Trade Structure and Trade Potential Between China, Japan and Korea

Sang-yirl Nam, Research fellow,

Korea Institute for International Economic Policy (KIEP)

The International Centre for the Study of East Asian Development, Kitakyushu

Trade Structure and Trade Potential Between China, Japan and Korea[*]

Sang-yirl Nam**, Research fellow,
Korea Institute for International Economic Policy (KIEP)

ABSTRACT

World trade relationships are changing rapidly. Regional trade arrangements proliferate even with considerable progress in multilateral trade liberalization. Without any institutional framework on regional integration, however, the three Northeast Asian countries, i.e., China, Japan and Korea, have been experiencing significant changes and progress in their economic relationships in trade, especially during the last two decades or so. The purpose of this paper is to examine the trade structure of the three Northeast Asian countries, especially, in terms of complementarity through the index of trade conformity (ITC) and to estimate trade potential with the gravity model of trade considering the directions of trade between them. The three Northeast Asian countries are analyzed as having relatively high complementarity in their trade structure, especially in trade flows from Korea to both China and Japan followed by those from Japan to China. Potential trades between them are also estimated significantly larger than their actual trade performances. Based on the results, some measures to attain the potential trades are suggested, for example, implementing trade facilitation measures, utilizing complementarity in trade between them, and introducing institutional integrations such as a regional trade arrangement.

Key Words: trade structure, complementarity, Northeast Asia, gravity model, trade
potential

** Research fellow
Korea Institute for International Economic Policy (KIEP)
300-4 Yomgok-Dong, Seocho-Gu,
Seoul 137-747, Korea
e-mail: synam@kiep.go.kr

---

[*] This paper focuses on trade structure and trade potential between three Northeast Asian countries, China, Japan and Korea, utilizing and updating the analysis in Nam (2003). Especially, it analyzes the relative intensity of bilateral trade between the three countries by commodity or industrial sector and differentiates trade flows by the directions between countries in the estimation of trade potential.

CONTENTS

1. INTRODUCTION

World trade has been increasing fast since the introduction of the multilateral trade system, the General Agreement on Tariffs and Trade (GATT) first signed in 1947. According to WTO (2003), total volume of world merchandise exports has increased about 23.4 times, or equivalently has grown at an annual average rate of 6.3 percent, between 1950 and 2002. In contrast, world production in volume and the world GDP has increased about 7.1 times and 6.8 times during the same period (annual average growth rates of 3.8 percent and 3.7 percent), respectively. Therefore, world merchandise trade volume has increased much faster since 1950 than world production in volume or the world GDP.[1] The trend of relatively faster growing world trade compared with world production accelerated after the launch of the WTO in 1995. The volume of world merchandise exports has increased at an annual average rate of 6.1 percent between 1994 and 2002, whereas world production in volume has increased at an annual average rate of 2.6 percent during the same period.[2] Not all of the major regions, however, performed with the similar pattern. For example, North America and Latin America observed their shares in world merchandise exports significantly decreased from 27.3 percent and 12.3 percent in 1948 to 15.1 percent and 5.6 percent in 2002, respectively. In contrast, Western Europe and Asia experienced their shares in world merchandise exports significantly increased from 31.5 percent and 13.6 percent to 42.4 percent and 25.8 percent during the same period, respectively. One of the most dynamic changes can be found in Northeast Asia, especially, in China, Japan and Korea. The three Northeast Asian countries' share in world merchandise exports has increased from 1.3 percent in 1948 to 14.3 percent in 2002.

---

[1] This trend is much more significant when we consider world exports and world production in manufacturing sector. That is, total volume of world exports in manufacturing sector has increased about 45.7 times (an annual average growth rate of 7.63 percent) between 1950 and 2002, while the volume of world production in manufacturing sector has increased about 10.2 times (an annual average growth rate of 4. 6 percent) during the same period. Therefore, world trade volume of manufacturing goods has increased much faster since 1950 than world production volume in manufacturing sector.

[2] For reference, the annual average growth rates before the launch of the WTO (between 1950 and 1994) were 6.3 percent for the volume of world merchandise exports and 4.0 percent for world production in volume. Therefore, world trade expanded steadily even with the recent declining trend of the growth rates in world production.

Table 1-1 World Merchandise Exports, Production and GDP   (index, 1990=100)

Year	World Exports (volume)		Production (volume)		World GDP
	Total	Manufacturing	Total	Manufacturing	
1950	9	5	18	13	19
1960	18	11	30	24	30
1970	41	29	54	49	50
1980	68	58	78	75	73
1990	100	100	100	100	100
1995	136	126	103	102	105
2000	196	210	127	130	125
2001	195	207	126	129	127
2002	200	213	127	130	129
Annual Average Growth Rate (%)					
1950~1994	6.27	7.77	3.99	4.83	3.95
1994~2002	6.13	6.85	2.63	3.07	2.60
1950~2002	6.25	7.63	3.78	4.56	3.74

Source: World Trade Organization (2003), *International Trade Statistics 2003*, Geneva; and author's calculation.

Table 1-2 Share of World Merchandise Trade by Region   (billions of dollar and percent)

	1948	1953	1983	1993	2002
EXPORTS					
World (bil. $)	58.0	84.0	1,835.0	3,671.0	6,272.0
North America	27.3	24.2	15.4	16.6	15.1
Latin America	12.3	10.5	5.9	4.4	5.6
Western Europe	31.5	34.9	38.9	44.0	42.4
Rest of Europe	6.0	8.1	9.5	2.9	5.0
Africa	7.3	6.5	4.4	2.5	2.2
Middle East	2.0	2.7	6.8	3.4	3.9
Asia	13.6	13.1	19.1	26.1	25.8
Northeast Asia	1.3	2.7	10.6	14.8	14.3
China	0.9	1.2	1.2	2.5	5.2
Japan	0.4	1.5	8.0	9.9	6.6
Korea	n.a.	0.02*	1.4	2.4	2.5
IMPORTS					
World (bil. $)	66.0	84.0	1,881.0	3,768.0	6,510.0
North America	19.8	19.7	17.8	19.7	22.0
Latin America	10.6	9.3	4.5	5.1	5.4
Western Europe	40.4	39.4	40.0	43.0	40.8
Rest of Europe	5.8	7.6	8.4	2.9	4.6
Africa	7.6	7.0	4.6	2.6	2.1
Middle East	1.7	2.0	6.3	3.3	2.7
Asia	14.2	15.1	18.5	23.3	22.4
Northeast Asia	2.1	5.0	9.3	11.5	12.0
China	1.1	1.7	1.1	2.8	4.5
Japan	1.0	2.9	6.7	6.4	5.2
Korea	n.a.	0.37*	1.5	2.3	2.3

Note: * Share in 1955.

Sources: World Trade Organization (2003), *International Trade Statistics 2003*, Geneva.
          International Monetary Fund (2004), *Direction of Trade Statistics*, CD-ROM, January.

World trade relationships have been changing rapidly with the fast growth of its volume. Especially, regional trade agreements (RTAs) proliferate even with the progress in multilateral trade liberalization under the Uruguay Round (UR) and the World Trade Organization (WTO). According to the WTO, some 250 RTAs have been notified to the GATT/WTO up to December 2002, of which 130 were notified after January 1995, the launch of the WTO.[3] Until very recently, however, Northeast Asia, one of the major regions in world trade arena and formed by some of the most dynamic countries, was an exception in this global trend of institutional integration based on regional proximity. Asia Pacific Economic Cooperation (APEC) might be the only regional and institutionalized forum that combines the three major Northeast Asian economies.[4] Even without any binding institutional framework on regional trade, however, they have been experiencing significant progress in their economic relationships of trade, especially during last two decades or so. The purpose of this paper is to examine the trade structure of the three Northeast Asian countries, especially, in terms of complementarity through the index of trade conformity (ITC) and to identify trade potential with the gravity model of trade considering the directions of trade between them. APEC member economies are utilized as a reference group. Some commodities or industrial sectors, that have relatively large contributions to the complementarity between them, will also be identified. With the results from the analysis, some common sectors or ways to enhance the integration of the Northeast Asian countries as a whole through international trade and enlarge mutual benefits between them will be examined.

The remaining part of this paper consists of the following contents. Overall trade structures and trends in the Northeast Asian countries are examined in part 2. Complementarity in Northeast Asian trade is analyzed in part 3 by utilizing the ITC that measures structural similarity between one country's exports and another country's imports. In part 4, trade potential between the three Northeast Asian countries is estimated with the gravity model of international trade and also taking into account of complementarity in trade. In addition, some approaches for attaining the estimated trade potential will be identified. Part 5 summarizes the paper and gives some brief implications.

---

[3] Please refer to the WTO homepage [www.wto.org]. By the end of 2005, if RTAs reportedly planned or already under negotiation are concluded, the WTO expects that the total number of RTAs in force might well approach 300.

[4] Officially, Japan reported to the WTO on the free trade agreement (FTA) with Singapore in November 2002. Besides, Korea-Chile FTA has begun to implement since April 1, 2004. All of the three Northeast Asian Countries are also pursuing free trade agreements with Southeast Asian countries, South American countries as well as among themselves.

2. TRADE STRUCTURE IN NORTHEAST ASIA

2.1 Northeast Asia in World Trade

The three Northeast Asian countries' shares in world merchandise exports and imports have increased significantly from 1.3 percent and 2.1 percent in 1948 to 14.3 percent and 12.0 percent in 2002, respectively. By individual country, China, Japan and Korea explain 5.1 percent, 6.5 percent and 2.5 percent of world exports in 2002, respectively. They also explain 4.5 percent, 5.1 percent and 2.3 percent of world imports in 2002, respectively. The share of each country in world exports is somewhat larger than that in world imports in recent years and all of them recorded trade surpluses.

Table 2-1 International Trade of Three Northeast Asian Countries   (billions of dollar)

	1980	1985	1990	1995	2000	2001	2002
Exports							
China	18.1	27.3	62.8	149.0	249.2	266.7	325.7
Japan	130.4	177.2	287.7	443.0	478.2	403.4	416.6
Korea	17.5	30.3	67.8	131.3	171.8	149.8	161.5
Imports							
China	19.5	42.5	53.8	132.2	225.1	243.6	295.4
Japan	141.3	130.5	235.3	336.0	379.5	349.1	337.1
Korea	22.1	31.1	74.4	135.1	160.5	141.1	152.1

Source: International Monetary Fund (2004), *Direction of Trade Statistics*, CD-ROM, January.

2.2 Bilateral and Intra-regional Trade in Northeast Asia

Intra-regional trade share, among the three Northeast Asian countries, in terms of the share in each country's aggregate imports or exports, has increased significantly during last two decades even with their fast growing trade. The only exception is China's export share with the Northeast Asian countries, which has decreased during the same period.[5] For example, China's import share with the Northeast Asian countries has increased from 26.5 percent in 1980 to 27.8 percent in 2002 but its export share with the Northeast Asia has decreased from 22.2 percent in 1980 to 19.7 percent in 2002. Japan experienced its export and import share with the Northeast Asian countries significantly

---

[5] This is a mirror image of fast increasing China's export share with the US.

increased from 8.1 percent and 5.2 percent in 1980 to 16.5 percent and 22.9 percent in 2002. Korea also saw its export and import share with the Northeast Asian countries increased from 17.4 percent and 26.6 percent in 1980 to 24.1 percent and 31.1 percent in 2002. Among the three countries, Korea has the highest integration with the Northeast Asian countries in terms of both its import and export share in 2002. Its import and export share with Northeast Asian countries in 2002 are 31.0 percent and 24.1 percent, respectively. In contrast, Japan has the lowest integration with Northeast Asian countries in terms of both its import and export share in 2002. Its import and export share with the Northeast Asian countries in 2002 are 22.9 percent and 16.5 percent, respectively.

Structural changes have also been observed in the composition of trade shares by their corresponding country. For example, China's export share and import share with Japan have been decreasing and those with Korea have been increasing fast since it began to reform and open its economy in 1978 and especially since it formed the amity relationship with Korea in August 1992. China's trade share with Korea has increased significantly and relatively faster in its imports than exports. Japan's trade share with China has been increasing fast and relatively much faster in its imports than exports. Japan's trade share with Korea has been stagnating since 1990s around 6 to 7 percent in its exports and 4 to 5 percent in its imports, respectively. Besides, both China's export share and Japan's export share with Korea seem to have been affected by Korea's financial crisis of 1997 and their shares lowered significantly in 1997 and 1998. Korea's trade share with China has been increasing fast and relatively faster in its exports than imports. In contrast, Korea's trade share with Japan has been decreasing fast in both its exports and imports. However, Korea's trade share with the Northeast Asia, combining China and Japan together, has been increasing in both its exports and imports.

Overall, bilateral trade between Japan and Korea, in terms of shares in one country's aggregate imports or exports, is relatively weak or has been weakening. For example, both Japan's export and import share with Korea are relatively low, even though it is increasing, at 6.9 percent and 4.6 percent in 2002, respectively. In addition, both Korea's export and import share with Japan has been decreasing significantly. The two trends seem to be closely related to each other. Therefore, to enhance regional integration in Northeast Asia as a whole, the industrial linkages through trade, especially, between Japan and Korea are to be developed.

Table 2-2 Bilateral and Intra-regional Trade Share in Northeast Asia

(1) Trends Between 1980-2002 (percent)

		1980	1985	1990	1995	2000	2001	2002
Bilateral Export Share (of country in the first column to country in the second column)								
China	Japan	22.2	22.3	14.7	19.1	16.7	16.9	14.9
	Korea	0.0	0.0	0.7	4.5	4.5	4.7	4.8
	NE Asia[1]	22.2	22.3	15.4	23.6	21.2	21.6	19.7
Japan	China	3.9	7.1	2.1	5.0	6.4	7.7	9.6
	Korea	4.1	4.0	6.1	7.1	6.4	6.3	6.9
	NE Asia	8.0	11.1	8.2	12.1	12.8	14.0	16.5
Korea	China	0.0	0.0	0.0	7.0	10.7	12.1	14.7
	Japan	17.4	15.0	18.6	13.0	11.9	11.0	9.4
	NE Asia	17.4	15.0	18.6	20.0	22.6	23.1	24.1
Bilateral Import Share (of country in the first column from country in the second column)								
China	Japan	26.5	35.7	14.2	22.0	18.4	17.6	18.1
	Korea	0.0	0.0	0.4	7.8	10.3	9.6	9.7
	NE Asia	26.5	35.7	14.6	29.8	28.7	27.2	27.8
Japan	China	3.1	5.0	5.1	10.7	14.5	16.6	18.3
	Korea	2.2	3.2	5.0	5.2	5.4	4.9	4.6
	NE Asia	5.3	8.2	10.1	15.9	19.9	21.5	22.9
Korea	China	0.0	0.0	0.0	5.5	8.0	9.4	11.4
	Japan	26.6	24.3	25.0	24.1	19.8	18.9	19.6
	NE Asia	26.6	24.3	25.0	29.6	27.8	28.3	31.0

Note: 1. 'NE Asia' denotes the three Northeast Asian countries, i.e., China, Korea, and Korea.
Sources: World Trade Organization (2003), *International Trade Statistics 2003*, Geneva.
International Monetary Fund (2004), *Direction of Trade Statistics*, CD-ROM, January.

(2) Bilateral and Intra-regional Trade Share Matrix in 2002 (1980) (percent)

Destination \ Origin	China	Japan	Korea	Northeast Asia
China	n.a.	18.3(3.1) / 14.9(22.2)	11.4(0.0) / 4.8(0.0)	19.7(22.2)
Japan	18.1(26.5) / 9.6(3.9)	n.a.	19.6(26.6) / 6.9(4.1)	16.5(8.0)
Korea	9.7(0.0) / 14.7(0.0)	4.6(2.2) / 9.4(17.4)	n.a.	24.1(17.4)
Northeast Asia	27.8(26.5)	22.9(5.3)	31.0(26.6)	

Notes: 1. The numbers in the left and below the diagonal line of each cell denote the export share of a country in the first column (origin) to the country in the first row (destination) in 2002. Those in the parenthesis are the share in 1980.
2. The numbers in the right and above the diagonal line of each cell denote the import share of a country in the first row (destination) from the country in the first column (origin) in 2002. Those in the parenthesis are the share in 1980.
3. The numbers in the last row and the last column are the sum of export and import share of a country with the remaining Northeast Asian countries in 2002. Those in the parenthesis are the share in 1980.

2.3 Bilateral Trade by Major Sector

We try to examine bilateral trade by major sector or commodity between the three Northeast Asian countries. Sectoral classification is based on two digit commodities of the HS (Harmonized System) classification supplemented by its four digit commodities.[6] Sectors or commodities are classified so that major industrial sectors or commodities, explain relatively large share of the three Northeast Asian countries' trade such as textiles and apparel, electric and electronic goods, machinery, and automobiles, are identifiable as individual sectors. Some sectors are further disaggregated into a few sub-sectors having differentiated characteristics. Bilateral trade by sector is examined as each sector's share of aggregate exports between the Northeast Asian countries. Besides, we examine the export share by sector in terms of each country's aggregate exports to the world. Relative intensity of bilateral trade, defined as the ratio of bilateral export share to aggregate export share by sector, is examined. Statistical data sources are customs data of each country and retrieved from *KOTIS Online Database* offered by Korea International Trade Association (KITA). The shares are calculated as averages of 2002 and January to November of 2003 since there might exist some fluctuations as sectors are disaggregated.

2.3.1 China

China's bilateral exports are concentrated on electric and electronic goods (28.4 percent of its aggregate exports to Japan and 24.9 percent of its aggregate exports to Korea), textiles and apparel (25.4 percent and 20.9 percent, respectively), and agricultural and fishery products (10.9 percent and 12.2 percent, respectively). In more disaggregated and other sectors, China's bilateral export share is relatively large with Japan in apparel (21.3 percent of its aggregate exports to Japan), computer (9.6 percent), miscellaneous goods (6.4 percent), machinery and precision equipment (6.1 percent), chemical products (4.9 percent), home appliances (4.8 percent), steel and steel products (4.2 percent), textiles (4.1 percent), and petroleum and fuel oil (4.0 percent); it is relatively large with Korea in apparel (13.7 percent of its aggregate exports to Korea), steel and steel products (10.0 percent), textiles (7.4 percent), chemical products (6.9 percent), miscellaneous goods (5.3 percent), computer (4.4 percent), and telecommunication equipment (4.4 percent).

Relative intensity of China's bilateral exports to both Japan and Korea is

---

[6] Harmonized System is the global classification system that is used to describe most world trade in goods. It was developed under the auspices of the Customs Cooperation Council.

comparatively high in agricultural and fishery products (2.17 with Japan and 2.43 with Korea), petroleum and fuel oil (1.59 and 2.73, respectively), textiles and apparel (1.47 and 1.21, especially apparel (1.97 and 1.26), respectively), mineral and wood (1.14 and 1.23, respectively); besides that of China's bilateral exports to Japan is comparatively high in precision equipment (1.33) and auto parts and accessories (1.12); that of China's bilateral exports to Korea is comparatively high in steel and steel products (1.73), semiconductors (1.65), textiles (1.15), and other transportation equipment (1.13).

Overall China has comparatively large export share and relative intensity of its bilateral exports to both Japan and Korea in agricultural and fishery products, petroleum and fuel oil, and textiles and apparel (especially in apparel); besides its export to Japan in precision and optical equipment, and to Korea in semiconductors, steel and steel products. However, even with large bilateral export share, China has no significant relative intensity of its bilateral exports to other Northeast Asian countries in electric and electronic goods (except in semiconductors to Korea) and miscellaneous goods.

2.3.2 Japan

Japan's bilateral exports are concentrated on electric and electronic goods (30.0 percent of its aggregate exports to China and 29.3 percent of its aggregate exports to Korea), machinery and precision equipment (23.8 percent and 24.3 percent, respectively), chemicals (13.1 percent and 16.5 percent, respectively), and steel and steel products (10.9 percent and 14.7 percent, respectively). In more disaggregated and other sectors, Japan's bilateral export share is relatively large with China in machinery (17.4 percent of its aggregate exports to China), semiconductors (9.7 percent), automobiles, parts and accessories (6.4 percent), precision equipment (6.3 percent), textiles (6.2 percent), telecommunication equipment (3.6 percent), computer (3.6 percent), and automobiles (3.6 percent); it is relatively large with Korea in machinery (15.4 percent of its aggregate exports to Korea), semiconductors (12.4 percent), precision equipment (8.9 percent), and telecommunication equipment (3.2 percent).

Relative intensity of Japan's bilateral exports to both China and Korea is comparatively high in telecommunication equipment (3.81 with China and 3.33 with Korea), semiconductors (2.66 and 3.40, respectively), petroleum and fuel oil (2.24 and 3.99, respectively), steel and steel products (1.71 and 2.30, respectively), chemicals (1.40 and 1.76, respectively), footwear (1.65 and 2.24, respectively), and miscellaneous goods (1.29 and 1.40, respectively); besides that of Japan's bilateral exports to China is comparatively high in textiles (3.95) and automobiles (2.18); that of Japan's bilateral exports to Korea is comparatively high in agricultural and fishery products (1.76),

apparel (1.67), precision equipment (1.58), and other communication equipment (1.56).

Overall Japan has comparatively large export share and relative intensity of its bilateral exports to both China and Korea in electronic goods (especially, telecommunication equipment and semiconductors), machinery and precision equipment, chemicals, and steel and steel products; besides its export to China in textiles and automobiles. However, even with large share in its aggregate export (to the world), Japan has no significant relative intensity of its bilateral exports to other Northeast Asian countries in automobile parts and accessories.

2.3.3 Korea

Korea's bilateral exports are concentrated on electric and electronic goods (35.3 percent of its aggregate exports to China and 35.8 percent of its aggregate exports to Japan), chemicals (19.8 percent and 9.4 percent, respectively), steel and steel products (10.6 percent and 10.0 percent, respectively), machinery and precision equipment (9.7 percent and 7.4 percent, respectively), petroleum and fuel oil (5.3 percent and 15.6 percent, respectively), and textiles and apparel (9.0 percent and 4.8 percent, respectively). In more disaggregated and other sectors, Korea's bilateral export share is relatively large with China in telecommunication equipment (10.0 percent of its aggregate exports to China), computer (9.4 percent), textiles (8.2 percent), machinery (8.1 percent), semiconductors (3.6 percent), automobiles, parts and accessories (2.7 percent), miscellaneous goods (2.7 percent), and mineral and wood (2.4 percent); it is relatively large with Japan in semiconductors (15.9 percent of its aggregate exports to Japan), agricultural and fishery products (8.6 percent), miscellaneous goods (3.6 percent), apparel (3.0 percent), home appliances (2.8 percent), telecommunication equipment (2.5 percent), and precision equipment (2.2 percent).

Relative intensity of Korea's bilateral exports to both China and Japan is comparatively high in footwear (2.51 with China and 1.37 with Japan), petroleum and fuel oil (1.39 and 4.08, respectively), steel and steel products (1.56 and 1.47, respectively), miscellaneous goods (1.21 and 1.67, respectively), and precision equipment (1.17 and 1.66, respectively); besides that of Korea's bilateral exports to China is comparatively high in chemicals (2.14), machinery (1.49), textiles (1.23), and mineral and wood (1.16); that of Korea's bilateral exports to Japan is comparatively high in agricultural and fishery products (5.35), semiconductors (1.93), apparel (1.51), other communication equipment (1.47), and toys etc. (1.45).

Overall Korea has comparatively large export share and relative intensity of its bilateral exports to both China and Japan in steel and steel products, petroleum and fuel

oil, and miscellaneous goods; besides to China in chemicals, machinery, textiles, and mineral and wood; to Japan in semiconductors, agricultural and fishery products, apparel, and precision equipment. However, even with large share in its aggregate export (to the world), Korea has no significant relative intensity of its bilateral exports to other Northeast Asian countries in electric and electronic goods as a whole (except semiconductors to Japan) and automobiles, parts and accessories.

Table 2-3 Export Share and Relative Intensity by Commodity Between Northeast Asian Countries

(1) China   (average of 2002 and 2003.1~11, percent and ratio)

Commodity/Sector (HS Code)	Export Share by Commodity			Relative Intensity	
	To the World	To Japan	To Korea	To Japan	To Korea
Agricultural & Fishery Products (01~24)	5.0	10.9	12.2	2.17	2.43
Mineral, Wood etc. (25, 26, 41, 43~47, 71)	2.8	3.1	3.5	1.14	1.23
Petroleum, Fuel Oil (27)	2.6	4.0	7.0	1.59	2.73
Chemicals (28~39)	6.8	4.9	6.9	0.73	1.02
Rubber, Tires (40)	0.6	0.2	0.4	0.41	0.67
Textiles, Apparel (50~63)	17.3	25.4	20.9	1.47	1.21
textiles (50~60, 63)	6.4	4.1	7.4	0.64	1.15
apparel (61, 62)	10.8	21.3	13.7	1.97	1.26
Footwear (64)	3.2	2.0	1.3	0.61	0.41
Steel, Steel Products (72~83)	5.8	4.3	10.0	0.74	1.73
Electric & Electronic Goods (85 &)	32.9	28.4	24.9	0.86	0.76
Computer (8471, 8473)	12.0	9.6	4.4	0.80	0.37
telecommunication equipment (8525, 8526, 8529)	4.0	2.4	4.4	0.62	1.09
other communication equipment (8517)	1.2	0.9	0.5	0.73	0.38
home appliances	5.0	4.8	3.3	0.96	0.66
semiconductors (8541, 8542)	2.0	1.4	3.3	0.72	1.65
Machinery, Precision Equipment & Arms (84, 90, 91, 93)	7.4	6.1	4.3	0.82	0.57
machinery (84)	4.6	2.7	2.3	0.58	0.50
Precision equipment (90)	2.4	3.1	1.9	1.33	0.81
Automobiles, Parts & Accessories (87)	1.9	1.8	0.7	0.95	0.35
Automobiles (8701~05, 8709, 8711)	0.4	0.1	0.04	0.34	0.10
Auto parts & accessories	1.5	1.6	0.7	1.12	0.45
Other Transportation Equipment (86, 88, 89)	1.6	0.7	1.8	0.46	1.13
Toys etc. (95, 96)	3.9	1.7	1.0	0.44	0.26
Miscellaneous Goods	8.4	6.4	5.3	0.76	0.63

Source : By author's calculation with Chinese customs data in KOTIS Online Database.

Table 2-3 Export Share and Relative Intensity by Commodity Between Northeast Asian
Countries (continue)

(2) Japan   (average of 2002 and 2003.1~11, percent and ratio)

Commodity/Sector (HS Code)	Export Share by Commodity			Relative Intensity	
	To the World	To China	To Korea	To China	To Korea
Agricultural & Fishery Products (01~24)	0.55	0.40	0.97	0.72	1.76
Mineral, Wood etc. (25, 26, 41, 43~47, 71)	0.62	0.81	0.53	1.31	0.85
Petroleum, Fuel Oil (27)	0.34	0.75	1.34	2.24	3.99
Chemicals (28~39)	9.36	13.09	16.48	1.40	1.76
Rubber, Tires (40)	1.46	0.78	0.81	0.54	0.56
Textiles, Apparel (50~63)	1.65	6.23	1.44	3.78	0.87
textiles (50~60, 63)	1.56	6.16	1.29	3.95	0.83
apparel (61, 62)	0.09	0.08	0.15	0.85	1.67
Footwear (64)	0.009	0.01	0.02	1.65	2.24
Steel, Steel Products (72~83)	6.40	10.93	14.69	1.71	2.30
Electric & Electronic Goods (85 &)	27.21	29.99	29.30	1.10	1.08
Computer (8471, 8473)	5.03	3.58	2.32	0.71	0.46
telecommunication equipment (8525, 8526, 8529)	0.96	3.64	3.18	3.81	3.33
Other communication equipment (8517)	0.58	0.23	0.09	0.39	1.56
home appliances	1.57	0.86	1.18	0.55	0.75
semiconductors (8541, 8542)	3.64	9.69	12.37	2.66	3.40
Machinery, Precision Equipment & Arms (84, 90, 91, 93)	20.63	23.75	24.33	1.15	1.18
Machinery (84)	14.73	17.41	15.36	1.18	1.04
Precision equipment (90)	5.66	6.25	8.91	1.10	1.58
Automobiles, Parts & Accessories (87)	22.33	6.36	2.80	0.29	0.13
Automobiles (8701~05, 8709, 8711)	1.64	3.57	0.52	2.18	0.32
Auto parts & accessories	20.69	2.79	2.27	0.14	0.11
Other Transportation Equipment (86, 88, 89)	2.60	0.07	0.31	0.03	0.12
Toys etc. (95, 96)	0.85	0.42	0.66	0.49	0.77
Miscellaneous Goods	1.93	2.50	2.71	1.29	1.40

Source : By author's calculation with Japanese customs data in KOTIS Online Database.

Table 2-3 Export Share and Relative Intensity by Commodity Between Northeast Asian Countries (continue)

(3) Korea (average of 2002 and 2003.1~11, percent and ratio)

Commodity/Sector (HS Code)	Export Share by Commodity			Relative Intensity	
	To the World	To China	To Japan	To China	To Japan
Agricultural & Fishery Products (01~24)	1.60	0.65	8.56	0.40	5.35
Mineral, Wood etc. (25, 26, 41, 43~47, 71)	2.06	2.38	1.25	1.16	0.61
Petroleum, Fuel Oil (27)	3.83	5.31	15.63	1.39	4.08
Chemicals (28~39)	9.27	19.83	9.39	2.14	1.01
Rubber, Tires (40)	1.29	0.54	0.61	0.42	0.48
Textiles, Apparel (50~63)	8.63	8.98	4.84	1.04	0.56
textiles (50~60, 63)	6.63	8.18	1.83	1.23	0.28
apparel (61, 62)	2.00	0.81	3.01	0.40	1.51
Footwear (64)	0.32	0.79	0.43	2.51	1.37
Steel, Steel Products (72~83)	6.80	10.57	10.01	1.56	1.47
Electric & Electronic Goods (85 &)	38.97	35.31	35.82	0.91	0.92
Computer (8471, 8473)	9.50	9.43	7.53	0.99	0.79
telecommunication equipment (8525, 8526, 8529)	9.49	10.04	2.46	1.06	0.26
Other communication equipment (8517)	0.36	0.23	0.52	0.65	1.47
home appliances	4.76	1.28	2.78	0.27	0.58
semiconductors (8541, 8542)	8.26	3.61	15.92	0.44	1.93
Machinery, Precision Equipment & Arms (84, 90, 91, 93)	6.92	9.72	7.43	1.41	1.07
machinery (84)	5.47	8.14	5.15	1.49	0.94
Precision equipment (90)	1.32	1.54	2.18	1.17	1.66
Automobiles, Parts & Accessories (87)	11.16	2.66	1.59	0.24	0.14
Automobiles (8701~05, 8709, 8711)	9.44	1.16	0.20	0.12	0.02
auto parts & accessories	1.75	1.50	1.40	0.86	0.80
Other Transportation Equipment (86, 88, 89)	6.45	0.09	0.13	0.01	0.02
Toys etc. (95, 96)	0.57	0.57	0.83	0.99	1.45
Miscellaneous Goods	2.18	2.65	3.64	1.21	1.67

Source : By author's calculation with Korean customs data in KOTIS Online Database.

Table 2-4 Commodities with High Relative Intensity Between Northeast Asian Countries

Dest. / Origin	China	Japan	Korea	Northeast Asia[1]
China	n.a.	agricultural & fishery products (2.17)[2] apparel (1.97) petroleum & fuel oil (1.59) precision equip. (1.33) mineral & wood (1.14) auto parts & accessories (1.12)	petroleum & fuel oil (2.73) agricultural & fishery products (2.43) steel & steel products (1.73) semiconductors (1.65) apparel (1.26) mineral & wood (1.23) textiles (1.15) other transportation equip. (1.13)	agricultural & fishery products petroleum & fuel oil apparel mineral & wood
Japan	textiles (3.95) telecomm equip. (3.81) semiconductors (2.66) petroleum & fuel oil (2.24) automobiles (2.18) steel & steel products (1.71) footwear (1.65) chemicals (1.40) mineral & wood (1.31)	n.a.	petroleum & fuel oil (3.99) semiconductors (3.40) telecomm equip. (3.33) steel & steel products (2.30) footwear (2.24) agricultural & fishery products (1.76) chemicals (1.76) apparel (1.67) precision equip. (1.58) other communication equip. (1.56)	telecomm equip. Semiconductors petroleum & fuel oil steel & steel products footwear chemicals
Korea	footwear (2.51) chemicals (2.14) steel & steel products (1.56) machinery (1.49) petroleum & fuel oil (1.39) textiles (1.23) miscellaneous goods (1.21) precision equip. (1.17) mineral & wood (1.16)	agricultural & fishery products (5.35) petroleum & fuel oil (4.08) semiconductors (1.93) miscellaneous goods (1.67) precision equip. (1.66) apparel (1.51) other communication equip. (1.47) toys etc. (1.45) steel & steel products (1.47) footwear (1.37)	n.a.	steel & steel products petroleum & fuel oil miscellaneous goods precision equip.
Northeast Asia	steel & steel products footwear petroleum & fuel oil chemicals mineral & wood	agricultural & fishery products petroleum & fuel oil precision equip.	petroleum & fuel oil steel & steel products agricultural & fishery products semiconductors apparel other transportation equip.	n.a.

Notes: 1. The cells correspond to "Northeast Asia" mean common commodities with high relative intensity between a country and each of the remaining countries.

2. Each cell inside of the table denotes commodities with high relative intensity between Northeast Asian countries in terms of the trade flows from the country in the first column (origin) to country in the first row (destination). The numbers in the parenthesis are the relative intensity of bilateral trade between the two Northeast Asian countries.

2.3.4 Intra- and Inter-industry Trade

Based on relative intensity, we can further identify intra- and inter-industry trade between the three Northeast Asian countries. In terms of the number of commodity categories in Table 2-3 and therefore coverage of industrial sector, the number of commodities or industrial sectors of intra-industry trade is increasing from between China and Japan to between China and Korea and then to between Japan to Korea. Inter-industry trade has the opposite characteristics, that is, it is the smallest between Japan and Korea and the largest between China and Japan. These reflect relative differences among the three Northeast Asian countries in terms of factor endowments and level of economic development.

Between China and Japan only two commodity groups, petroleum & fuel oil and mineral & wood, belong to intra-industry. Most of the other commodity groups belong to inter-industry trade. More specifically, inter-industry trade from China to Japan is significant in primary products and industrial intermediate goods such as agricultural & fishery products, apparel, precision equipment, and auto parts & accessories. Inter-industry trade from Japan to China is rather significant in relatively more advanced industrial sectors and also industrial intermediate goods such as textiles, telecommunication equipment, semiconductors, automobiles, steel & steel products, footwear, and chemicals.

Between China and Korea four commodity groups, such as petroleum & fuel oil, steel & steel products, mineral & wood, and textiles, belong to intra-industry. Inter-industry trade from China to Korea is significant in primary products such as agricultural & fishery products, and some industrial goods such as semiconductors, apparel, and other transportation equipment. Inter-industry trade from Korea to China is significant in industrial intermediate goods such as footwear, chemicals, machinery, miscellaneous goods, and precision equipment.

Between Japan and Korea intra-industry trade is predominant. Intra-industry trade is significant between Japan and Korea in many industrial sectors sectors such as petroleum & fuel oil, semiconductors, steel & steel products, apparel, precision equipment, other telecommunication equipment, footwear and also in agricultural & fishery products. Only few sectors are significant in inter-industry trade between Japan and Korea. Besides, those sectors between the two directions of inter-industry trade between Japan and Korea are quite different from each other. That is, inter-industry trade from Japan to Korea is significant in rather advanced industrial products such as telecommunication equipment and chemicals. Inter-industry trade from Korea to Japan is significant in rather labor-intensive products such as miscellaneous goods and toys etc.

Table 2-5 Commodities of Intra- and Inter-Industry Trade Between Northeast Asian Countries

(1) Between China and Japan

Trade	Intra-Industry Trade	Inter-Industry Trade	
Directions of Trade	Both Directions	From China to Japan	From Japan to China
Commodities	- petroleum & fuel oil - mineral & wood	- agricultural & fishery products - apparel - precision equipment - auto parts & accessories	- textiles - telecomm. equipment - semiconductors - automobiles - steel & steel products - footwear - chemicals

Note: Based on relative intensity by commodity in Table 2-3. The commodities are arranged according to their level of significance in intra- or inter-industry trade between two countries.

(2) Between China and Korea

Trade	Intra-Industry Trade	Inter-Industry Trade	
Directions of Trade	Both Directions	From China to Korea	From Korea to China
Commodities	- petroleum & fuel oil - steel & steel products - mineral & wood - textiles	- agricultural & fishery products - semiconductors - apparel - other transportation equipment	- footwear - chemicals - machinery - miscellaneous goods - precision equipment

Note: Based on relative intensity by commodity in Table 2-3. The commodities are arranged according to their level of significance in intra- or inter-industry trade between two countries.

(3) Between Japan and Korea

Trade	Intra-Industry Trade	Inter-Industry Trade	
Directions of Trade	Both Directions	From Japan to Korea	From Korea to Japan
Commodities	- petroleum & fuel oil - semiconductors - steel & steel products - agricultural & fishery products - apparel - precision equipment - other telecommunication equipment - footwear	- telecomm. equipment - chemicals	- miscellaneous goods - toys etc.

Note: Based on relative intensity by commodity in Table 2-3. The commodities are arranged according to their level of significance in intra- or inter-industry trade between two countries.

3. COMPLEMENTARITY IN NORTHEAST ASIAN TRADE[7]

3.1 Index of Trade Conformity

In the previous part, focus was mainly on the changes and current structures of international trade between the three Northeast Asian countries in terms of their bilateral and intra-regional trade share. To enhance practical and implementation oriented cooperation among the Northeast Asian countries, we should know more about and make better use of complementarities among them. With the performances and current structure in mind, in this part we try to analyze complementarity in international trade among them. The idea is to measure the extent of structural similarities in trade between each pair of the three countries. We hope to denote the trade complementarity using a single measure so that we can easily compare the estimates from the different combinations of the countries. We also hope to measure the complementarity differentiated by the direction of trade, that is, the trade complementarity between country *j*'s exports and country *k*'s imports and that between country *j*'s imports and country *k*'s exports are to be two different measures. Besides, we hope to identify some commodities that have relatively large contributions to the trade complementarity. For these purposes, we adopt the index of trade conformity (ITC) discussed in Linnemann and van Beers (1988). The ITC, as one of many trade related indices, seems to be an appropriate measure to analyze the complementarity of international trade between two economies. It is intended to measure the extent of overall similarities between a country's export structure by commodity and a trade partner country's import structure by commodity. The export or import structure is measured as the share of each commodity in the aggregate exports or imports of the country in concern.

Formally, the ITC between country *j*'s export structure and country *k*'s import structure is measured with the following formula:[8]

$$ITC_{jk} = \Sigma_i \, (X_{ij} * M_{ik}) \, / \, SQRT(\Sigma_i X_{ij}^2 * \Sigma_i M_{ik}^2)$$

where X_{ij} denotes the share of commodity *i* in country *j*'s aggregate exports, M_{ik} denotes the share of commodity *i* in country *k*'s aggregate imports, Σ_i denotes the sum of all of the *n* commodities *i=1,2,3,…,n*, *SQRT* denotes the function of square root.

---

[7] Please refer to Nam (2003) for more extensive discussions on APEC member economies.
[8] Mathematically the ITC measure is related to the value of *cos θ*, where *θ* is the smaller angle between the two vectors X_{ij} and M_{ik} in the *n*-dimensional space, where *i=1, 2, 3,…, n*. In general, the dot product of

Some characteristics of the ITC can be summarized as follows. First, the ITC measures structural similarities in international trade by commodity between two economies as a single index. It can be derived based on the trade performances of as detailed number of commodities as possible. Second, the ITC can have a value from *0* to *1*. The more similar a country's export structure to another country's import structure, the closer the ITC is to *1*.[9] Third, the ITC is sensitive to or differentiated by the direction of trade flows between the two economies. More specifically, the ITC based on the export structure of country *j* and the import structure of country *k* is a different measure from that based on the import structure of country *j* and the export structure of country *k*. Fourth, the ITC measures structural similarities between two economies with the actual trade performances of the two economies by commodity. However, the ITC can be interpreted as being the potential to increase bilateral trade between two economies since it uses the aggregate rather than bilateral trade structure (i.e., data) of the two economies in concern. Fifth, the ITC can also be interpreted as the summation of each commodity's contribution, as implied in the formula. By using this characteristic, commodities that would potentially increase trade between the two economies can be identified. In addition, we can rank the commodities by their extent of contributions to the index. Finally, the ITC can also measure the extent of intra-industry trade in a country when it is applied to the import and export structure of the same country. Again, we can identify some commodities that make significant contributions to the ITC in terms of intra-industry trade.

3.2 International Trade Data

To analyze the trade complementarity between each pair of the three Northeast Asian countries, we need consistent import and export data for each country by somewhat disaggregate commodities for some periods. We need disaggregated trade data for some period of time since trade structure as the share of each commodity in the aggregated trade of an economy may fluctuate year by year. We can get somewhat stable trade structure by averaging the trade share of each commodity for some years. We adopted the trade database built by International Trade Center of the United Nations (UN). It is

---

two vectors *a* and *b* is defined by $a \bullet b = |a| \, |b| \, cos \, \theta$, where θ is the smaller angle between the two vectors.
[9] The ITC, between a country's export structure and another country's import structure, has the value *0* when the former exports totally different commodities that the latter imports. That is, the former exports some commodities but the latter doesn't import them at all and the latter imports some commodities but the former doesn't export them at all. In the other extreme, the ITC has the value *1* when the former exports commodities with the exactly same shares as the latter imports them.

based on SITC Revision 3 and offers import and export data for most of countries in the world. We analyzed the import and export data of the three countries with three-digit SITC Revision 3 from 1997 to 2001. SITC stands for Standard International Trade Classification by the United Nations. Three-digit SITC Revision 3 includes 261 commodities from 001 (Live Animals except Fish) to 971 (Gold Non-monetary except Ore).[10]

3.3 Complementarity in Trade

3.3.1 Trade Complementarity in Terms of Imports of a Country

The ITCs between the three countries are measured and compared. Here, the ITCs are measured in terms of imports of a country. The average of ITC measures between a country's import structure and each of the remaining two countries' export structure are also examined as an aggregate measure. China has relatively large ITC measures between its import structure and the export structure of other countries, especially Korea (0.767) and also Japan (0.582). They are significantly larger than the average of ITCs between its import structure and the export structure of each of the remaining 18 APEC member economies, 0.442.[11] Japan has relatively large ITC measures between its import structure and the export structure of other countries, especially Korea (0.700) but not much with China (0.514). They are also larger than the average of ITCs between its import structure and the export structure of each of the remaining 18 APEC member economies, 0.501. In contrast, Korea has relatively small ITC measures between its import structure and the export structure of other country, especially China (0.305) but somewhat larger with Japan (0.436). They are also much smaller than or just above the average of ITCs between its import structure and the export structure of each of the remaining 18 APEC member economies, 0.422.

Table 3-1 ITC Measures Between Northeast Asian Countries

Origin \ Destination	China	Japan	Korea	APEC Average
China	n.a.	0.514	0.305	0.405
Japan	0.582	n.a.	0.436	0.561
Korea	0.767	0.700	n.a.	0.621
APEC Average	0.442	0.501	0.422	

Notes: 1. The numbers in each cell denote the ITC measure between the export structure of a country in the first column (origin) and the import structure of a country in the first row (destination).

2. The numbers in the last row and the last column are the average of ITCs between the corresponding country and each of 18 out of 21 APEC member economies (except Taiwan, Vietnam and the country in concern).

3.3.2 Trade Complementarity in Terms of Exports of a Country

ITC measures can also be examined in the other direction, that is, between a country's export structure and each of the remaining two countries' import structure. China has relatively significant ITC measures between its export structure and the import structure of other countries, especially Japan (0.514) but relatively small with Korea (0.305). They can be comparable with the average of ITCs between China's export structure and each of the 18 other APEC member economies' import structure, 0.405. Japan has relatively significant ITC measures between its export structure and the import structure of other countries, especially China (0.582) but not much with Korea (0.436). The former is just above and the latter is far below the average of ITCs between its export structure and each of the remaining 18 APEC member economies' import structure, 0.561. In contrast, Korea has considerably large ITC measures between its export structure and the import structure of other countries, both China (0.767) and Japan (0.700). They are also larger than the average of ITCs between Korea's export structure and each of the remaining 18 other APEC member countries' import structure, 0.621.

3.3.3 Relative ITC Measures

For any pair of two countries, j and k, two different ITC measures can be obtained. One can be defined as ITC_{jk} (between country j's export structure and country k's import structure) and the other as ITC_{kj} (between country j's import structure and country k's export structure). The former implies the potential that country j's exports to country k can be increased. In turn, the latter implies the potential that country j's imports from country k can be increased. Therefore, the difference between the two measures (ITC_{jk} - ITC_{kj}) can be interpreted as the potential for country j's exports to country k to increase

relative to the potential for country *j*'s imports from country *k*. We will define this as "the relative ITC measure." Relative ITC measures are examined between the three Northeast Asian countries.

China has negative relative ITC measures with both Japan (-0.067) and Korea (-0.462). In particular, it has a negative and significantly large (in absolute terms) relative ITC measure with Korea. China also has negative average of relative ITC measures, even though small in absolute value, with each of the 18 APEC member economies (-0.037). Japan has a positive relative ITC measure with China (0.067) but has a negative one with Korea (-0.265). Especially, it has a negative and large (in absolute terms) relative ITC measure with Korea. Overall, Japan has positive and small average of relative ITC measures with each of the 18 APEC member economies (0.060). Korea has positive relative ITC measures with both China (0.462) and Japan (0.265). It has a significantly large relative ITC measure, especially with China then followed by Japan. Korea also has the significant positive average of relative ITC measures with each of the 18 APEC member economies (0.199).

Table 3-2 Relative ITC Measures Between Northeast Asian Countries

Origin \ Destination	China	Japan	Korea	APEC Average
China	n.a.	-0.067	-0.462	-0.037
Japan	0.067	n.a.	-0.265	0.060
Korea	0.462	0.265	n.a.	0.199
APEC Average	0.037	-0.060	-0.199	

Notes: The numbers in each cell denote the relative ITC measure, that is, the difference between two ITCs. The first one is the ITC between the export structure of a country in the first column (origin) and the import structure of a country in the first row (destination). The second one is the ITC in the other direction between the same two countries, that is, the ITC between the import structure of a country in the first column and the export structure of a country in the first row. The numbers in the last row and the last column are the average of relative ITCs between the corresponding country and each of 18 out of 21 APEC member economies (except Taiwan, Vietnam and the country in concern).

3.3.4 Complementary Commodities

Since the ITC measure is denoted as symmetric summation of contributions from each commodity's trade structure, we can identify each commodity's relative contribution to the aggregate index (ITC) and rank the commodities by their extent of contribution. The top 25 complementary commodities, about 10 percent of total 261 SITC three-digit commodities, are identified for each pair of the three countries in both

directions of trade. They are organized in terms of a country's export to each of the other two countries and sorted by their extent of contributions to the ITC. Consequently, they can be regarded as having relatively high potential to increase trade between the two countries in concern.

For China, its exports have relatively high complementarity with the other two countries in SITC 752 (computer equipment), 776 (valves, transistors, etc.), 764 (telecommunications equipment, not elsewhere specified (nes)), 333 (petroleum, bitumen oil, crude), 759 (office equipment parts, accessories), 778 (electrical equipment, nes) and 894 (baby carrier, toy, game, sports). In addition, its exports have relatively high complementarity with Japan in SITC 851 (footwear), 841 (men's and boys' wear, woven) and 842 (women's and girls' clothing, woven). Its exports also have relatively high complementarity with Korea in SITC 772 (electric circuit equipment), 334 (heavy petroleum, bitumen oils), 728 (special industrial machine, nes) and 651 (textile yarn).

For Japan, its exports have relatively high complementarity with the other two countries in SITC 776 (valves, transistors, etc.), 764 (telecommunications equipment, nes), 728 (special industrial machine, nes), 759 (office equipment parts, accessories) 752 (computer equipment), 778 (electrical equipment, nes) and 772 (electric circuit equipment). SITC 781 (passenger cars, etc.), 784 (motor vehicle parts, accessories) and 874 (measure, control apparatus, nes) follow behind and they are not much different from those between with China and with Korea in terms of SITC three-digit commodity classification. In addition, its exports have relatively high complementarity with China in SITC 931 (special transactions, nes) and with Korea in 598 (miscellaneous chemical products, nes).

For Korea, its exports have relatively high complementarity with the other two countries in SITC 776 (valves, transistors, etc.), 752 (computer equipment), 764 (telecommunications equipment, nes), 781 (passenger cars, etc.), 334 (heavy petroleum, bitumen oils) and 759 (office equipment parts, accessories). In addition, its exports have relatively high complementarity with China in SITC 653 (man-made woven fabrics), 728 (special industrial machines, nes), 673 (flat rolled iron, steel products) and with Japan in SITC 845 (articles of apparel, nes), 034 (fish, live/fresh/chilled/frozen), 971 (gold non-monetary excluding ore).

Table 3-3 Complementary Commodities between Northeast Asian Countries

(1) Top 25 SITC Three-Digit Commodities by Their Contribution to the ITC Between Northeast Asian Countries

Origin	China		Japan		Korea	
Destination	Japan	Korea	China	Korea	China	Japan
Ranking	SITC	SITC	SITC	SITC	SITC	SITC
1	752	776	776	776	776	776
2	764	333	764	728	764	752
3	333	764	759	764	334	781
4	845	752	728	752	752	764
5	776	778	778	778	759	334
6	759	759	752	759	653	759
7	894	772	772	772	728	845
8	851	334	781	874	781	778
9	841	894	784	784	673	34
10	842	728	874	713	778	971
11	778	651	931	781	772	842
12	821	321	713	598	641	784
13	831	845	673	673	651	841
14	334	841	653	743	611	772
15	321	851	724	793	655	792
16	893	771	741	334	657	673
17	34	874	598	741	793	728
18	772	699	731	731	572	775
19	899	653	743	881	571	684
20	771	893	792	682	784	851
21	844	716	716	515	682	894
22	658	842	682	898	792	761
23	36	671	675	971	575	641
24	775	684	641	511	511	763
25	699	899	575	716	741	898

Note: The numbers in each cell inside of the table denote an SITC three-digit commodity with relatively high complementarity in trade between the three Northeast Asian countries in terms of the trade flows from the country in the first row (origin) to country in the second row (destination).

(2) Top 10 Complementary Commodities By SITC Three Digit

Origin \ Dest.	China	Japan	Korea	Northeast Asia[1]
China	n.a.	computer equip. (752)[2] telecomm equip. (764) petroleum & fuel oil (333) articles of apparel (845) valves, transistors (776) office equip. parts & accessories (759) baby carrier, toy, game, sports (894) footwear (851) men's wear (841) women's wear (842)	valves, transistors (776) petroleum & fuel oil (333) telecomm equip. (764) computer equip. (752) electrical equip. (778) office equip. parts & accessories (759) electric circuit equip. (772) heavy petroleum, bitumen oil (334) baby carrier, toy, game, sports (894) special industrial machine (728)	computer equip. (752) telecomm equip. (764) petroleum & fuel oil (333) valves, transistors (776) office equip. parts & accessories (759) baby carrier, toy, game, sports (894)
Japan	valves, transistors (776) telecomm equip. (764) office equip. parts & accessories (759) special industrial machine (728) electrical equip. (778) computer equip. (752) electric circuit equip. (772) passenger cars (781) motor parts & accessories (784) measure, control apparatus (874)	n.a.	valves, transistors (776) special industrial machine (728) telecomm equip. (764) computer equip. (752) electrical equip. (778) office equip. parts & accessories (759) electric circuit equip. (772) measure, control apparatus (874) motor parts & accessories (784) internal combustion engines, parts (713)	valves, transistors (776) special industrial machine (728) telecomm equip. (764) computer equip. (752) electrical equip. (778) office equip. parts & accessories (759) electric circuit equip. (772) measure, control apparatus (874) motor parts & accessories (784)
Korea	valves, transistors (776) telecomm equip. (764) heavy petroleum, bitumen oil (334) computer equip. (752) office equip. parts & accessories (759) man-made woven fabric (653) special industrial machine (728) passenger cars (781) flat rolled iron, steel products (673) electrical equip. (778)	valves, transistors (776) computer equip. (752) passenger cars (781) telecomm equip. (764) heavy petroleum, bitumen oil (334) office equip. parts & accessories (759) articles of apparel (845) electrical equip. (778) fish (034) gold, non-monetary (971)	n.a.	valves, transistors (776) telecomm equip. (764) heavy petroleum, bitumen oil (334) computer equip. (752) office equip. parts & accessories (759) passenger cars (781) electrical equip. (778)
Northeast Asia	valves, transistors (776) telecomm equip. (764) office equip. parts & accessories (759) special industrial machine (728) electrical equip. (778) computer equip. (752) passenger cars (781)	computer equip. (752) telecomm equip. (764) articles of apparel (845) valves, transistors (776) office equip. parts & accessories (759)	valves, transistors (776) special industrial machine (728) telecomm equip. (764) computer equip. (752) electrical equip. (778) office equip. parts & accessories (759) electric circuit equip. (772)	n.a.

Notes: 1. The cells correspond to "Northeast Asia" mean common commodities with high complementarity between a country and each of the remaining countries.

2. Each cell inside of the table denotes commodities with high complementarity between Northeast Asian countries in terms of the trade flows from the country in the first column (origin) to country in the first row (destination). The numbers in the parenthesis are SITC (Rev. 3) three-digit commodity classification.

3.4 Intra-Industry Trade

Intra-industry trade denotes two-way trade, both imports and exports, of relatively similar products with high substitutability between two countries. This kind of trade tends to happen between relatively similar economies with similar resource endowments and levels of economic development, especially between industrial countries. These are stylized facts in international trade. According to IMF (2003), for example, 66.4 percent of global exports are to industrial countries and 71.8 percent of industrial countries' exports are to industrial countries in 2001. Since intra-industry trade increases the variety of goods in an economy, consumers can have higher utility on the same budget.[12] Intra-industry trade is important for industrial linkages through international trade and accounts for a large share of global trade. We tried to estimate the extent of intra-industry trade and compare the findings among the three countries. Some products with relatively large intra-industry trade are also identified for each of the three countries. In this paper, the extent of intra-industry trade in each country is measured by applying the ITC for between the import structure and export structure of the same country. We will define it as "the intra-industry ITC" of a country.[13] The more similar a country's import structure and export structure are, the larger intra-industry ITC measure we expect to get. The intra-industry ITC is convenient in that it can measure the overall extent of intra-industry trade of a country as a whole from its own import structure and export structure for disaggregated commodities. In addition, each commodity is considered symmetrically and consistently. Therefore, we can also identify commodities that have relatively large contributions to the measure and the extent of their relative contributions.

The intra-industry ITC is measured significantly large in Korea (0.783) with the same data set as before. It is much larger than that of China (0.464) and Japan (0.454). For reference, the average of intra-industry ITC measures for 19 APEC members (except Taiwan and Vietnam from current 21 members) is 0.479. Therefore, Japan and China are below the average in terms of intra-industry ITC measure, which denotes that each of them imports and exports relatively dissimilar products.

---

[12] Chapter 3 of Krugman (1994) on "Intraindustry Specialization and the Gains from Trade" is an example.

[13] Originally intra-industry trade is a concept to explain bilateral trade between two economies. Grubel and Lloyd (1975) type intra-industry trade index is one of the most popular ones for empirical studies. To apply the concept, however, we need bilateral trade data for each pair of members differentiated by the direction of trade and also disaggregated by commodity. For convenience, we try to apply the concept for between aggregate imports and exports of the same country.

Table 3-4 Intra-industry ITC Measure

Country	Intra-industry ITC[1]
China	0.464
Japan	0.454
Korea	0.783
Average of 19 APEC Members[2]	0.497

Notes: 1. The intra-industry ITC measures structural similarity between imports and exports of the same country.
      2. 19 APEC members denote 21 current members except Taiwan and Vietnam.

We can also identify some commodities with relatively high contributions to the intra-industry ITC measure. We denote the top 25 out of 261 SITC three-digit commodities by the extent of their contribution to the intra-industry ITC measure. For example, some commodities with relatively high contribution to its intra-industry ITC measure in all of the three countries are SITC 776 (valves, transistors, etc.), 764 (telecommunications equipment, nes), 752 (computer equipment), 759 (office equipment parts, accessories) and 778 (electrical equipment, nes). In addition, SITC 334 (heavy petroleum and bitumen oils) and 653 (man-made woven fabric) have relatively high contribution to the intra-industry ITC measure of both China and Korea; SITC 728 (special industrial machines, nes) have relatively high contribution to the intra-industry ITC measure of both Japan and Korea.

Table 3-5 Commodities with High Intra-Industry Trade by Northeast Asian Country

(1) Top 25 SITC Three-Digit Commodities by Contribution to Intra-industry ITC

Country	China	Japan	Korea
Ranking	SITC	SITC	SITC
1	764	776	776
2	776	781	764
3	752	752	334
4	759	759	752
5	778	764	971
6	333	931	728
7	772	778	759
8	653	874	778
9	651	784	793
10	652	772	653
11	334	728	673
12	771	894	772
13	893	763	651
14	716	515	511
15	851	713	784
16	699	598	781
17	728	792	682
18	894	334	741
19	845	898	684
20	874	684	874
21	885	743	598
22	773	773	898
23	899	741	575
24	792	771	871
25	673	785	792

Note: The numbers in each cell inside of the table denote an SITC three-digit commodity with relatively high intra-industry trade in the three Northeast Asian countries in terms of exports and imports of the same country in the first row.

(2) Top 10 SITC Three-Digit Commodities by Contribution to Intra-industry ITC

Country	China	Japan	Korea	Northeast Asia[1]
Commodity	telecomm equip. (764) valves, transistors (776) computer equip. (752) office equip. parts & accessories (759) electrical equip. (778) petroleum & fuel oil (333) electric circuit equip. (772) man-made woven fabric (653) textile yarn (651) cotton fabrics, woven (652)	valves, transistors (776) passenger cars (781) computer equip. (752) office equip. parts & accessories (759) telecomm equip. (764) special transactions and commodities not classified (931) electrical equip. (778) measure, control apparatus (874) motor parts & accessories (784) electric circuit equip. (772)	valves, transistors (776) telecomm equip. (764) heavy petroleum, bitumen oil (334) computer equip. (752) gold, non-monetary (971) special industrial machine (728) office equip. parts & accessories (759) electrical equip. (778) ships, boats and floating structures (793) man-made woven fabric (653)	valves, transistors (776) telecomm equip. (764) computer equip. (752) office equip. parts & accessories (759) electrical equip. (778)

Notes: 1. The cells correspond to "Northeast Asia" mean common commodities with relatively high intra-industry trade in the three Northeast Asian countries in terms of exports and imports of the same country in the first row.

2. Each cell inside of the table denotes commodities with relatively high intra-industry trade in the corresponding Northeast Asian country in terms of exports and imports of the same country. The numbers in the parenthesis are SITC (Rev. 3) three-digit commodity classification.

4. TRADE POTENTIAL IN NORTHEAST ASIA

4.1 The Gravity Model of Trade

In this part, we try to estimate potential trades between each pair of the three Northeast Asian countries and compare them with their actual trade performances. For this purpose, we apply the gravity model of trade for the 21 APEC member economies as a reference group. The gravity model of trade is to explain aggregate trade flows between two countries by their overall economic activity (GDP) and the distance between them as a proxy of trade barriers. It originated from the principle of gravity between two masses in physics and often criticized for having no clear and sound economic justification. Deardorff (1995) offered some theoretical background by demonstrating that the gravity model of trade can be derived from a utility maximization problem. He interpreted the physical distance between two economies as a proxy of transaction costs including every trade barriers between them. Recently, it is used often to explain the implication of regional trade agreement on intra- and inter-regional trade. A good example of applying the gravity model can be found in Frankel, Stein and Wei (1997) and Chapter 4 of Frankel, ed. (1998). Additionally, Evenett and

Hutchison (2002) introduced recent applications of gravity model for such cases as border effects on trade, impact of labor movement, financial flows including FDI, effects of common language, and model specification for consistent estimate of distance coefficient.

Data set for the analysis was obtained from *Direction of Trade Statistics* (IMF), *Monthly Statistics of Exports and Imports Taiwan Area* (Ministry of Finance, Taiwan) for bilateral trade data among APEC members in 2001, Jon Haveman's homepage (*www.haveman.org*) for physical distance between two capital cities, and the ITC measures for complementarities in trade among APEC member economies. Since countries are usually much more concerned about their imports than exports, bilateral import data are believed to be more reliable than their corresponding export data measured by the trade partner country for the same trade flows. For this reason, we adopted bilateral trade data in 2001 measured in terms of a country's imports rather than exports for each pair of 21 APEC member economies.

4.2 Basic Gravity Model and Potential Trades

We tried to estimate potential trades considering the directions of trade, i.e., trade flows from country j to country k and those from country k to country j are entered in the model separately and independently. Here, the basic gravity model of trade is to explain the imports of an APEC member economy from another by utilizing the product of the two countries' GDP and physical distance between them. Besides, we modified the basic model by deflating both sides of the equation by the GDP of the importing country.[14] Therefore, we try to estimate the potential imports of a country relative to its GDP in reference to the trade partner's GDP and the distance between them. The basic gravity model with direction of trade is applied to 420 pairs of 21 APEC member economies' bilateral trade, GDP and distance data in 2001. The estimated equation is as follows,

$$log(M_{jk} / GDP_k) = 7.014 + 0.874 * log(GDP_j) - 1.203 * log(D_{jk}) - 1.705 * D_{rus}$$
$$(0.655) \quad (0.036) \qquad\qquad (0.075) \qquad\qquad (0.231)$$

R-squared: 0.672

---

[14] This is important from the fact that the trade flows of a pair of countries in two directions usually do not balance each other, which is different from physical gravity between two masses. Even the same amount of trade flows might be recognized differently, relative to the size of the economies in concern.

Adjusted R-squared: 0.670
F-statistic: 273.804
Prob.(F-statistic): 0.000
Number of observations: 420 (= 21*20)

Note: The numbers in the parenthesis under each estimated coefficient are standard errors. The variable names M_{jk}, GDP_j, GDP_k, D_{jk} denote the imports of APEC member economy k from member economy j, GDP of economy j, GDP of economy k in 2001 and the distance between two capital cities of economy j and economy k, respectively. In addition, the variable name D_{rus} in the equation denotes the dummy variable having the value of 1 if Russia's bilateral trade is related and 0 otherwise. The Russian dummy (D_{rus}) is added since it joined APEC in November 1998 and still reveals exceptionally low level of integration through international trade with other APEC member economies.

The coefficients for both GDP and physical distance are estimated significant at *1* percent significance level with expected signs, respectively. The estimated potential trade (imports) measures from the results are summarized as in *Table 4-1*. The first and the second column are a pair of countries that their bilateral trade flows are originated from and destined for, respectively. The third column is actual bilateral trade from the country in the first column to the country in the second column in 2001. The fourth column is the potential bilateral trade from the country in the first column to the country in the second column estimated by the model in reference to the available information in 2001. The fifth and last column is the ratio of the potential to actual bilateral trade (imports). So the last column can be interpreted as how many times the bilateral trade of the three Northeast Asian countries can potentially increase in consideration of the APEC members' bilateral trade performances, their overall economic activity (GDP) in 2001 and their vicinity.

The potential-actual trade ratio is estimated as significantly large in all of the pairs between the three Northeast Asian countries, especially from Korea to Japan (10.7) and followed by from Japan to Korea (5.3), from Japan to China (4.8), from China to Korea (4.4), from China to Japan (3.8) and from Korea to China (3.1). It is estimated relatively large between Korea and Japan, and followed by between Japan and China, and between China and Korea. The potential-actual trade ratios for the three Northeast Asian countries are estimated as some of the highest cases among the pairs of APEC member economies. Potential Trade can also be denoted in terms of its share in aggregate

---

Therefore, we want to explain relative trade deflated by the size of the importing economy.

imports of a destination country in 2001. The potential trade share is estimated relatively large in the trade from Japan to Korea (100.6%) followed by from Japan to China (78.1%), and then from China to Japan (64.0%). However, it is estimated relatively small in the trade from Korea to China (27.2%). The figures seem to be relatively large and somewhat overestimated but denote relatively large trade potential among the three Northeast Asian countries.

Table 4-1 Actual and Potential Bilateral Trades from the Basic Gravity Model with Directions of Trade (millions of dollar)

Origin	Destination	Actual Tades[1] (A)	Potential Trades[2] (B)	Ratio (B/A)	Potential Share[3]
Korea	Japan	17,634	189,311	10.7	54.2%
Japan	Korea	26,633	141,982	5.3	100.6%
Japan	China	39,365	190,292	4.8	78.1%
China	Korea	13,303	58,430	4.4	41.1%
China	Japan	58,259	223,482	3.8	64.0%
Korea	China	21,099	66,337	3.1	27.2%

Notes: 1. Actual trade denotes bilateral trade from the country in the first column to the country in the second column. It is measured in terms of each economy's imports from the other economy in 2001. Actual Trade data are from IMF's Direction of Trade Statistics.
2. Potential trades denote bilateral trade forecasted from the basic gravity model applied for the APEC member economies based on 2001 data.
3. Share of potential trade in aggregate imports of destination country in 2001.
Source: Actual trade data are IMF. 2003. *Direction of Trade Statistics*. CD-ROM. March.
Ministry of Finance. 2002. *Monthly Statistics of Exports and Imports Taiwan Area- September 2002*. October. Taiwan.

4.3 Alternative Gravity Model and Potential Trades

We try to estimate potential trades considering the directions of trade. In addition, we want to consider the structural similarity between the two countries in concern with the index of trade conformity. Since the ITC is differentiated in terms of the directions of trade, it is expected to be matched relatively well with the alternative gravity model with direction of trade. So, the alternative gravity model with directions of trade is to explain the imports of an APEC member economy from another, deflated by its GDP with the trading partner country's GDP, physical distance between them and the structural similarity between the former country's import structure and the latter country's export structure.It is applied to 342 pairs of 19 out of 21 APEC member

economies' bilateral trade, GDP and distance data in 2001.[15] The estimated equation is as follows,

$$log(M_{jk} \; / GDP_k) = 7.386 + 0.774 * log(GDP_j) - 1.300 * log(D_{jk})$$
$$\qquad\qquad (0.798) \; (0.044) \qquad\qquad (0.089)$$
$$\qquad + 1.065 * ITC_{jk} - 1.509 * D_{rus}$$
$$\qquad\quad (0.377) \qquad\quad (0.245)$$

R-squared: 0.695
Adjusted R-squared: 0.691
F-statistic: 184.693
Prob.(F-statistic): 0.000
*Number of observations: 342 (= 19*18)*

Note: The numbers in the parenthesis under each estimated coefficient are standard errors. The variable names M_{jk}, GDP_j, GDP_k, D_{jk}, ITC_{jk} denote the imports of APEC member economy k from member economy j, GDP of economy j, GDP of economy k in 2001, the distance between two capital cities of economy j and economy k and the ITC measures between economy j's export structure and economy k's import structure for 1997-2001, respectively. In addition, the variable name D_{rus} in the equation denotes the dummy variable having the value of 1 if Russia's bilateral trade is related and 0 otherwise. The Russian dummy (D_{rus}) is added since it joined APEC in November 1998 and still reveals exceptionally low level of integration through international trade with other APEC member economies.

The coefficients for GDP, physical distance and ITC are all estimated significant at *1* percent significance level with expected signs, respectively. The estimated potential trades (imports) from the regression analysis are summarized as in *Table 4-2*. The structure of the table is the same as the previous one, *Table 4-1*. The potential-actual trade ratio is estimated as significantly large in all of the pairs between the three Northeast Asian countries, especially from Korea to Japan (14.8) and followed by from Korea to China (4.7), from Japan to China (4.6), from Japan to Korea (4.4), China to Japan (3.9) and from China to Korea (3.6). Potential Trade can also be denoted in terms of its share in aggregate imports of a destination country in 2001. The potential trade share is estimated relatively large in the trade from Japan to Korea (83.3%) followed by

---

[15] As mentioned before, Taiwan and Vietnam are not included since comparable international trade data by commodity are not available in the UN's COMTRADE database.

from Korea to Japan (74.9%), from Japan to China (74.4%), and then from China to Japan (64.5%). However, it is estimated relatively small in the trade from China to Korea (34.1%) and from Korea to China (40.6%). The figures seem to be relatively large and somewhat overestimated but denote relatively large trade potential among the three Northeast Asian countries.

Overall, the potential-actual trade ratio or the potential trade share is estimated as a similar pattern as the model without the ITC measures but the values from Korea to the two other Northeast Asian countries have significantly increased, especially to Japan and followed by China. Those from Japan to the two other countries, and those from China to Korea have decreased compared with those from the model without the ITC measures. The potential-actual trade ratios or the potential trade share between the three Northeast Asian countries are still estimated as some of the highest cases among the pairs of APEC member economies.

Table 4-2 Actual and Potential Bilateral Trades from the Alternative Gravity Model with Directions of Trade
(million dollars)

Origin	Destination	Actual Tades[1] (A)	Potential Trades[2] (B)	Ratio (B/A)	Potential Share[3]
Korea	Japan	17,634	261,382	14.8	74.9%
Korea	China	21,099	98,834	4.7	40.6%
Japan	China	39,365	181,207	4.6	74.4%
Japan	Korea	26,633	117,607	4.4	83.3%
China	Japan	58,259	225,173	3.9	64.5%
China	Korea	13,303	48,109	3.6	34.1%

Notes: 1. Actual trade denotes bilateral trade from the country in the first column to the country in the second column. It is measured in terms of each economy's imports from the other economy in 2001. Actual Trade data are from IMF's Direction of Trade Statistics.
2. Potential trades denote bilateral trade forecasted from the alternative gravity model applied for the APEC member economies based on 2001 data.
3. Share of potential trade in aggregate imports of destination country in 2001.
Source: Actual trade data are IMF. 2003. *Direction of Trade Statistics*. CD-ROM. March.
Ministry of Finance. 2002. *Monthly Statistics of Exports and Imports Taiwan Area- September 2002*. October. Taiwan.

4.4 Attaining the Trade Potential

The three Northeast Asian countries, China, Japan and Korea, need to identify some practical ways to enhance economic cooperation among them and to attain the trade potential that is estimated to be significantly larger than their current performance. For these purposes, we can concentrate on some related factors and issues.

First, practical and feasible cooperation among the three Northeast Asian countries might be based on their dynamism in world trade, their regional vicinity and their

complementarity in the trade of Northeast Asia as a whole. Priority in economic cooperation should be given to the commodities and industrial sectors that reveal relatively strong complementarity in their trade structure. They also have to continue to make an effort to identify some measures that can potentially bring common and large benefits to each other. For example, they have relatively high complementarity to each other in electronic parts (valves and transistors), computer, telecommunications equipment, office equipment and their parts and accessories. In addition, China also has relatively significant complementarity with both Japan and Korea in the export of petroleum and fuel oil, electrical equipment, toys, etc.; with Japan in the export of footwear, woven clothing; and with Korea in the export of electric circuit equipment, heavy petroleum, special industrial machine and textile yarn. Japan also has relatively significant complementarity with both China and Korea in the export of special industrial machine, electrical equipment, electric circuit equipment, passenger cars, motor vehicle parts and accessories, measure and control apparatus. Korea also has relatively significant complementarity with both China and Japan in the export of passenger cars, heavy petroleum; with China in the export of man-made woven fabrics, special industrial machines, flat rolled iron, steel and steel products; and with Japan in the export of articles of apparel, fish and non-monetary gold.

Second, the simple averages of MFN applied tariffs for non-agricultural products are 11.3 percent for China (2002), 2.7 percent for Japan (2001) and 7.5 percent for Korea (2001).[16] They are relatively low and will be further reduced through the process of multilateral trade negotiations. Therefore, the main areas of cooperation might be overall reform in trade related procedures and institutions other than tariffs. Trade facilitation, to reduce trade related costs and time, would include most related areas. Some basic principles and means of implementing trade facilitation have already been discussed in WTO, OECD and APEC. For example, the basic principles for trade facilitation in OECD are (a) transparency, (b) consistency and predictability, (c) non-discrimination, (d) simplification and avoidance of unnecessary restrictiveness, and (e) due process. In addition, those in APEC are (a) transparency, (b) communication and consultation, (c) simplification, practicability and efficiency, (d) non-discrimination, (e) consistency and predictability, (f) harmonization, standardization and recognition, (g) modernization and the use of new technology, (h) due process, and (i) cooperation. To make an effort to be consistent with the above stated principles, it is of the utmost important to implement the concessions related to trade facilitation in multilateral negotiations made by the three countries. That is, the need to accept global standards

and to harmonize their domestic rules and regulations with international ones cannot be overemphasized. Based on this, the three countries may be able to cooperate in order to identify and to set priorities and to decide which obstacles and trade facilitation issues are more important and specific to the trade relationships among them.

Third, we need to identify major trade obstacles and their priorities among the three countries to implement some practical cooperative measures. In the major reports on trade barriers by country, more transparency and consistency related to trade procedures and institutions is often required for all of the three countries. Some examples are customs procedures, valuation and related inspection; quarantine, standards, technical regulations, conformity assessment procedures and recognition; domestic distribution related barriers, etc.[17]

Fourth, cooperative approaches, rather than negotiatory approaches, are required for trade facilitation among them since the targets for trade facilitation are usually difficult to be identified as a whole before actual trade procedures can be performed. That is, many targets for trade facilitation might be identified during and only when actual market access procedures happen and need to be gathered from private sector (firms). Therefore, there also need some concrete and independent institutional mechanism for the private sector to participate in the process.

Fifth, based on their complementarity, trade potential as well as actual trade performance even without any institutional trade arrangement, institutional integration, for example, regional trade agreement between the three Northeast Asian countries could be considered. In addition, since trade integration between Japan and Korea is relatively weak or has been weakening in Northeast Asia, mutual efforts are required to enhance industrial linkages through trade between the two economies. Both Japan and Korea produce and export relatively similar and globally competitive products, such as automobiles, home electric and electronic goods, and information and telecommunication equipment. However, their globally competitive major products are not very successful in accessing each other country's market. Therefore, intra-industry trade is key in the process. Horizontal as well as vertical intra-industry trade between Japan and Korea has to be enhanced before institutional integration. Since Korea, for example, imports lots of industrial intermediate goods (parts) and capital goods from Japan, Japan could increase its imports from Korea in final goods using Japanese intermediate goods (parts) and parts for capital goods exported to Korea. It is analyzed

---

[16] WTO (2003), *World Trade Report 2003*, p.214-215.

[17] USTR (2003), *2003 National Trade Estimate Report on Foreign Trade Barriers*. and European Commission (2004), *Market Access Database*. [europa.eu.int].

that Japan and Korea have mutually high relative intensity and complementarity in electronic equipment and parts including computer, telecommunication equipment, office equipment, semiconductors, steel and steel products, precision equipment, and petrochemical products.

5. SUMMARY AND IMPLICATIONS

In this paper, we tried to analyze the economic relationships of the three Northeast Asian countries, i.e., trade structure by commodity, trade performances and potentials between them. The results can be summarized as follows.

First, in terms of international trade, one of the most dynamic performances can be found in Northeast Asian countries. China, Japan and Korea, the three Northeast Asian countries' share in world merchandise exports has increased from 1.3 percent in 1948 to 14.3 percent in 2002. Recently, China experienced significant increases in its shares of world trade, while Japan recorded significant decreases in its share.

Second, intra-regional trade share, among the three Northeast Asian countries, in terms of the share in each country's aggregate imports or exports, has been increasing significantly during the last two decades even with their fast growing aggregate trade. Structural changes have also been observed in the composition of trade shares by their corresponding country. For example, China's export and import share with Japan has been decreasing and that with Korea has been increasing fast since it began to reform and open its economy in 1978 and also since it formed the amity relationship with Korea in August 1992.

Third, Korea has relatively large ITC measures between its export structure and the other countries' import structure. They are also relatively larger than those between Korea's import structure and other countries' export structure, especially China and followed by Japan. In contrast, China has relatively larger ITC measures between its import structure and the other countries' export structure than those between its import structure and the other countries' export structure.

Fourth, complementary commodities are identified from the degree of their contribution to the ITC between a country's exports and another country's imports. Some examples are as follows. The three Northeast Asian countries have relatively high complementarity with each other in their exports of SITC 776 (valves, transistors, etc.), 764(telecommunications equipment, not elsewhere specified), 759 (office equipment parts, accessories) and 752 (computer equipment). Other complementary commodities by country are as follows. For China, its exports have relatively high complementarity

with the other two countries in SITC 333 (petroleum, bitumen oil, crude) and 894 (baby carrier, toy, game, sports); with Japan in SITC 851 (footwear), 841 (men's and boys' wear, woven) and 842 (women's and girls' clothing, woven); and with Korea in SITC 772 (electric circuit equipment), 334 (heavy petroleum, bitumen oils), 728 (special industrial machine, nes) and 651 (textile yarn). For Japan, its exports have relatively high complementarity with the other two countries in SITC 781 (passenger cars, etc.), 784 (motor vehicle parts, accessories) and 874 (measure, control apparatus, nes); with China in SITC 931 (special transactions, nes); and with Korea in 598 (miscellaneous chemical products, nes). For Korea, its exports have relatively high complementarity with the other two countries in 781 (passenger cars, etc.) and 334 (heavy petroleum, bitumen oils) and 759 (office equipment parts, accessories); with China in SITC 653 (man-made woven fabrics), 728 (special industrial machines, nes), 673 (flat rolled iron, steel products); and with Japan in SITC 845 (articles of apparel, nes), 034 (fish, live/fresh/chilled/frozen), 971 (gold non-monetary excluding ore).

Fifth, we estimated potential trades between the three Northeast Asian countries using the gravity model of trade and compared them with their actual bilateral trade performances in 2001. The potential-actual trade ratio is estimated as significantly large between all of the three Northeast Asian countries, especially from Korea to Japan. In the model with the ITC measures, potential-actual trade ratios from Korea to the two other Northeast Asian countries have significantly increased, especially to Japan and followed by China. The potential-actual trade ratios for the three Northeast Asian countries are estimated as some of the highest cases among the pairs of APEC member economies.

Finally, the three Northeast Asian countries, China, Japan and Korea, need to identify some practical ways to enhance economic cooperation among them and to attain the trade potential that is estimated to be significantly larger than their current performance. The need to accept global standards and harmonize their domestic rules and regulations with an international one cannot be overemphasized. Based on this, the three countries might be able to cooperate to identify and set priorities among the obstacles and important trade facilitation issues and those issues specific to the trade relationships among them. Institutional integration, for example, regional trade agreement between the three Northeast Asian countries could be considered based on their complementarity, trade potential as well as actual trade performance. In consideration of Japan and Korea's similar export structure and relatively low and somewhat weakening trends of trade integration, mutual efforts are required to enhance horizontal as well as vertical intra-industry trade.

REFERENCES

Deardorff, Alan V. 1995. "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?" *NBER Working Paper*. 5377. December.

Evenett, Simon J. and William K. Hutchinson. 2002. "The Gravity Equation in International Economics: Theory and Evidence - Editors Introduction." *Scottish Journal of Political Economy*. 49. 5. November.

Frankel, Jeffrey A. ed. 1998. *The Regionalization of the World Economy*. The University of Chicago Press.

Grubel, H. G. and P. J. Lloyd. 1975. *Intra-industry Trade: The Theory and Measurement of International Trade in Differential Products*. Wiley.

IMF. 2003. *Direction of Trade Statistics*. CD-ROM. March.

Korea International Trade Association (KITA). *KOTIS Online Database*.

Linnemann, Hans and Cees van Beers. 1988. "Measures of Export-Import Similarity, and the Linder Hypothesis Once Again." *Weltwirtschaftliches Archiv*, 124:3. pp. 445-457.

Ministry of Finance. 2002. *Monthly Statistics of Exports and Imports Taiwan Area – September 2002*. October, Taiwan.

Nam, Sang-yirl. 2000. "Competition and Complementarity in Northeast Asian Trade: Korea's Perspective." *Working Paper 00-02*. KIEP. April.

_____. 2003. *Trade Structure and Complementarity among APEC Member Economies*. APEC Study Series 03-01. KIEP. December.

Soesastro, Hadi. 1999. "APEC after 10 Years." Presented in *APEC Study Center Consortium 1999 Conference*. Auckland, New Zealand. May.

Sohn, Chan-Hyun and Jinna Yoon. 2001. "Does the Gravity Model Fit Korea's Trade Patterns?" *Working Paper 01-01*. KIEP.

Tirole, Jean. 1990. *The Theory of Industrial Organization*. MIT Press.

United Nations. 1986. *Standard International Trade Classification Revision 3*. Statistical Papers Series M, No.34/Rev. 3.

_____. *International Trade Center Homepage*. [www.un.org]

WTO. 2003. *World Trade Report 2003*. Geneva.