: } (1 + r_i) = \sum_j \alpha_{ij} P_j (1 + r_j) + \sum_k \alpha_{ik} P_k (1 + r_k) \quad (11.2)$$

It is also assumed that the product (i) and its material inputs (j) are traded and primary input (k) are not traded. Differences (r) between domestic and the world market prices of trade goods can be due to tariffs and other protective measures. Hence, equation (11.2) can be represented by equation (11.3):

$$\begin{aligned} D_i &= \frac{(1 + r_i) - \sum_j \alpha_{ij} P_j (1 + r_j)}{\sum_k \alpha_{ik} P_k} - 1 \\ &= \frac{(1 + T_i) - \sum_j \alpha_{ij} P_j (1 + T_j)}{\sum_k \alpha_{ik} P_k} - 1 \end{aligned} \quad (11.3)$$

Domestic prices of inputs might be different from international ones. The percentage excess of domestic prices over world market prices for the output and for material inputs is called the nominal rate of protection (T). The effective rate of protection (D) is defined as the percentage excess of the domestic price of the value added unit over its world market price. The relevant world market prices are those a

country faces in foreign trade i.e. cost-insurance-freight (CIF) prices for actual and potential imports and free-on-board (FOB) prices for exports. In this chapter, it is assumed that domestic prices equal the sum of the CIF price and the tariff in the first case and the sum of FOB price and export subsidies in the second. Since input coefficients are assumed to be constant, this general formulation of effective protection can be reinterpreted as the percentage of domestic value added (DVA) over world market value added (WVA).

11.4.2. Data

Input-Output table

The ERP of Indonesian manufacturing sector is calculated by the use of input-output coefficients, which refer to the value of inputs per unit of output. Under free trade conditions, input-output coefficients (a_{ij}) will equal the corresponding input coefficient defined in natural units multiplied by the ratio of the world market price of the input to that of output $a_{ij} = \alpha_{ij} \frac{P_j}{P_i} = \alpha_{ij} P_j$ (taking again the world market price of output to be one).

Equation (11.3) can be represented as in equation (11.4):

$$D_i = \frac{DVA_i - WVA_i}{WVA_i} = \frac{(1 + T_i) - \sum_j a_{ij}(1 + T_j)}{1 - \sum_j a_{ij}} - 1 = \frac{T_i - \sum_j a_{ij} T_j}{1 - \sum_j a_{ij}} \quad (11.4)$$

In the case of an export product, the rate of export subsidy (S) replaces the rate of tariff (T) in the formula. The effective rate of protection will be either positive, zero or negative depending on whether the ‘subsidy element’ due to the nominal protection of the product –the first term in (11.4)- is greater than, equal to or less than the ‘implicit tax’ due to the protection of material inputs –the second term in equation (11.4).

The Indonesian Central Bureau of Statistics (*Badan Pusat Statistik*, BPS) publishes regularly Input-Output (IO) Table every five years. This research requires IO Table for 1990, 1995, 2000 and 2005. IO Table 2005 has not been published yet. Therefore, this research estimates IO Table 2005 by using non-survey method namely RAS method⁸. The non-survey method is developed to find matrix of technology based on the available matrix of technology.

Tariff

The classifications of outputs regarding tariffs and industries are different. The tariff lines are at the Harmonized Commodity Description and Coding System (HS), for example nine-digit level consisting of thousands of product codes. The outputs of the manufacturing sector are recorded under the International Standard Industrial Classification (ISIC). Thus, the coding systems of HS and ISIC are different. Fortunately, with the help of an unpublished concordance between this HS nine-digit classification and the five-digit ISIC from the Indonesian Central Bureau of Statistics (*Badan Pusat Statistik*, BPS), Amiti and Konings (2005) have calculated final good tariffs for each five-digit industry in 1991, 1995 and 2001. The final good tariffs by ISIC are given in Table 11.3.

Table 11.3 describes the variations and changes in average tariffs by ISIC two-digit industries for 1991, 1995, 2001 and 2005. The last three columns show the rates of

⁸ The Indonesian Central Bureau of Statistics (*Badan Pusat Statistik*, BPS) regularly publishes IO table every five years. This chapter requires IO Table for 1990, 1995, 2000 and 2005. Since IO Table for 2005 has not been published yet, we estimate IO Table 2005 by using the non-survey method known as the 'RAS' method. See Miller and Blair (1985) and CEPPS (2004), among others, for the detailed explanation. The 'RAS' method is developed to find the matrix of technology by using the available matrix of technology. Let $A(0)$ and A^2 denote the initial (existing) and the final (updated) technical coefficient matrices in the IO table, respectively. Let R^1 and S^1 denote diagonal matrices related to total industry sales by sector i and total inter-industry input purchase by sector j in year 1, respectively. Miller and Blair (1985:281) formulate $A^2 = R^1 A(0) S^1$. Ignoring superscripts and the (0), representing base-year information, we have 'RAS' on the right-hand side. This is the origin of the name of the non-survey technique.

tariff reduction for the periods 1991-1995, 1995-2001 and 2001-2005. During the period 1991-1995, the largest decrease of tariff was -53.91% in Metals (ISIC 36), followed by Paper (-52.43%) and 'Other' group (-31.93%). The manufacture under 'Others' had a decrease in tariff not more than 30%. During the period 1995-2001, the largest decrease in tariff was -61% in Wood (ISIC 33), followed by Paper (-60%). The 'others' manufacture had a decrease more than 40% except Food (-22%) and Machinery (-28.59%). For 2001-2005, the largest decrease in tariff was Food (-57.5%) industry followed by Paper (-38%), Chemical (-27.7%) and Wood (-27.6%).

Table 11.3 Tariffs in Manufacturing Sector (in %)

ISIC	Industry	Tariff Rate				Change in Tariff		
		1991*	1995*	2001*	2005**	1991-1995	1995-2001	2001-2005
31	Food	21	20.99	16.21	6.9	-0.1	-22.8	-57.4
32	Textile clothing	27.8	20.1	9.39	7.5	-27.7	-53.3	-20.1
33	Wood	24.2	17.95	6.91	5	-25.8	-61.5	-27.6
34	Paper	21.21	10.09	4.03	2.5	-52.4	-60.1	-38.0
35	Chemicals	15.6	12.05	6.92	5	-22.8	-42.6	-27.7
36	Metals	23.04	10.62	5.65	5	-53.9	-46.8	-11.5
37	Machinery	11.5	8.08	5.77	5	-29.7	-28.6	-13.3
38	Electrical	18.9	14.75	6.72	5	-22.0	-54.4	-25.6
39	Other	32.48	22.11	10.97	10	-31.9	-50.4	-8.8
	All	20.88	15.6	8.44	5.8	-25.3	-45.9	-31.3

Source: * obtained from Amiti and Konings (2005);

** obtained from the APEC website (simple average of tariff in the late 2004).

In the context of the Indonesian economy where export-promotion is pursued alongside import-substitution policies (double-track industrialization), it is important to estimate effective rate of protection (ERP) for import competing and export-oriented industries separately. However, because of the unavailability of data on export subsidies, import duty rebate and other duty concessions, we focus only on ERP for the manufacturing sector as a whole. However, we have to keep in mind that such non-tariff barriers are important. Kim (2004) finds that the coverage of import prohibitions was increased from 7 to 27 tariff lines, while the coverage of import licensing was increased from 27 to 1,027 lines for the period 2001- 2003.

We estimate the ERP based on data from the input-output (IO) tables in 1990, 1995, 2000 and 2005 and based on data of the tariffs calculated by Amiti and Konings (2005) and of the tariffs scheduled in 2004 at the latest (from APEC website). By using the corresponding IO, it is hoped that the estimates have taken into account the technological changes in the process of production. Therefore, the estimates might probably understate the true values since they do not capture various non-tariff measures.

11.5. Results and Analysis

11.5.1. Effective rates of protection (ERP)

In the past, protection in the manufacturing sector was implemented for the reasons suggested in the following three models. Hill (1997) states that there are at least three models explaining patterns of protection, i.e. ‘adding machine model’ (convenient for ballots collection), ‘interest group model’ and ‘national interest model’. In the first model, government acts to maximize the likelihood of their re-election. Then, the more labor-intensive in the process of production, the higher will be the protection put in that industry. The second model relies on cost-benefit analysis. The tariff structure depends on the cost and benefit of the pressure groups to secure protection. The third model postulates that government might take the view that there are particular market failures that need to be overcome. There may be objectives with a higher priority than the short-run efficiency maximization. In the case of Indonesia, Hill (1997) argues that the second and third models are appropriate in explaining the structure of protection in Indonesian manufacturing sector especially during the New Order era.

The Indonesian government has undertaken substantial reforms on structure of protection, especially following the 1997 financial crisis, becoming member of WTO and fulfilling some commitments of regional economic cooperation such as the APEC, the AFTA, ASEAN-China Free Trade Agreement (ACFTA), ASEAN-Korea Free Trade Agreement (AKFTA), ASEAN-Japan Comprehensive Economic Partnership and other preferential trade agreements (PTAs). Currently, in term of tariffs, there have been relatively low levels of protections and such protections are widely varied across industries. Table 11.4 shows ERP in the manufacturing sector ISIC 2-digit in 1991-2005. The rates were relatively high during the period 1991-1995 but the rates decreased during the period 2001-2005.

Table 11.4 Effective Rate of Protection by ISIC 2-digit Industry (in %)

ISIC	Industry/sectors	Effective Rates of Protection			
		1991	1995	2001	2005
31	Food	52.6	61.7	43.3	15.4
32	Textile clothing	78.9	55.1	17.5	13.7
33	Wood	53.4	53.2	16.0	10.7
34	Paper	49.4	25.4	6.6	4.0
35	Chemicals	48.0	33.6	13.6	9.5
36	Metals	67.3	29.2	12.2	9.0
37	Machinery	30.8	20.1	8.6	7.7
38	Electrical	57.9	47.1	10.8	6.8
39	Other	74.9	56.2	19.6	15.0
	All	57.0	42.4	16.5	10.2

Source: calculations by the author based on data from IO Table - BPS (1990, 1995, 2000), Estimated IO Table – CEPPS (2004), Amiti and Konings (2005) and tariff schedules 2004 available from the APEC Secretariat online database.

The average ERP for all industries in the manufacturing sector was 57.0%, 42.4%, 16.5% and 10.2% in 1991, 1995, 2001 and 2005, respectively. The average ERP 57.0% in 1991 implies that the combined domestic value added in the manufacturing sector production under the structure of import tariff in 1991 was 57% higher than what was achievable under free trade. In contrast, the average ERP 10.2% in 2005 means that the combined domestic value added in the manufacturing sector production under the

structure of import tariff in 2005 was only 10.2% higher than what was achievable under free trade. In 1991, it ranged from the lowest 30.8% (Machinery, ISIC 37) to the highest 78.9% (Textile clothing, ISIC 32). In 2005, it ranged from the lowest 4.0% (Paper, ISIC 34) to the highest 15.4% (Food, ISIC 31).

11.5.2. Some comparisons across countries

It is interesting to compare the structure of protections between Indonesia and other ASEAN countries. In this chapter, Malaysia (the original ASEAN member) and Vietnam (the new ASEAN member) are chosen for comparison purposes. Table 11.5 shows the ERP of the manufacturing sector (in the Input-Output table classification, IO-code) in Indonesia, Malaysia and Vietnam. The figures for Malaysia (2003) and Vietnam (2003) are taken from Athukorala (2005a) and Athukorala (2005b), respectively. Several statistics are presented in the bottom of Table 11.5. In general, the ERP of the manufacturing sector in Indonesia were still higher than Malaysia but much lower than Vietnam. The simple average of Indonesian ERP in the manufacturing sector was 11.6% in 2005. Meanwhile, the simple averages of Malaysian ERP and Vietnamese ERP in 2003 were 10.4% and 32.2%, respectively.

The estimates also show that Indonesia in 2001 had the same degree of variation in ERP across industries as that of Malaysia in 2003. This is shown by the same value of coefficient of variation i.e. 0.8. However, this coefficient was only 0.4 in the case of Indonesia in 2005. Decrease in the coefficients of variation indicates that the discrimination levels of protections in the manufacturing sector have declined in Indonesia. This was due to the elimination of protections in Food; Oil and fat; Rice milling; Flour; Sugar; Other food; Beverage; and Tobacco industries.

Table 11.5 Effective Rate of Protection by IO Code Industry (in %)

IO Code	Industry	Effective Rate of Protection					
		Indonesia				Malaysia*	Vietnam**
		1991	1995	2001	2005	2003	2003
27	Food manufacture industry	-18.8	65.5	49.6	29.4	3.6	43.9
28	Oil and fat industry	48.0	59.5	38.7	12.3	5.8	18.5
29	Rise milling industry	178.0	117.5	82.9	17.8	11.4	123.2
30	Flour industry	57.8	61.6	31.9	10.2	11.4	34.0
31	Sugar industry	26.1	45.7	58.6	11.7	3.8	34.0
32	Other food industry	48.7	56.8	35.9	11.7	3.8	34.0
33	Beverage industry	43.8	51.2	25.7	15.3	24.3	55.4
34	Tobacco industry	37.5	35.7	23.3	14.5	5.3	55.3
35	Knitting industry	63.7	49.3	17.3	13.5	13.9	71.0
36	Textile, clothes and leather industry	94.2	61.0	17.7	13.9	28.6	43.0
37	Bamboo, wood and rattan industry	53.4	53.2	16.0	10.7	21.0	1.2
38	Paper and paper product an carton industry	49.4	25.4	6.6	4.0	7.8	17.1
39	Fertilizer and pesticide industry	54.4	40.6	16.5	11.5	4.1	-1.7
40	Chemical industry	46.9	34.8	12.0	7.9	1.6	-4.0
41	Refined petroleum industry	40.7	27.5	11.3	7.8	4.1	-
42	Rubber and plastic products industry	59.5	40.9	13.0	9.7	17.5	21.8
43	Non-metallic mineral products	34.1	26.9	12.2	8.6	15.8	47.8
44	Cement industry	52.3	30.6	16.8	11.5	7.2	49.7
45	Iron and steel industry	58.6	23.4	11.8	9.4	6.6	-20.9
46	Non-ferrous metal industry	74.4	35.3	15.0	9.1	18.0	0.8
47	Metallic products industry	68.9	28.9	9.7	8.4	4.9	-
48	Machinery and electrics equipment industry	57.9	47.1	10.8	6.8	2.4	2.0
49	Transportation equipment industry	30.8	20.1	8.6	7.7	21.7	46.6
50	Other manufacturing products	74.9	56.2	19.6	15.0	4.0	34.6
	Maximum (Max.)	178.0	117.5	82.9	29.4	28.6	123.2
	Minimum (Min.)	-18.8	20.1	6.6	4.0	1.6	-20.9
	Range = (Max.-Min.)	196.8	97.4	76.3	25.4	27.0	144.1
	Simple Average	55.6	45.6	23.4	11.6	10.4	32.2
	Standard Deviation	33.5	20.5	18.3	4.9	7.9	31.3
	Coefficient of Variation	0.6	0.5	0.8	0.4	0.8	1.0

Note: * taken from Athukorala (2005a), ** taken from Athukorala (2005b). Some figures in the cases of Malaysia and Vietnam are the simple averages of ERP of some industries (IO codes) due to different classification of sector in IO table among countries.

Source: calculations by the author based on data from IO Table - BPS (1990, 1995, 2000), Estimated IO Table - CEPPS (2004), Amiti and Konings (2005) and tariff schedules 2004 available from the APEC Secretariat online database.

In the case of Indonesia, the simple average of ERP decreased from 55.6% in 1991 to only 11.6 in 2005. The (simple) averages of ERP in Table 11.4 and Table 11.3 are slightly different due to the different classification in industries between the IO and ISIC codes. In general, we can say that the ERP associated with domestic market-oriented industry was relatively smaller than export-oriented industry. The most protected industry is Food manufacturing with ERP 29.4% in 2005. Double digit ERP, greater than

10%, is observed in such industries as Oil and fat; Rice milling; Flour; Sugar; Other food; Beverage; Tobacco; Knitting; Textile, wood and leather; Bamboo, wood and rattan; Fertilizer and pesticide; and Cement. In the case of Malaysia, Athukorala (2005a) finds that ERP associated export-oriented industries (for example, household machinery; industrial machinery; radio; TV and computer equipment; and other electronics) was much smaller compared with domestic market oriented industries (for example, motor vehicles; cycles and motorcycles; metal products; rubber goods; plastic products; and furniture) in 2003.

Table 11.6 represents some comparisons between the ERP estimates for Indonesian manufacturing sector and available estimates for seven major East Asian economies. A strict comparison of estimates across the countries is not possible because of significant differences in estimates in terms of the coverage given the various elements of the trade regime in each country. Nevertheless, based on the order of magnitude alone, one can safely infer that the current level of effective protection to domestic manufacturing in Indonesia is clearly in line with the protection levels in other countries in the region.

By the late 1980s or the beginning 1990s, the ERP in the manufacturing sector in Indonesia, Malaysia, the Philippines and Thailand ranged around 20-60%. Panagariya (1994) finds that the ERPs in Malaysian, the Philippines and Thai manufacturing sector were 23% in 1988, 32% in 1992 and 51% in 1988, respectively. World Bank (1993) finds that the ERP in Indonesian manufacturing sector was 59% in 1990. Therefore, Indonesia had relatively higher ERP in the manufacturing sector than the other three ASEAN countries in the 1970s. It is estimated that the ERP in Indonesian manufacturing sector was only 10.2% in 2005. Such figure is lower than that in Malaysia, which was estimated

around 16% in 2003. The ERP in Thai manufacturing sector was estimated to be about 22.7% in 2004. The Philippines had faster liberalization in the manufacturing sector as the ERP in her manufacturing sector decreased from 32% in 1992 to only 10% in 1999.

Table 11.6 ERP Manufacturing Sector in Selected East Asian Countries (in %)

Country	Year	ERP	Source
Indonesia	1975	74	World Bank (1993)**
	1987	70	Fane and Condon (1996)**
	1990	59	World Bank (1993)**
	1991	51 ^a , 55.6 ^b	This research
	1995	25 ^c ; 42.4 ^{a,d} , 45.6 ^{b,d}	^c Fane and Condon (1996)**; ^d This research
	2000	25.7	Soesastro and Basri (2005)
	2001	16.5 ^a , 23.4 ^b	This research
	2005	10.2 ^a , 11.6 ^b	This research
South Korea	1970	40	World Bank (1993)
	1975	55	World Bank (1993)
	1980	67	World Bank (1993)
	1985	80	World Bank (1993)
	1988	28	Panagariya (1994)
Malaysia	1969	45	Shalleh and Meyanadan (1993)
	1979/80	31	Shalleh and Meyanadan (1993)
	1988	23	Panagariya (1994)
	2003	16 ^e ; 10.4 ^f	^e Athukorala (2005a); ^f taken from Table 11.5
Philippines	1992	32	Panagariya (1994)
	1999	10	WTO (1999)*
Thailand	1981	74	World Bank (1993)
	1988	51	Panagariya (1994)
	2002	25.2	Athukorala <i>et al.</i> (2004)
	2004	22.7	Athukorala <i>et al.</i> (2004)
Vietnam	1997	121	Athukorala (2002)
	2002	95	Athukorala (2002)
	2003	44	Athukorala (2005b)

Note:

* Calculated as the weighted average of estimates by industry reported in the given source. Weighting was done by using value added data from UNIDO.

** Estimate for non-oil manufacturing.

^a the simple average of ERP of industry ISIC (taken from Table 3); ^b the simple average of ERP industry IO-codes (taken from Table 11.5)

Source: mainly from Athukorala (2005b) and *author's calculation*.

11.6. Concluding Remarks

Over the past 35 years, Indonesian manufacturing sector has been liberalized. However, from time to time we saw periods of protection increase in short or medium terms. This chapter describes evolution of the industrial and trade policies in Indonesia.

To some extent, the Indonesian industrial and trade policies in these periods make us remind of a statement of the supporters of deregulation and liberalization: ‘good times mean bad policies and bad times mean good policies’ (Fane, 1996). The increase in the government revenue during the oil boom in 1973-1982 (good times) had changed the policy orientation from liberal to inward-looking policies (bad policies); in contrast, decrease in the government revenue due to decrease in oil price during 1982-85 and due to the financial crisis (1997) (bad times), made the government implement more liberalization policies (good policies). However, the current increase in oil price is not a ‘windfall’ anymore but a ‘burden’ for the government, since more oil subsidies are required in the APBN (*Anggaran Pendapatan dan Belanja Negara*, government budget). Indonesia should continue the liberalization process in the manufacturing sector to encourage efficiency, rather than to give several protections to the manufacturing sector. SOEs in the manufacturing sector should also be managed professionally and efficiently. It is commonly believed that their operations have been intervened by the political interest of the ruling political party.

The ERP analysis shows that Indonesian manufacturing sector has been more liberalized after the Asian financial crisis. The liberalization in the manufacturing sector has also been encouraged by international/regional commitments such as the WTO, IMF, AFTA and PTAs. During the crisis, the government removed almost all import licenses under the influences from the IMF. While the general trend since the Asian crisis has been further liberalization, protections have recently increased in some areas in the form of non-tariff measures as mentioned in Section 11.2. Therefore, it is hoped that consideration of non-tariff measures be made in analyzing the structure of protections in Indonesia.

Chapter 12

Concluding Remarks

This chapter briefly summarizes the results of the all previous chapters. The main purpose of this research is to answer some critical questions related to the economic integration, comparative advantages and purchasing power parity (PPP) of the East Asian economies. (1) Has the focus of the ASEAN changed, parallel with the development of international regionalism? (2) How are the major trade trends in the ASEAN region? (3) How have the patterns of comparative advantage of the East Asian countries shifted? (4) How have the endowment factors determined the countries' comparative advantage? (5) To what directions have the trade specialization and trade patterns of the East Asian countries been going on? (6) Does the FG pattern exist in the East Asia? (7) What are the dynamic markets for the East Asian countries' exports? (8) Has the intra-industry trade in the intra-regional trade become significant compared with the inter-industry trade in the region? (9) Does purchasing power parity (PPP) not hold in the strong sense in the case of East-Asian countries? (10) How is the structure of protection in Indonesian manufacturing sector? All the 10 research questions have been answered through the entire chapters:

- From the background of establishment and the evolution in organizational structure of the ASEAN, it is argued that the ASEAN has changed its focus from political to economic interests. Parallel with the proliferation of economic regionalism in the world and the period of active trade liberalization

in the 1980s and 1990s, the ASEAN has pushed economic cooperation forward.

- In inter-regional trade, there have been shifts in the destinations of the ASEAN countries' exports. Although Japan, the EU and the NAFTA are still dominant trade partners, China (Mainland), Hong Kong and Taiwan have increasingly become important destinations to the ASEAN countries' exports. Meanwhile, the five original ASEAN members have still dominated the intra-regional trade (95 percent) in the ASEAN region. There is positive relationship between the size of country and the share of intra-regional trade in the region. The intra-regional trade in the ASEAN region has been larger (intense) than expected, given the ASEAN's importance in world trade, excepting Cambodia.
- There have been changes in the pattern of comparative advantage; therefore, it must be examined in the dynamic sense rather than static matter. The ASEAN has exhibited the most dynamic change in the pattern of comparative advantage, followed by China, Korea and Japan. The ASEAN, China and Korea have shown increases in overall comparative advantage together with decreases in the standard deviation. This implies that the increase in overall comparative advantage is encouraged by the higher increase in comparative advantage of products which had no or lower comparative advantage in the past.
- The H-O theory is constructed under strict assumptions. The H-O theorem does not necessarily hold when assumptions on production and consumption

are violated. The static comparative advantage can only explain inter-industry trade but not intra-regional trade. China, Indonesia and Thailand have comparative advantage in *unskilled labor*-intensive industries, meanwhile only Japan has comparative advantage in *technology*-intensive industries for the last two decades.

- The East Asian countries have exhibited despecialization together with convergence in the pattern of comparative advantage, which might indicate the existence of intra-regional trade in the region. China, Thailand and Indonesia have shown more dynamic despecialization. In general, such despecialization processes are different across countries as well across industries.
- The ‘Flying Geese’ pattern is recognized in the case of the East Asian region. The industries in the first round of the FG pattern are *unskilled labor*-intensive industries, followed by *human capital*-intensive industries in the second round and *technology*-intensive industries in the third round.
- By employing a new version of the CMS derived in this thesis, we find that the constant share norm seems powerful in explaining a country’s exports performance since the mid 1980s. In the case of China, the general rise in world export can only explain about 30 percent of the China’s change in exports. The more dominant factor underlying China’s exports has been the market share effect i.e. 53 percent during 1990-1995, 80 percent during 1995-2001 and 74.5 percent during 2001-2006. The proliferation of regionalism and economic integrations in the beginning of 1990-s caused the change in trade

pattern. Intra-regional trade has increased significantly. Trade creation and trade diversion occur. However, this thesis finds that the change in trade pattern happened only in the short period (in the beginning of economic integrations) i.e. 1990-1995 in the case of the EU, the North East Asia and the ASEAN5 and 1995-2001 in the case of the NAFTA.

- By using a modified intra- and inter-industry trade measures (incorporating intra- and inter-regional trade), we find that intra-regional trade increased significantly in the case of the East Asia and the NAFTA. As the importance of the intra-industry trade increases, the dominance of inter-industry trade decreases in the East Asia. Intra-industry trade in intra-regional trade has larger increases than that in inter-regional trade in the East Asia.
- The three widely used methods in analyzing PPP i.e. univariate time series of Real Exchange Rate (RER); multivariate regression; and Johansen framework of multivariate cointegration give the same conclusion that the PPP hypothesis does not hold in the strong sense in the case of all selected East Asian countries. Japan and Hong Kong have opposite signs of estimated coefficients with that of the PPP theory postulates. In general, the Balassa-Samuelson effect plays significant role in causing deviation away from PPP.
- Indonesian industrial and trade policies follow the statement of a supporter of trade liberalization; ‘good times mean bad policies and bad times mean good policies’. Effective Rate of Protection (ERP) analysis shows that Indonesian manufacturing sector has become more liberalized i.e. starting from very high

rate of protection during inward-looking regimes to the lower rate of protection after the Asian financial crisis onward.

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Supplements to Chapters 4 and 6

I. Supplements to Chapter 4

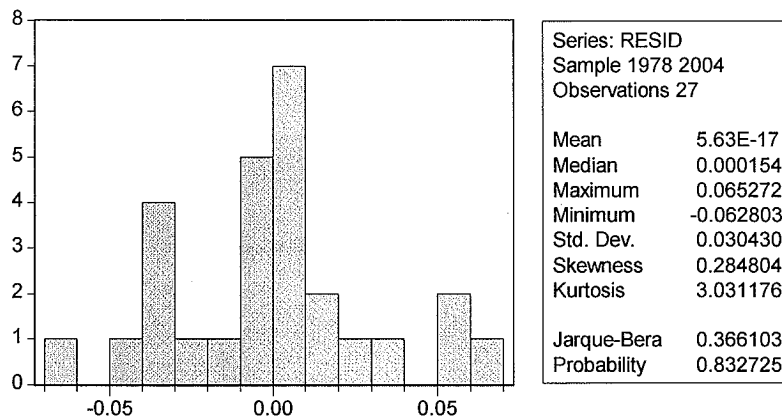
The author would like to thank Prof. Koichi Maekawa and Prof. Toshiyuki Mizoguchi for pointing out a possible problem in the econometric model (4.8). Since the values of Spearman's rank correlation are between -1 and +1, the classical assumption of normality distribution of error terms or residuals (ε_t) might be violated. Prof. Mizoguchi, therefore, argues that the test of normal distribution for residuals is necessary. Prof. Maekawa states that it is important to show the estimated variance (or standard deviation) of residuals in the equation (4.8). The author finds that the standard deviations in the cases of ASEAN-Japan, ASEAN-Korea and ASEAN-China are 0.03, 0.022 and 0.021, respectively. These results assure that the error terms are distributed between -1 and +1. Theoretically, a (continuous) random variable x , with the mean μ and the standard deviation σ has a normal distribution if its probability density function (PDF) has the following form: $f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{1}{2} \frac{(x-\mu)^2}{\sigma^2}\right)$ for $-\infty < x < \infty$ (Gujarati, 1995:771). Accordingly, 68.26%, 95.44% and 99.74% of the data lie in the ranges $\mu \pm \sigma$, $\mu \pm 2\sigma$ and $\mu \pm 3\sigma$, respectively. Therefore, Prof. Maekawa argues that if the standard deviation is very small, for example, such as 0.03 in the case of ASEAN-Japan, then the error term could be distributed between -0.09 and +0.09 with probability 0.99. It means that the residuals are distributed almost surely between -1 and +1 and hence normality assumption may not be violated. Furthermore, 99% of the estimated rank correlation $\hat{\rho}$ is

distributed within the range $[-1,1]$, which indicates that the normality assumption is harmless. The author finds that all the values of the estimated rank correlation $\hat{\rho}$ in the all cases of ASEAN-Japan (AJHAT), ASEAN-Korea (AKHAT) and ASEAN-China (ACHAT) lie exactly in the range -1 and +1 (Please see the Histogram and Statistics of AJHAT with the range $[-0.3,0.2]$, AKHAT with the range $[0.23,0.305]$ and ACHAT with the range $[0.225,0.35]$ presented in the section PROOF below). In this research, the author applies a formal test of the normality distribution of residuals, namely the Jarque-Bera (JB) test of normality. This test is based on the estimated residuals. The statistic is $JB = n \left[\frac{S^2}{6} + \frac{(K-3)^2}{24} \right]$, where S denotes skewness and K represents kurtosis. For a normal distribution, the value of skewness is zero and the value of kurtosis is 3. Under the null hypothesis that the residuals are normally distributed, Jarque and Bera show that asymptotically (i.e. in large sample) the statistic JB follows the chi-square distribution with degree of freedom 2 ($\chi^2_{df=2}$). The author finds that the statistics JB in the cases of ASEAN-Japan, ASEAN-Korea and ASEAN-China are 0.366 (p -value: 0.83), 0.68 (p -value: 0.71) and 0.47 (p -value 0.79). Since p -values are greater than the level of significance (either $\alpha=1\%$, $\alpha=5\%$ or $\alpha=10\%$), the null hypothesis is accepted.

PROOF of the supplements to Chapter 4:

a. ASEAN-Japan:

a.1. Histogram and Statistics of error terms (RESID)



a.2. Test of Normal Distribution of error terms (RESID)

Empirical Distribution Test for RESID

Hypothesis: Normal

Date: 12/13/08 Time: 21:18

Sample(adjusted): 1978 2004

Included observations: 27 after adjusting endpoints

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.127353	NA	> 0.1
Cramer-von Mises (W2)	0.075935	0.077341	0.2244
Watson (U2)	0.074120	0.075492	0.2050
Anderson-Darling (A2)	0.450203	0.464098	0.2553

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

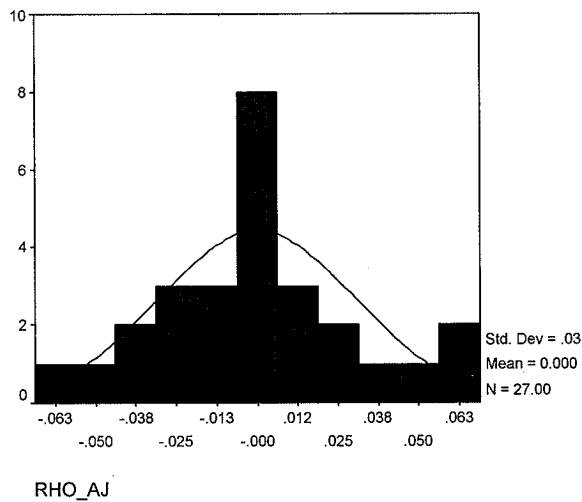
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	5.63E-17	0.005856	9.61E-15	1.0000
SIGMA	0.030430	0.004220	7.211103	0.0000
Log likelihood	56.48162	Mean dependent var.		5.63E-17
No. of Coefficients	2	S.D. dependent var.		0.030430

One-Sample Kolmogorov-Smirnov Test

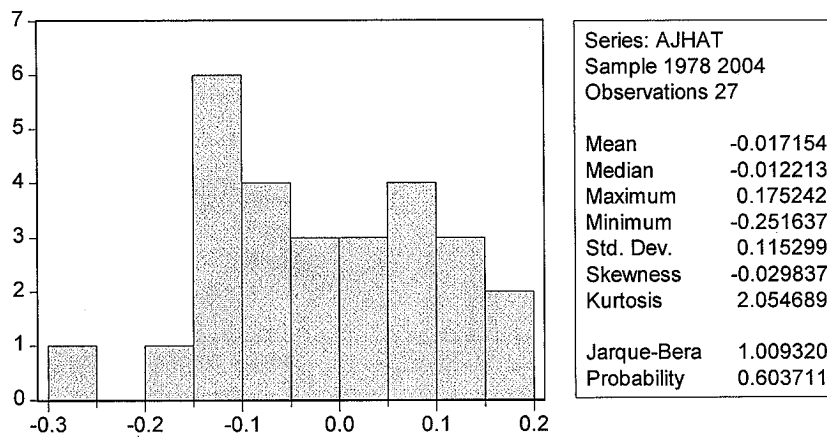
		RHO_AJ
N		27
Normal Parameters ^{a,b}	Mean	.0000
	Std. Deviation	.03043
Most Extreme Differences	Absolute	.127
	Positive	.127
	Negative	-.111
Kolmogorov-Smirnov Z		.662
Asymp. Sig. (2-tailed)		.774

a. Test distribution is Normal.

b. Calculated from data.

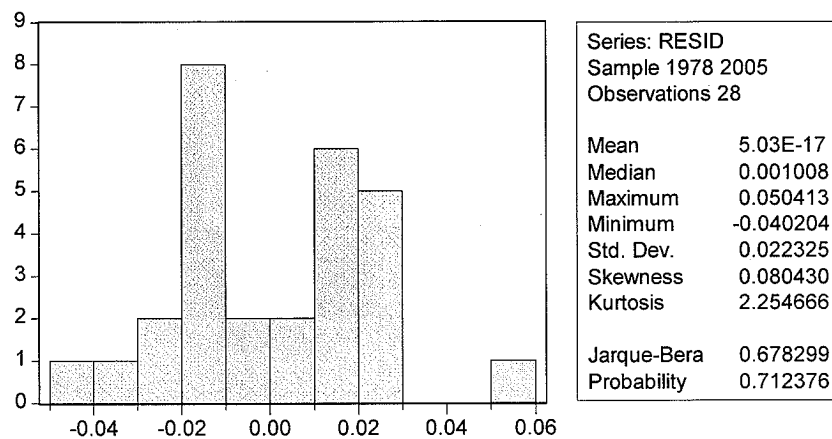


a.3. Histogram and Statistics of the estimated rank correlation $\hat{\rho}$



b. ASEAN-Korea

b.1. Histogram and Statistics of error terms (RESID)



b.1. Test of Normal Distribution of error terms (RESID)

Empirical Distribution Test for AK

Hypothesis: Normal

Date: 12/13/08 Time: 21:19

Sample: 1976 2005

Included observations: 30

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.116624	NA	> 0.1
Cramer-von Mises (W2)	0.039803	0.040466	0.6733
Watson (U2)	0.039015	0.039665	0.6334
Anderson-Darling (A2)	0.278203	0.285854	0.6255

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

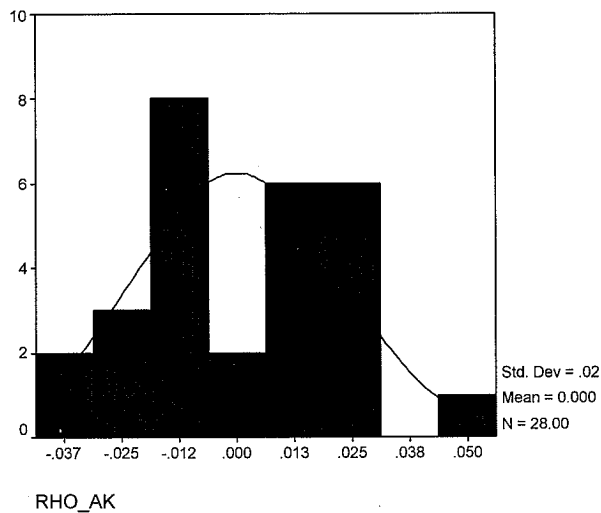
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	0.268051	0.005930	45.20168	0.0000
SIGMA	0.032481	0.004265	7.615773	0.0000
Log likelihood	60.74529	Mean dependent var.		0.268051
No. of Coefficients	2	S.D. dependent var.		0.032481

One-Sample Kolmogorov-Smirnov Test

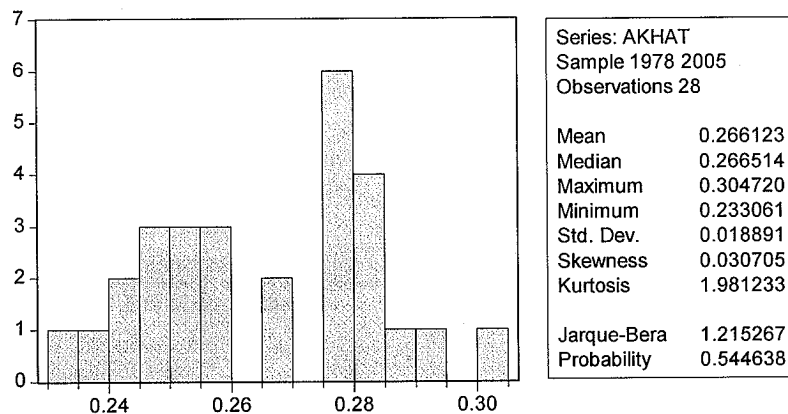
		RHO_AK
N		28
Normal Parameters ^{a,b}	Mean	.0000
	Std. Deviation	.02232
Most Extreme Differences	Absolute	.126
	Positive	.126
	Negative	-.125
Kolmogorov-Smirnov Z		.667
Asymp. Sig. (2-tailed)		.765

a. Test distribution is Normal.

b. Calculated from data.

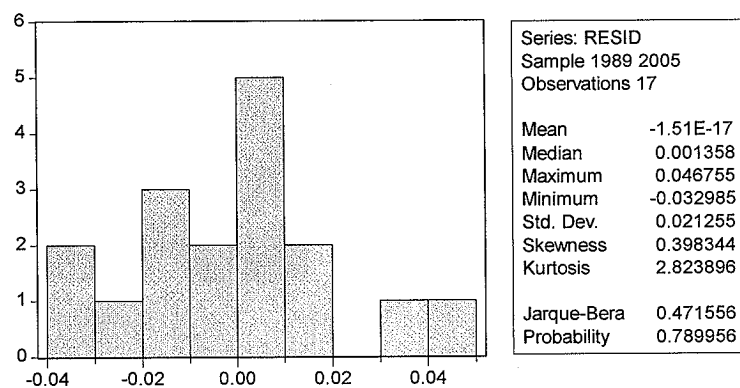


b.3. Histogram and Statistics of the estimated rank correlation $\hat{\rho}$



c. ASEAN-China

c.1. Histogram and Statistics of error terms (RESID)



c.2. Test of Normal Distribution of error terms (RESID)

Empirical Distribution Test for RESID
Hypothesis: Normal
Date: 12/13/08 Time: 21:20
Sample(adjusted): 1989 2005
Included observations: 17 after adjusting endpoints

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.117424	NA	> 0.1
Cramer-von Mises (W2)	0.027899	0.028720	0.8642
Watson (U2)	0.026266	0.027038	0.8660
Anderson-Darling (A2)	0.207013	0.217758	0.8413

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

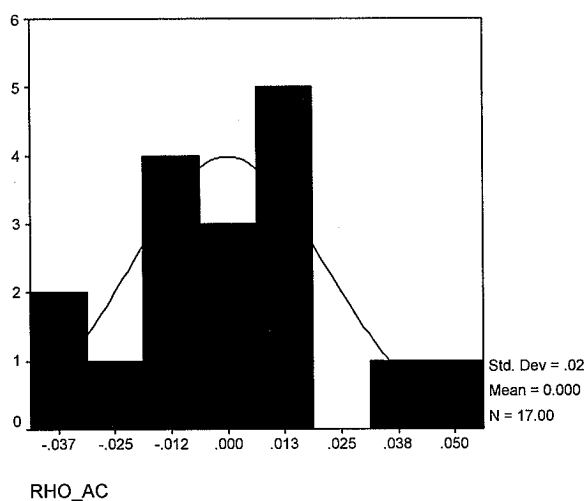
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	-1.51E-17	0.005155	-2.93E-15	1.0000
SIGMA	0.021255	0.003757	5.656854	0.0000
Log likelihood	41.84808	Mean dependent var.		-1.51E-17
No. of Coefficients	2	S.D. dependent var.		0.021255

One-Sample Kolmogorov-Smirnov Test

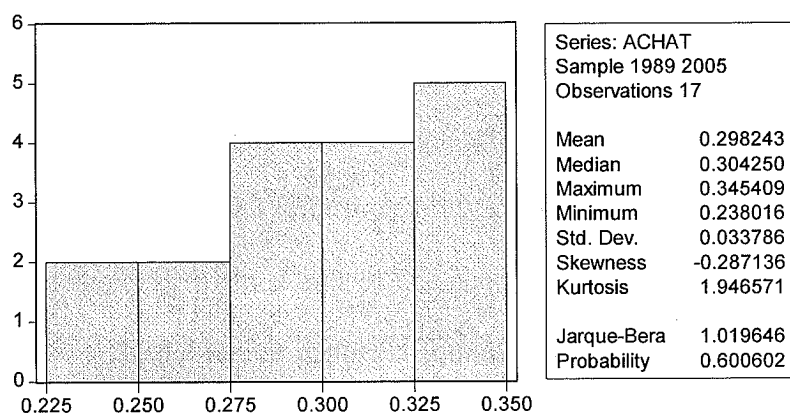
		RHO_AC
N		17
Normal Parameters ^{a,b}	Mean	.0000
	Std. Deviation	.02125
Most Extreme Differences	Absolute	.117
	Positive	.117
	Negative	-.060
Kolmogorov-Smirnov Z		.484
Asymp. Sig. (2-tailed)		.973

a. Test distribution is Normal.

b. Calculated from data.



b.3. Histogram and Statistics of the estimated rank correlation $\hat{\rho}$



II. Supplements to Chapter 6

The author would like to thank Prof. Koichi Maekawa and Prof. Toshiyuki Mizoguchi for pointing out a possible problem in the econometric model (6.2). Since the values of RSCA are between -1 and +1, the classical assumption of normality distribution of error terms or residuals (ϖ_{ij}) might be violated. Prof. Mizoguchi, therefore, argues that the test of normal distribution for residuals is necessary. Prof. Maekawa states that it is important to show the estimated variance (or standard deviation) of residuals in the equation (6.2). The author finds that the standard deviations in the cases of across countries for the periods 1985-1995 and 1995-2005 are 0.35 and 0.29, respectively. In the cases of across industries (products), they are 0.35 and 0.28 for the periods 1985-1995 and 1995-2005, respectively. From these results, it is almost certain that the error terms are between -1 and +1. Theoretically, a (continuous) random variable x , with the mean μ and the standard deviation σ has a normal distribution if its probability density function

(PDF) has the following form: $f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{1}{2} \frac{(x-\mu)^2}{\sigma^2}\right)$ for $-\infty < x < \infty$ (Gujarati,

1995:771). Accordingly, 68.26%, 95.44% and 99.74% of the data will lie in the ranges $\mu \pm \sigma$, $\mu \pm 2\sigma$ and $\mu \pm 3\sigma$, respectively. Therefore, Prof. Maekawa argues that if the standard deviation is very small, for example, such as 0.1, then the error term could be distributed between -0.3 and +0.3 with probability 0.99. It means that the residuals are distributed almost surely between -1 and +1 and hence normality assumption may not be violated. In this research, the author applies a formal test of the normality distribution of residuals, namely the Jarque-Bera (JB) test of normality. This test is based on the estimated residuals. The statistic is $JB = n \left[\frac{S^2}{6} + \frac{(K-3)^2}{24} \right]$, where S denotes skewness and K represents

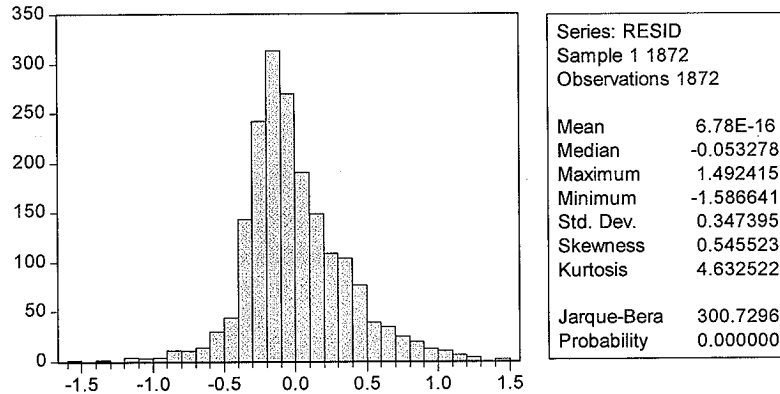
kurtosis. For a normal distribution, the value of skewness is zero and the value of kurtosis is 3. Under the null hypothesis that the residuals are normally distributed, Jarque and Bera show that asymptotically (i.e. in large sample) the statistic JB follows the chi-square distribution with degree of freedom 2 ($\chi^2_{df=2}$). In this research, the author finds that the statistics JB in the cases of across countries for the periods 1985-1995 and 1995-2005 are 300.7 (p -value: 0.000) and 584.2 (p -value 0.000), respectively. In the cases of across industries, they are 357.9 (p -value: 0.000) and 678.2 (p -value 0.000) for the periods 1985-1995 and 1995-2005, respectively. Since p -values are less than the level of significance (either $\alpha=1\%$, $\alpha=5\%$ or $\alpha=10\%$), we reject the null hypothesis. Therefore, Bayesian approach might be appropriate for this model. To avoid complexity, however, we will apply the ordinary least squares in this research. Gujarati (1995:141) states that if the residuals are not normally distributed, the t and F tests will not be valid in small, or finite, samples. However, this research uses a large sample (1872 observations). Furthermore, 99% of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA} is distributed within the range $[-1,1]$, which indicates that the normality assumptions is harmless. The author finds that all the values of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA} lie exactly in the range -1 and $+1$ for all the models across countries, across industries, and across industries within country and for all the periods of observations 1979-1985, 1985-1995 and 1995-2005 (Please see the Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA} presented in the section PROOF below).

PROOF of the supplements to Chapter 6:

a. Across Countries

a.1. The period 1985-1995

Histogram and Statistics of error terms (RESID) for the model across countries (1985-1995):



Test of normal distribution:

Empirical Distribution Test for RESID

Hypothesis: Normal

Date: 12/13/08 Time: 23:07

Sample: 1 1872

Included observations: 1872

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.084748	NA	0.0000
Cramer-von Mises (W2)	4.408193	4.409370	0.0000
Watson (U2)	3.924236	3.925284	0.0000
Anderson-Darling (A2)	24.81568	24.82564	0.0000

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

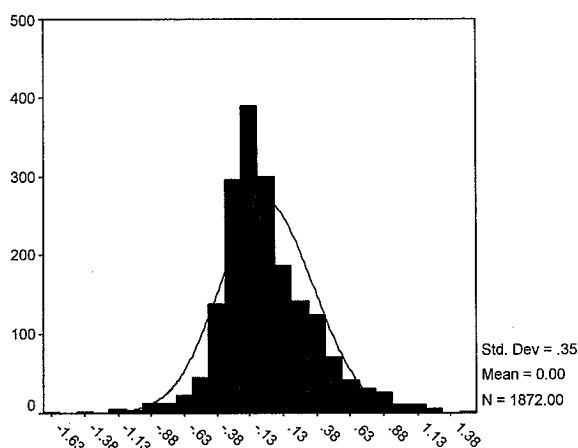
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	6.78E-16	0.008029	8.44E-14	1.0000
SIGMA	0.347395	0.005679	61.17189	0.0000
Log likelihood	-676.4981	Mean dependent var.		6.78E-16
No. of Coefficients	2	S.D. dependent var.		0.347395

One-Sample Kolmogorov-Smirnov Test

		CCTR9585
N		1872
Normal Parameters ^{a,b}	Mean	.0000
	Std. Deviation	.34739
Most Extreme Differences	Absolute	.085
	Positive	.085
	Negative	-.077
Kolmogorov-Smirnov Z		3.667
Asymp. Sig. (2-tailed)		.000

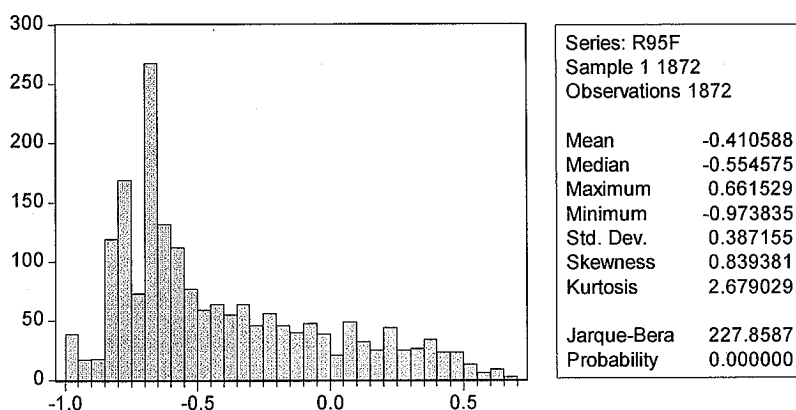
a. Test distribution is Normal.

b. Calculated from data.



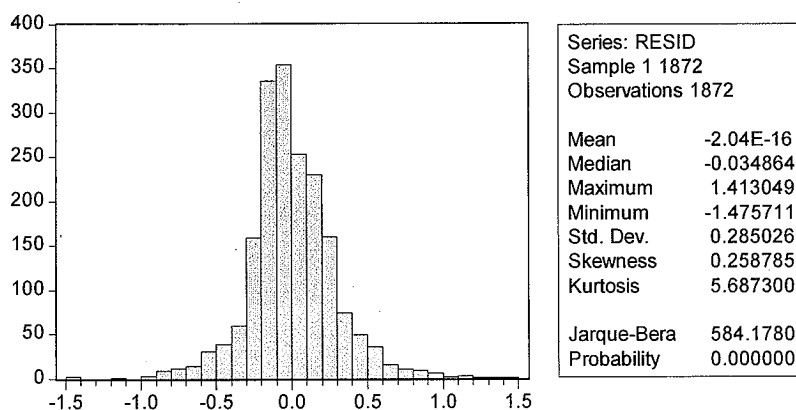
CCTR9585

Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA} for the model across countries (1985-1995):



a.2. The period 1995-2005

Histogram and Statistics of error terms (RESID) for the model across industries (1995-2005):



Test of normal distribution:

Empirical Distribution Test for RESID

Hypothesis: Normal

Date: 12/13/08 Time: 23:11

Sample: 1 1872

Included observations: 1872

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.066408	NA	0.0000
Cramer-von Mises (W2)	2.832754	2.833511	0.0000
Watson (U2)	2.753796	2.754532	0.0000
Anderson-Darling (A2)	16.98734	16.99416	0.0000

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

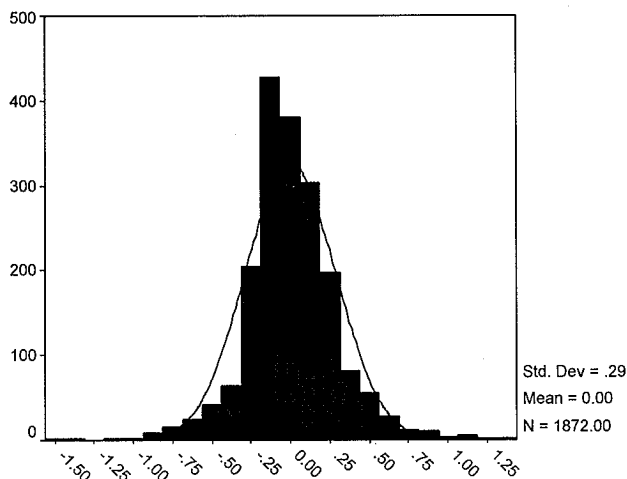
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	-2.04E-16	0.006588	-3.10E-14	1.0000
SIGMA	0.285026	0.004659	61.17189	0.0000
Log likelihood	-306.0687	Mean dependent var.		-2.04E-16
No. of Coefficients	2	S.D. dependent var.		0.285026

One-Sample Kolmogorov-Smirnov Test

		CCTR0595
N		1872
Normal Parameters a,b	Mean	.0000
	Std. Deviation	.28503
Most Extreme Differences	Absolute	.066
	Positive	.051
	Negative	-.066
Kolmogorov-Smirnov Z		2.873
Asymp. Sig. (2-tailed)		.000

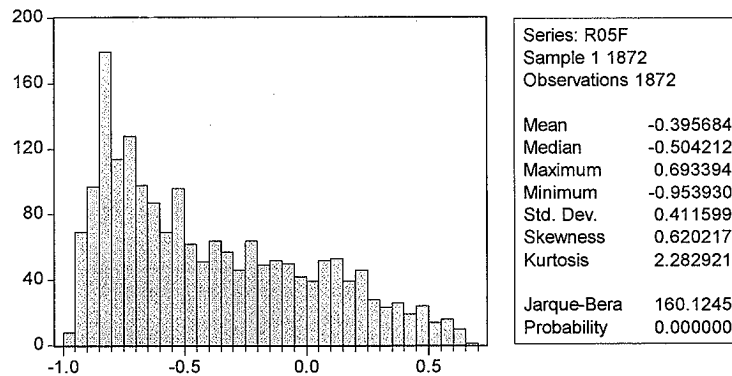
a. Test distribution is Normal.

b. Calculated from data.



CCTR0595

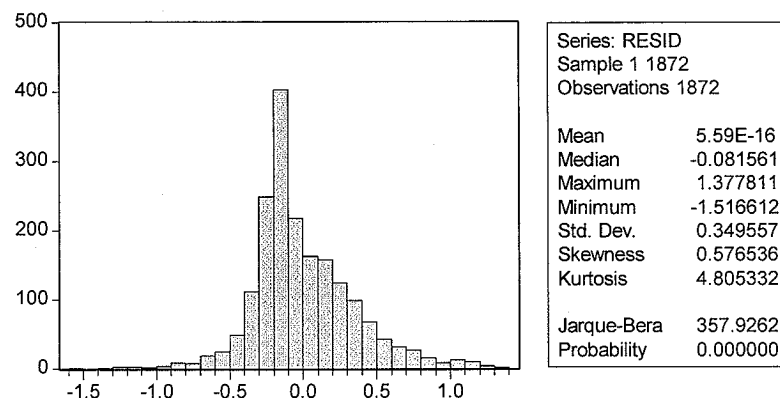
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage RSCA for the model across countries (1995-2005):



b. Across Industries (Products)

b.1. The period 1985-1995

Histogram and Statistics of error terms (RESID) for the model across industries (1985-1995):



Test of normal distribution:

Empirical Distribution Test for RESID

Hypothesis: Normal

Date: 12/13/08 Time: 23:19

Sample: 1 1872

Included observations: 1872

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.097342	NA	0.0000
Cramer-von Mises (W2)	5.580285	5.581775	0.0000
Watson (U2)	5.040458	5.041804	0.0000
Anderson-Darling (A2)	30.58492	30.59719	0.0000

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

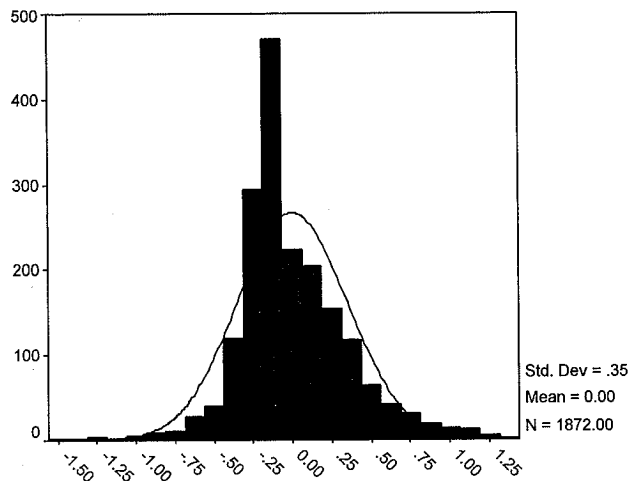
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	5.59E-16	0.008079	6.91E-14	1.0000
SIGMA	0.349557	0.005714	61.17189	0.0000
Log likelihood	-688.1173	Mean dependent var.		5.59E-16
No. of Coefficients	2	S.D. dependent var.		0.349557

One-Sample Kolmogorov-Smirnov Test

		CIND9585
N		1872
Normal Parameters ^{a,b}	Mean	.0000
	Std. Deviation	.34956
Most Extreme Differences	Absolute	.097
	Positive	.097
	Negative	-.073
Kolmogorov-Smirnov Z		4.212
Asymp. Sig. (2-tailed)		.000

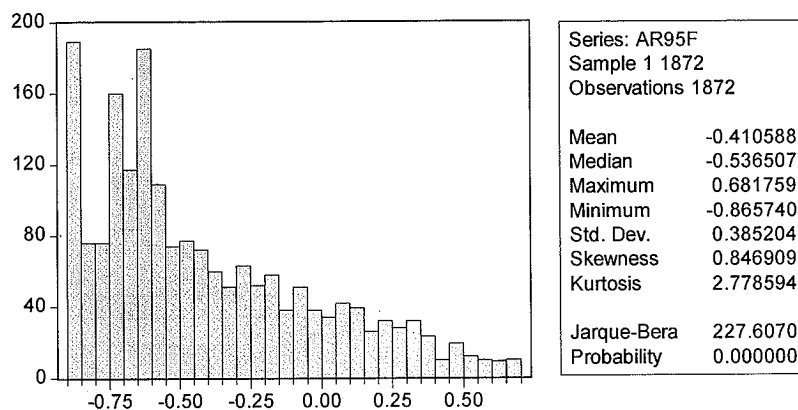
a. Test distribution is Normal.

b. Calculated from data.



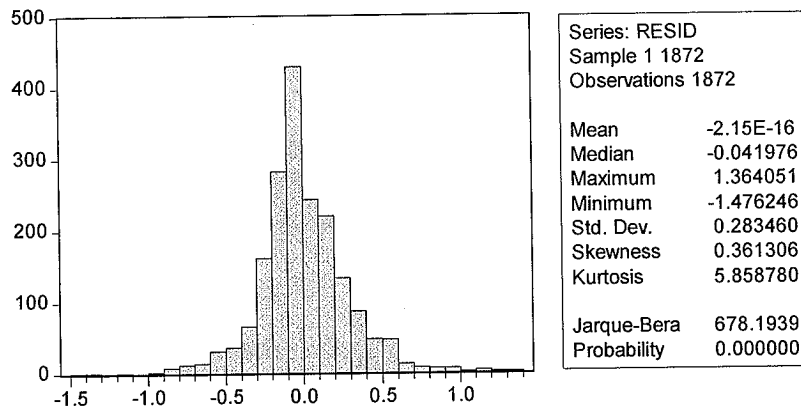
CIND9585

Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA} for the model across industries (1985-1995):



b.2. The period 1995-2005

Histogram and Statistics of error terms (RESID) for the model across industries (1995-2005):



Test of normal distribution:

Empirical Distribution Test for RESID

Hypothesis: Normal

Date: 12/13/08 Time: 23:24

Sample: 1 1872

Included observations: 1872

Method	Value	Adj. Value	Probability
Lilliefors (D)	0.065482	NA	0.0000
Cramer-von Mises (W2)	3.820991	3.822012	0.0000
Watson (U2)	3.694124	3.695111	0.0000
Anderson-Darling (A2)	21.20768	21.21619	0.0000

Method: Maximum Likelihood - d.f. corrected (Exact Solution)

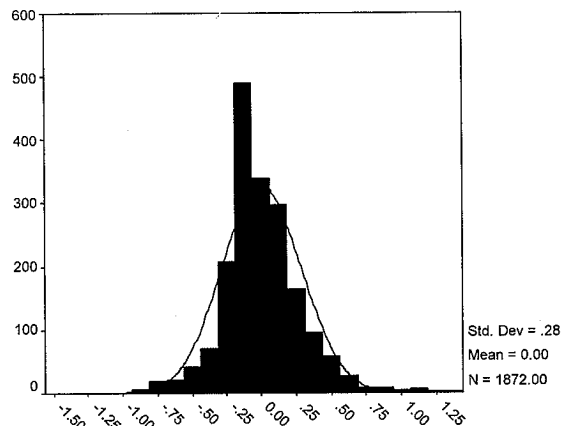
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	-2.15E-16	0.006551	-3.28E-14	1.0000
SIGMA	0.283460	0.004634	61.17189	0.0000
Log likelihood	-295.7547	Mean dependent var.		-2.15E-16
No. of Coefficients	2	S.D. dependent var.		0.283460

One-Sample Kolmogorov-Smirnov Test

		CIND0595
N		1872
Normal Parameters ^{a,b}	Mean	.0000
	Std. Deviation	.28346
Most Extreme Differences	Absolute	.065
	Positive	.065
	Negative	-.064
Kolmogorov-Smirnov Z		2.833
Asymp. Sig. (2-tailed)		.000

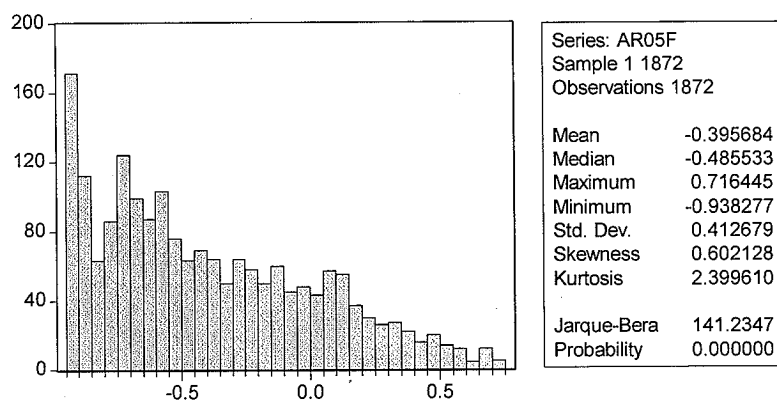
a. Test distribution is Normal.

b. Calculated from data.



CIND0595

Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA} for the model across industries (1995-2005):

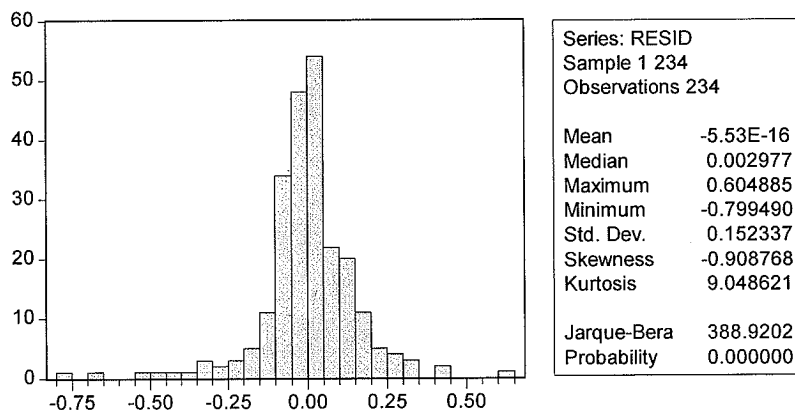


c. Across Industries within Countries

c.1. Japan

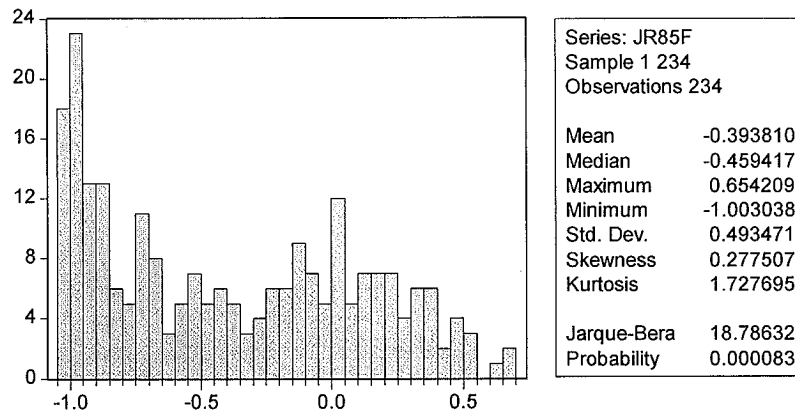
c.1.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



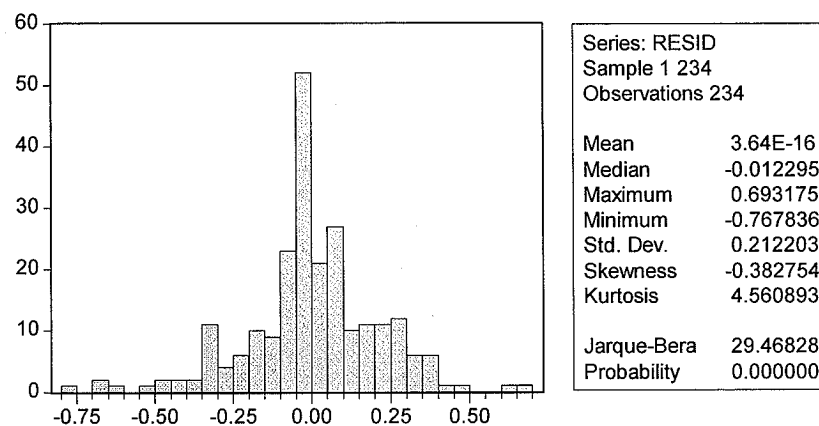
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



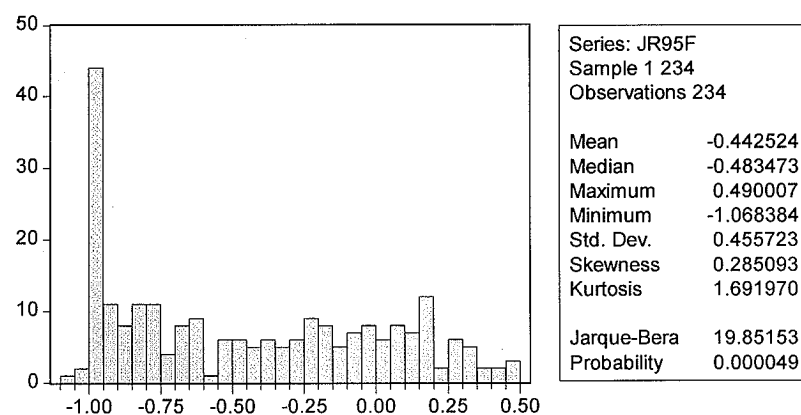
c.1.2. The Period 1985-1995

Histogram and Statistics of error terms (RESID)



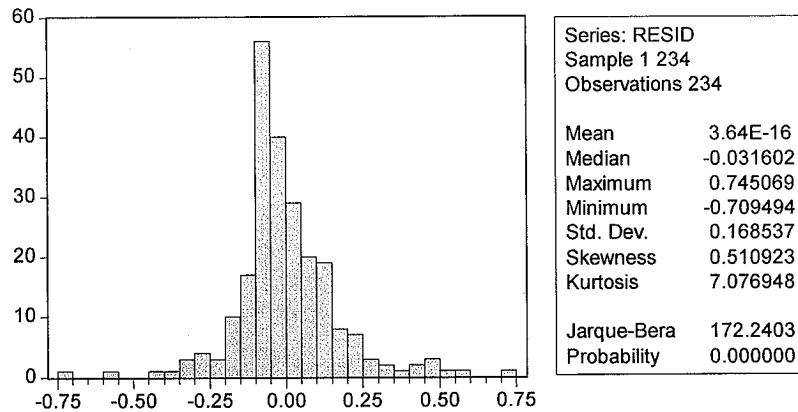
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



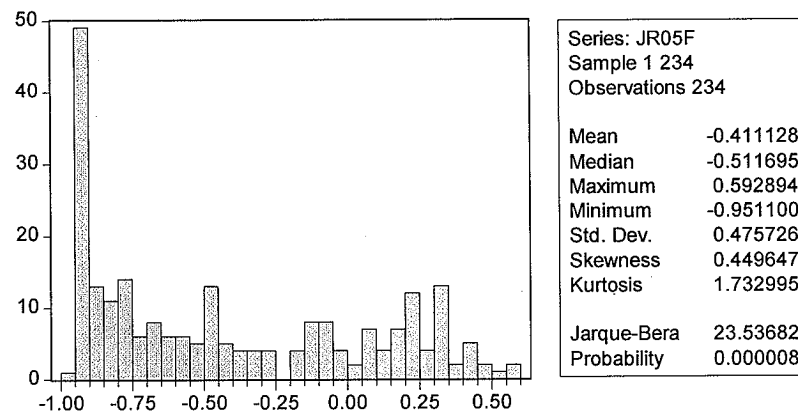
c.1.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

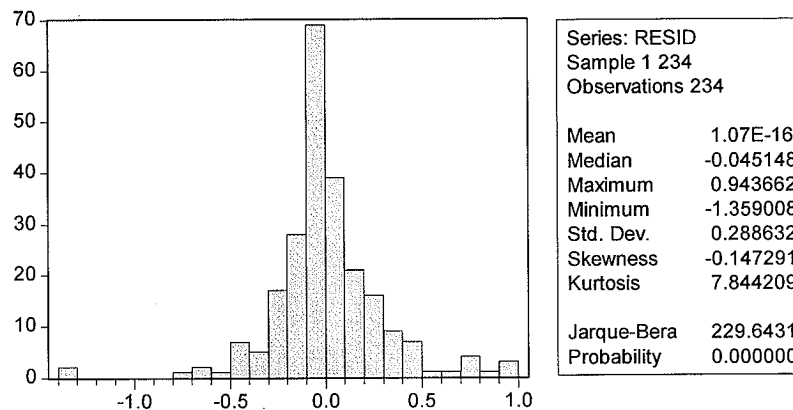
\hat{RSCA}



c.2. Korea

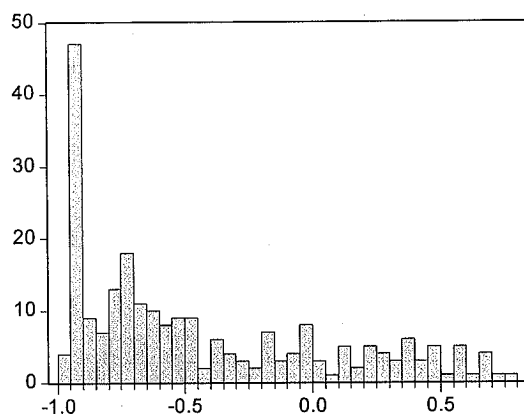
c.2.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

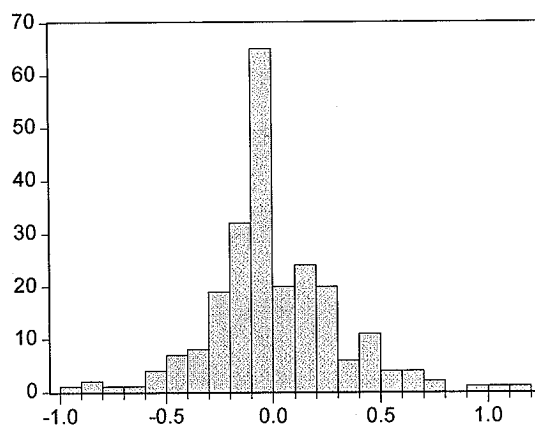
\hat{RSCA}



Series: KR85F	
Sample 1 234	
Observations 234	
Mean	-0.429863
Median	-0.616415
Maximum	0.754261
Minimum	-0.991556
Std. Dev.	0.495359
Skewness	0.805841
Kurtosis	2.377598
Jarque-Bera	29.10277
Probability	0.000000

c.2.2. The Period 1985-1995

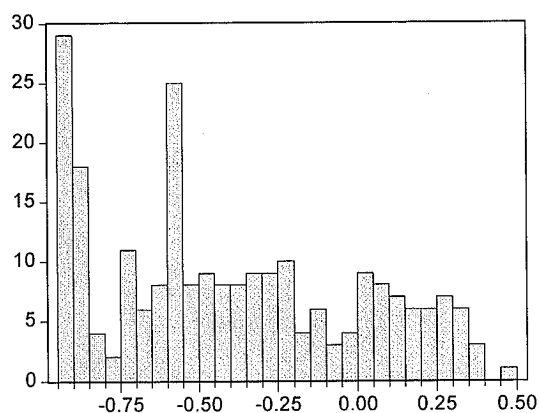
Histogram and Statistics of error terms (RESID)



Series: RESID	
Sample 1 234	
Observations 234	
Mean	-2.76E-16
Median	-0.054583
Maximum	1.168113
Minimum	-0.981264
Std. Dev.	0.298561
Skewness	0.453891
Kurtosis	4.972079
Jarque-Bera	45.95336
Probability	0.000000

Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

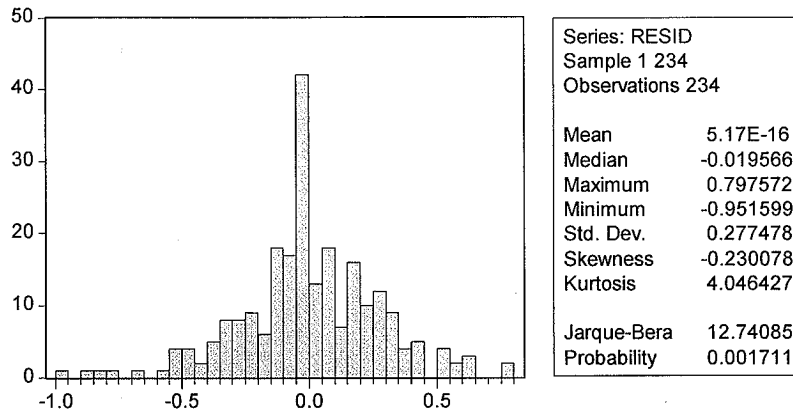
\hat{RSCA}



Series: KR95F	
Sample 1 234	
Observations 234	
Mean	-0.398209
Median	-0.470453
Maximum	0.479810
Minimum	-0.906299
Std. Dev.	0.394645
Skewness	0.356637
Kurtosis	1.947143
Jarque-Bera	15.76835
Probability	0.000377

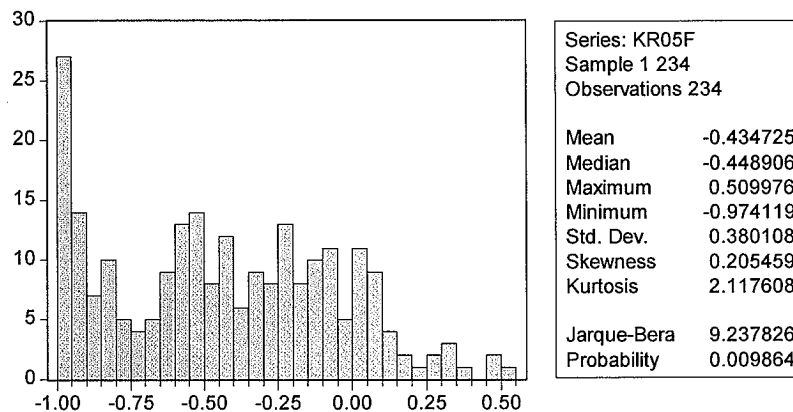
c.2.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

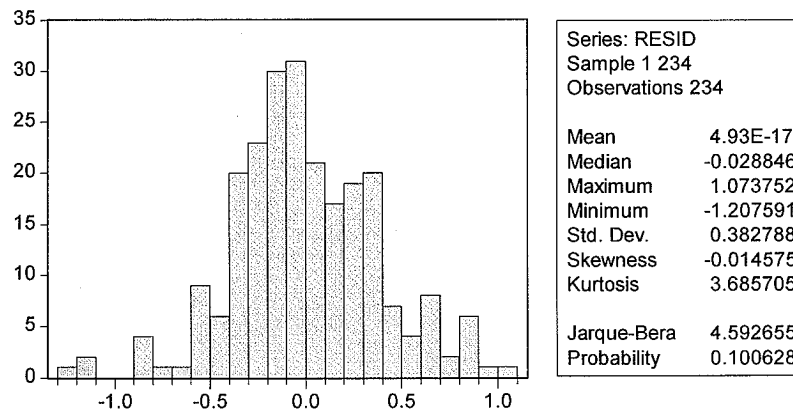
\hat{RSCA}



c.3. China

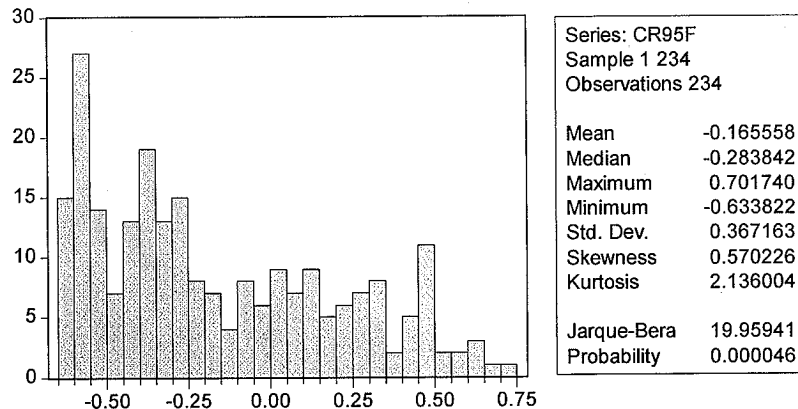
c.3.1. The Period 1987-1995

Histogram and Statistics of error terms (RESID)



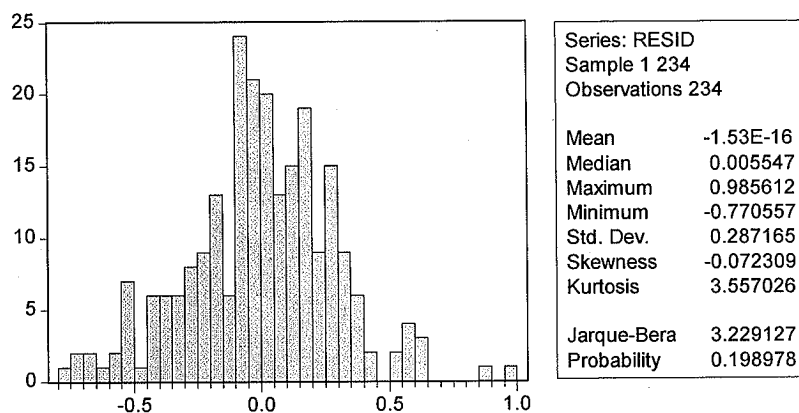
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



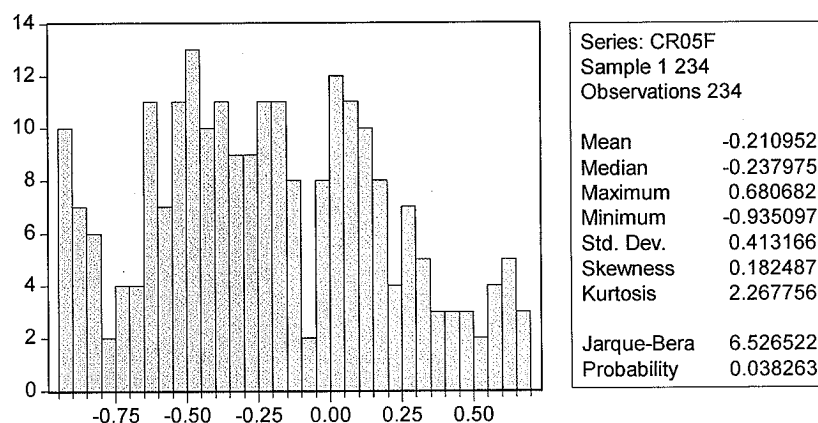
c.3.2. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

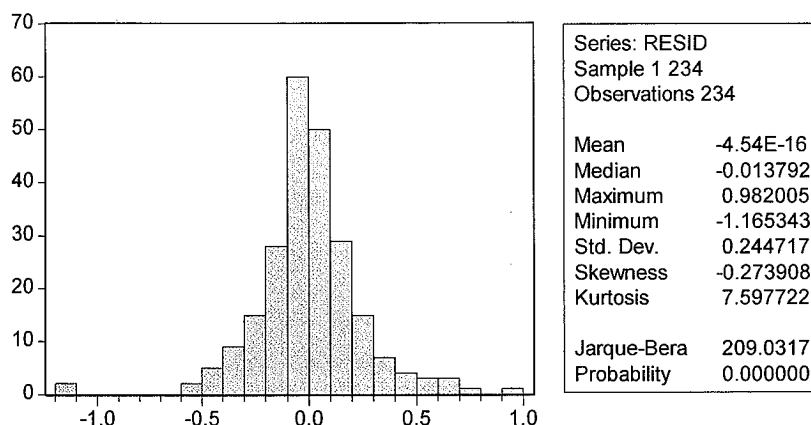
\hat{RSCA}



c.4. Singapore

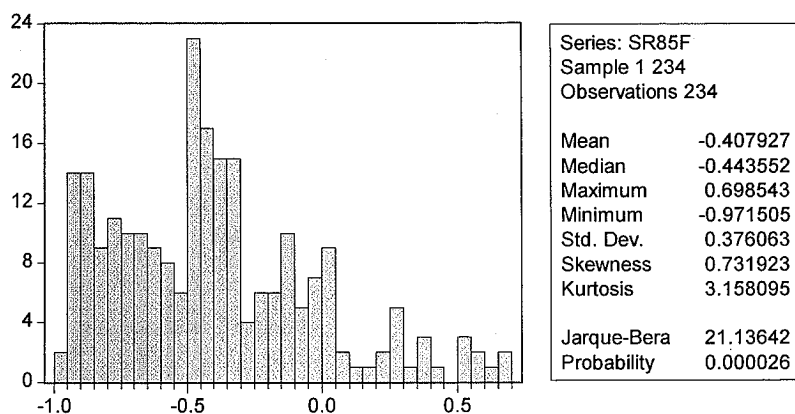
c.4.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



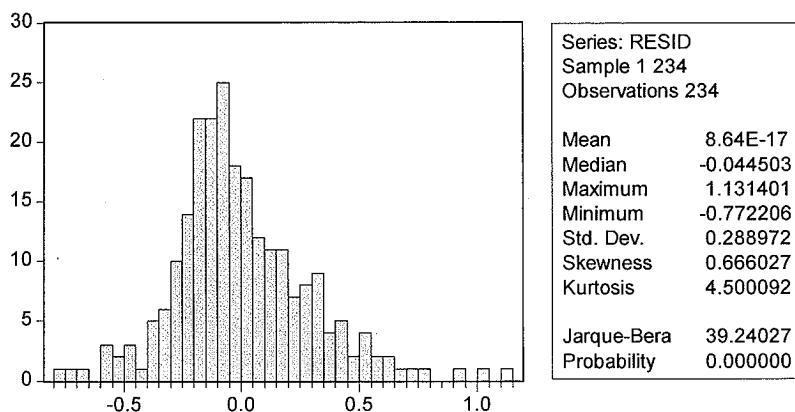
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}

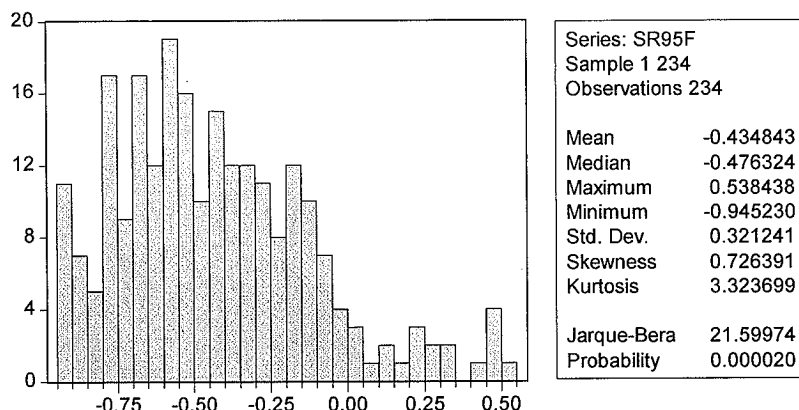


c.4.2. The Period 1985-1995

Histogram and Statistics of error terms (RESID)

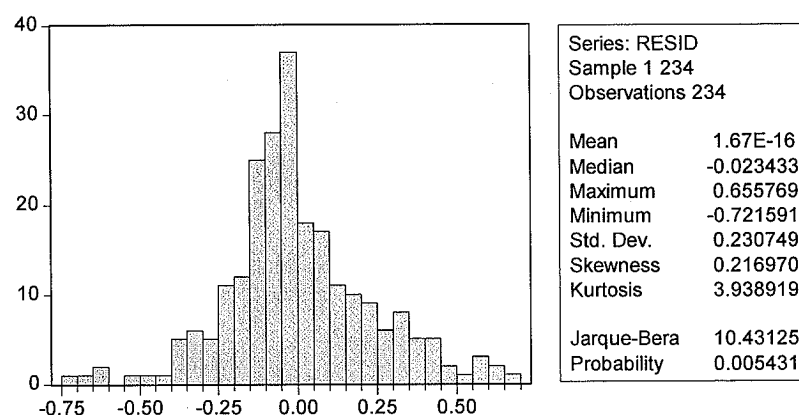


Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA}

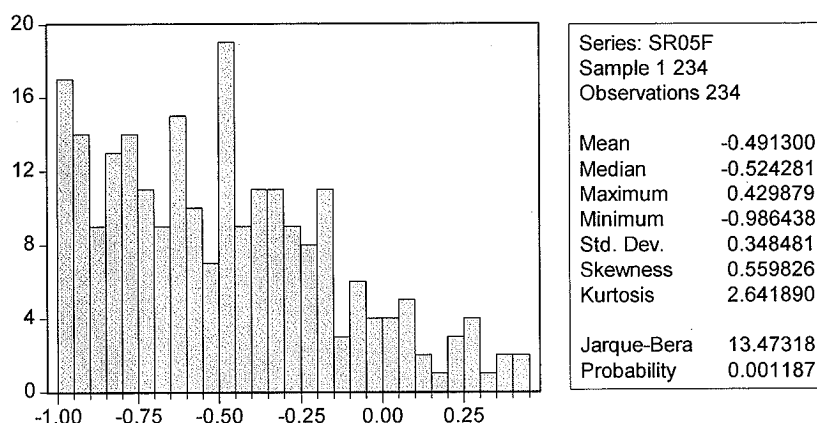


c.4.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



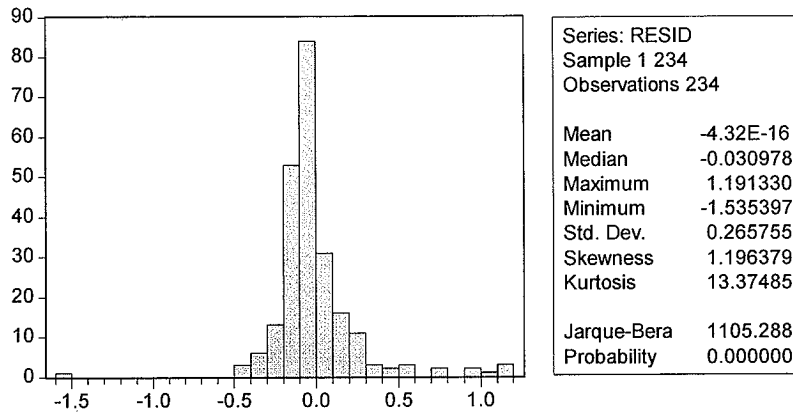
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage \hat{RSCA}



c.5. Indonesia

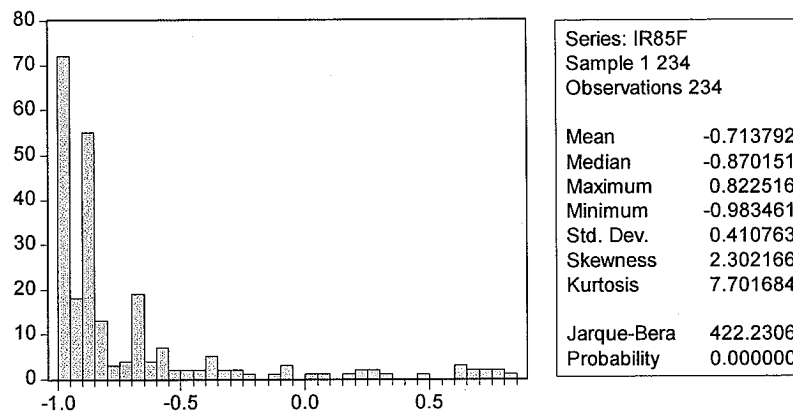
c.5.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



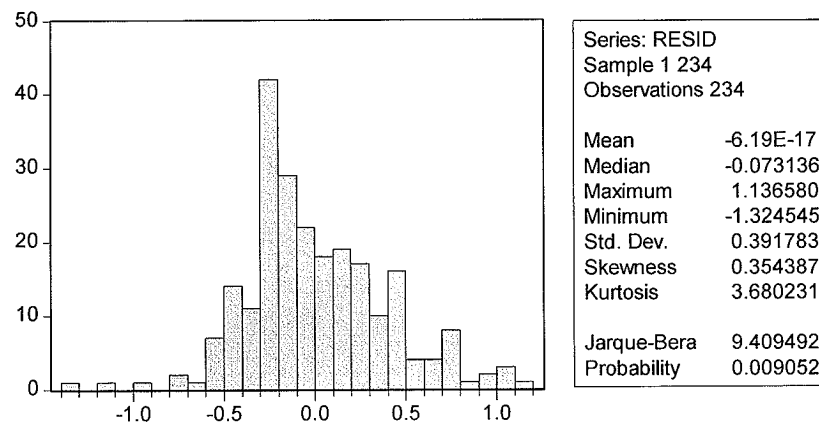
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



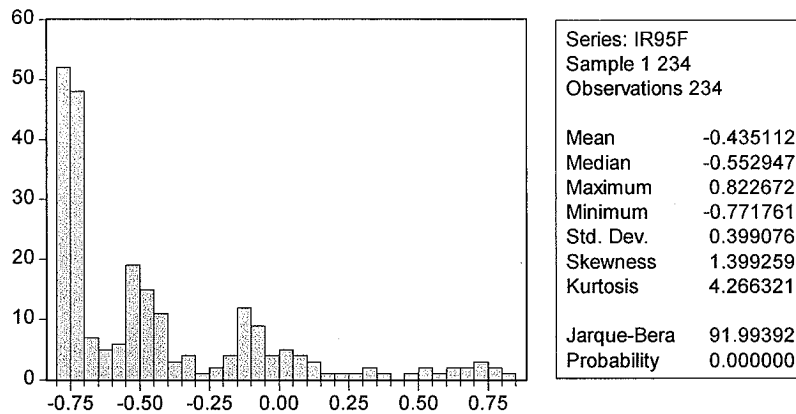
c.5.2. The Period 1985-1995

Histogram and Statistics of error terms (RESID)



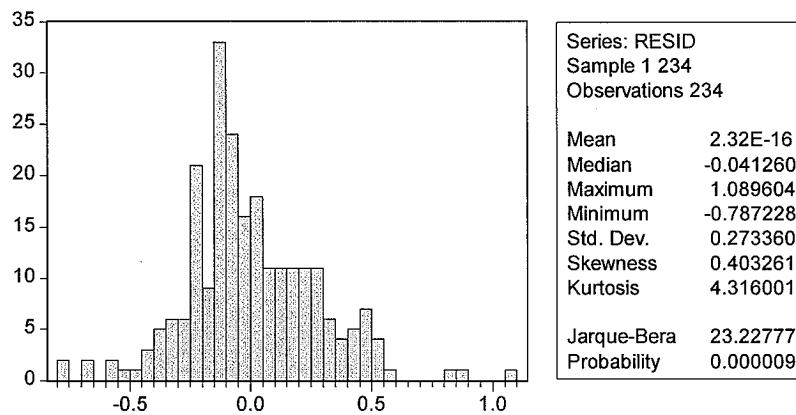
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



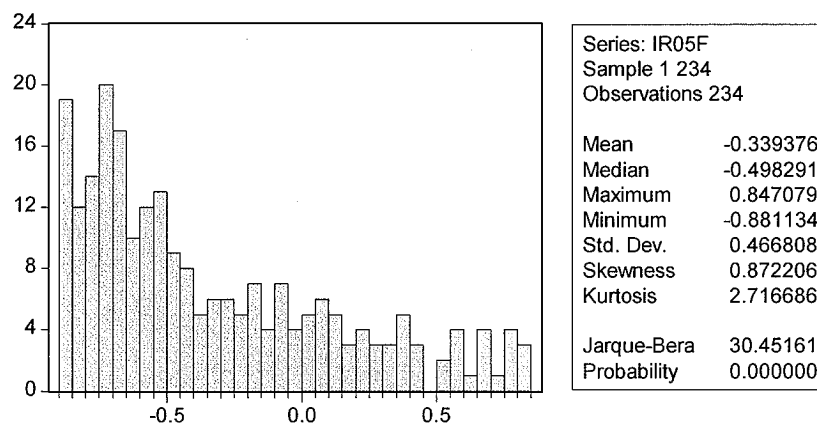
c.5.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

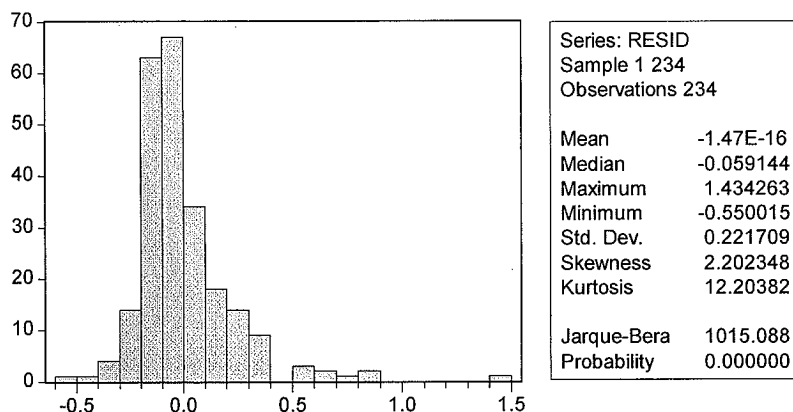
\hat{RSCA}



c.6. Malaysia

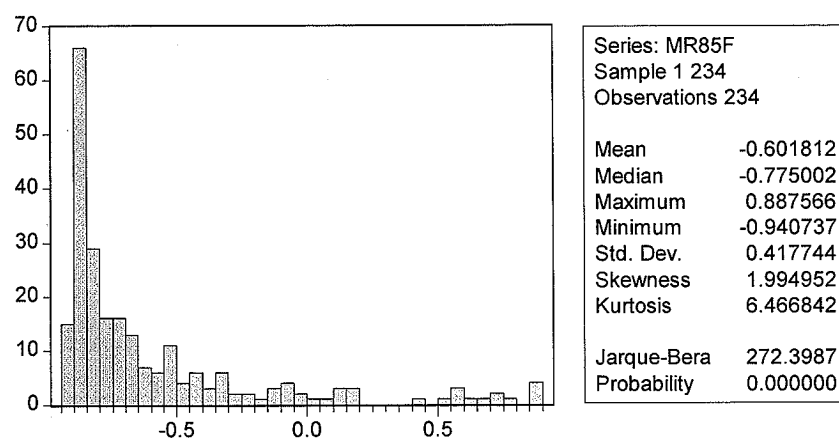
c.6.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



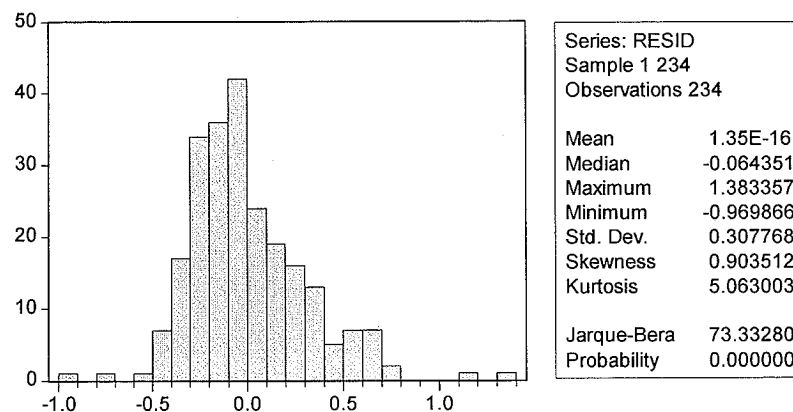
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



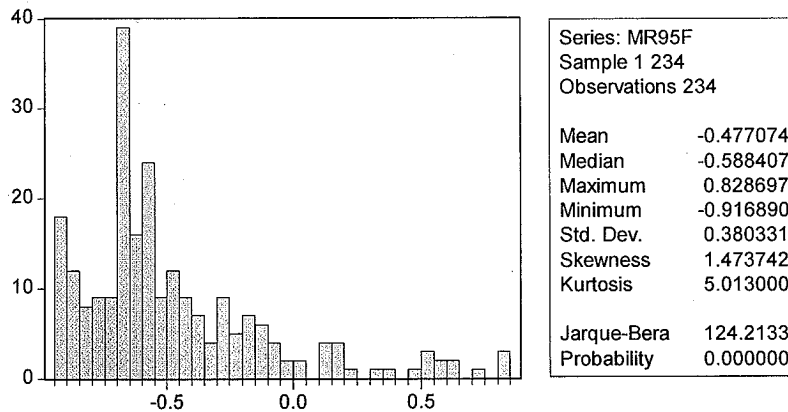
c.6.2. The Period 1985-1995

Histogram and Statistics of error terms (RESID)



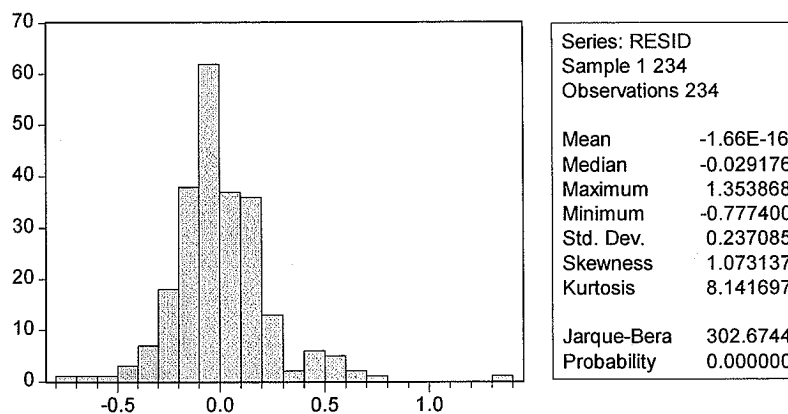
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



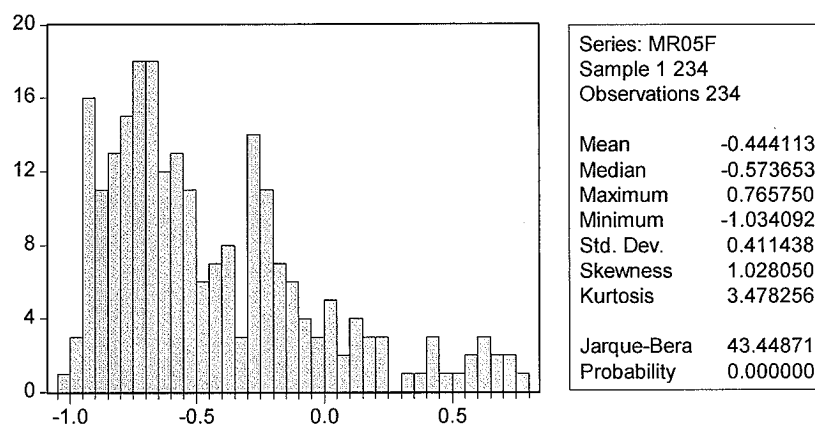
c.6.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

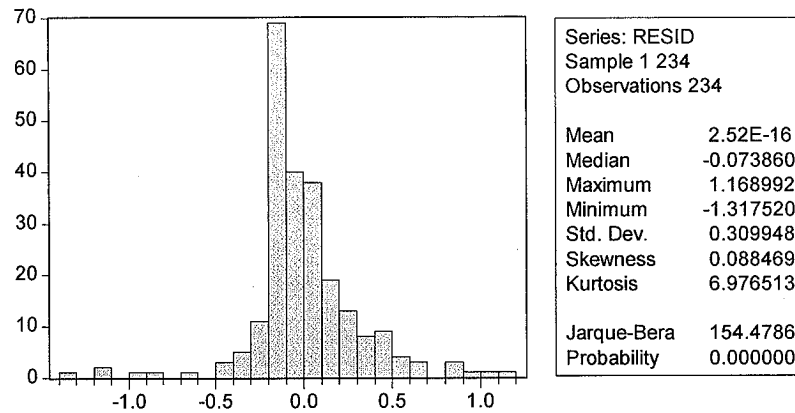
\hat{RSCA}



c.7. Thailand

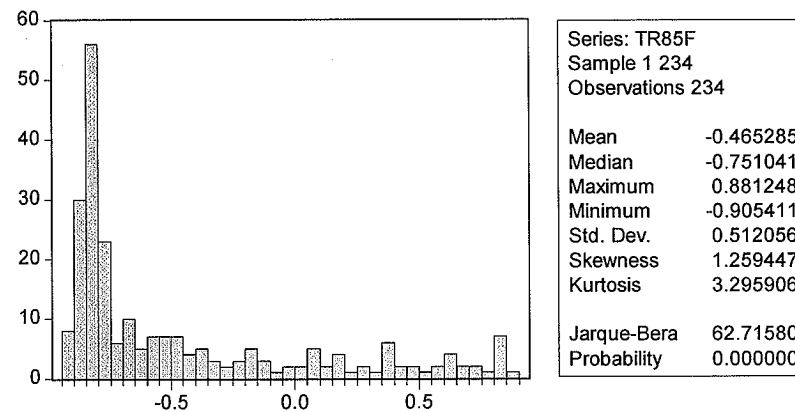
c.7.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



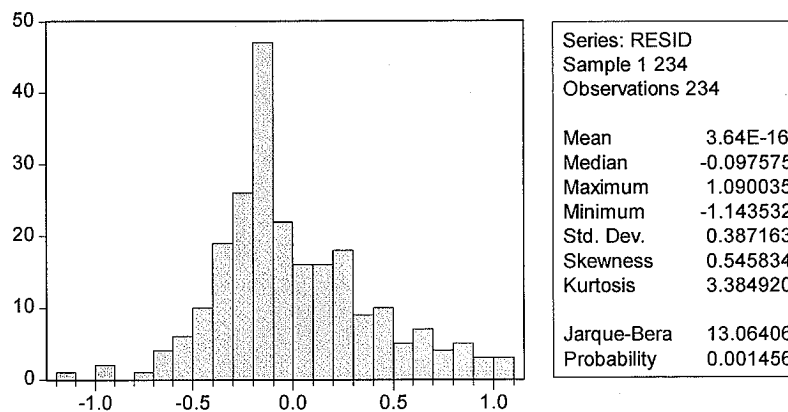
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



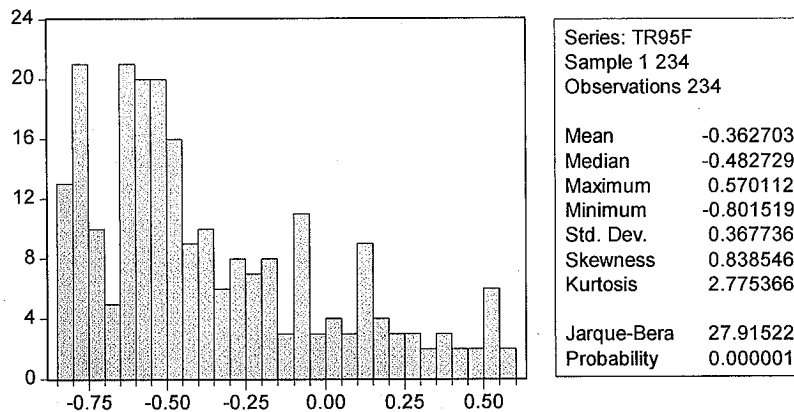
c.7.2. The Period 1985-1995

Histogram and Statistics of error terms (RESID)



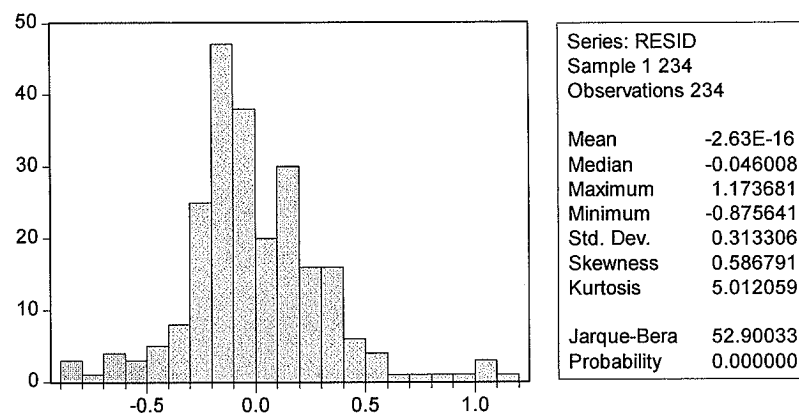
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



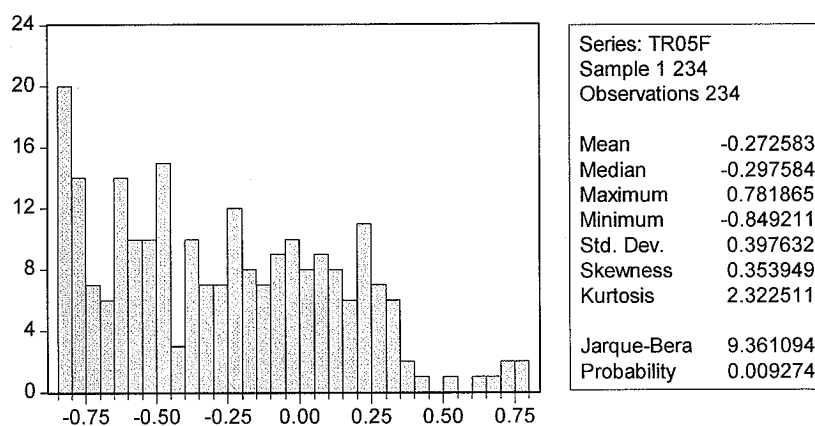
c.7.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

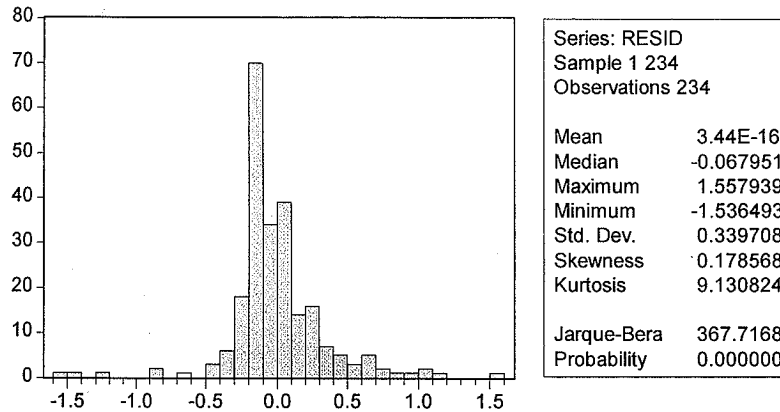
\hat{RSCA}



c.8. The Philippines

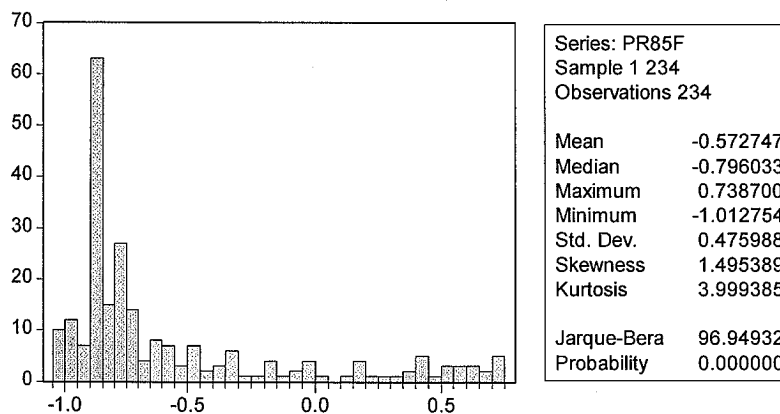
c.8.1. The Period 1979-1985

Histogram and Statistics of error terms (RESID)



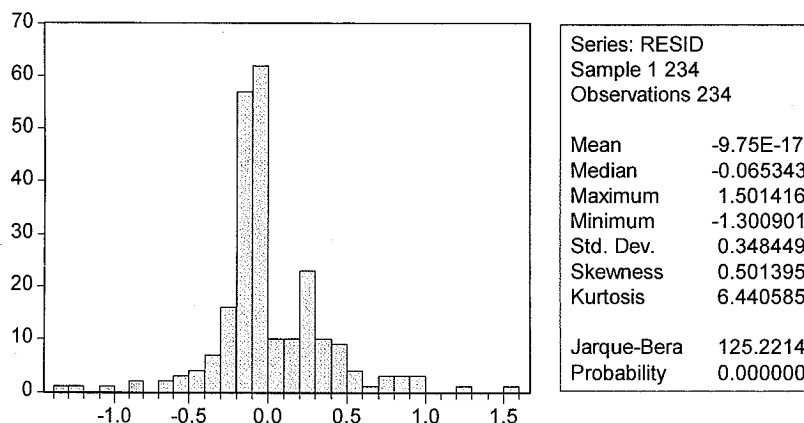
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



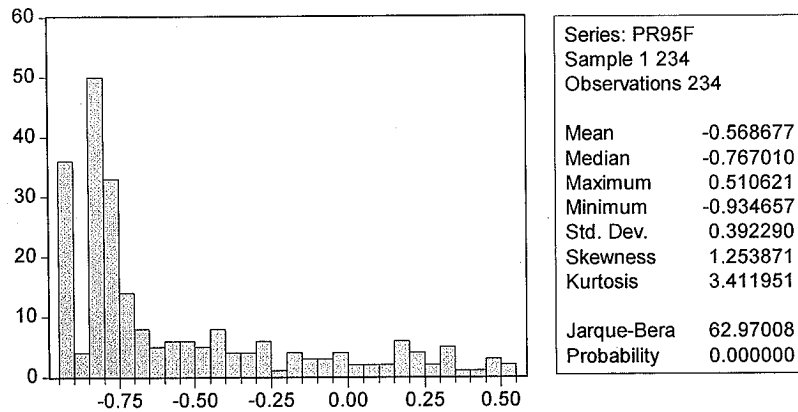
c.8.2. The Period 1985-1995

Histogram and Statistics of error terms (RESID)



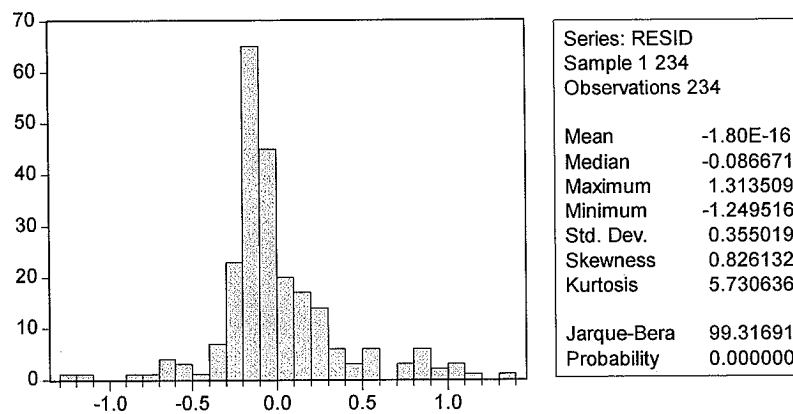
Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}



c.8.3. The Period 1995-2005

Histogram and Statistics of error terms (RESID)



Histogram and Statistics of the estimated Revealed Symmetric Comparative Advantage

\hat{RSCA}

