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Trade Complementarity Between South Korea And Her Major Trading Countries: Its Changes Over The Period Of 2005-2009*

Seung Jin Kim**

This paper analyzes how South Korea's trade intensity with her major trading countries (i.e., China, the USA, and Japan, CUJ in short hereafter) in 35 industries of the manufacturing sector changed from 2005 to 2009. For this purpose, trade intensity index, trade complementarity index, and special country bias index between South Korea and CUJ were measured and analyzed by a trade intensity index model developed by Yamazawa (1970). The OECD trade matrix, which reports all the trade data between each and every OECD member country and non-member countries of OECD from the viewpoint of OECD member countries, was used as data. For example, South Korea's trade intensity with China was found to decrease from 8.17 in 2005 to 7.75 in 2009 due to (a) the decrease in South Korea's special country bias with China from 6.79 in 2005 to 6.52 in 2009 and (b) the decrease in South Korea's trade complementarity with China from 1.20 in 2005 to 1.19 in 2009. Exactly the opposite patterns of change were found in the case of South Korea's trade intensity (and trade complementarity, and special country bias) with the USA. South Korea's trade intensity with Japan turned out to increase from 5.11 in 2005 to 5.49 in 2009 due to (a) the increase in South Korea's special country bias with Japan from 5.51 in 2005 to 6.08 in 2009 and (b) the decrease in South Korea's trade complementarity with Japan from 0.93 in 2005 to 0.90 in 2009. Very fortunately, FTA agreement between South Korea and the USA was reached on 15 March 2012. Therefore FTA discussion between South Korea and China (and Japan) should be started soonest as possible in order to enhance South Korea's special country bias with China (and Japan) by (a) increasing capital movements and economic cooperation and (b) reducing discriminatory tariffs and other import restrictions between South Korea and China (and Japan).

JEL Codes: F11, F13 and F14

1. Introduction

Thanks to laborious and painstaking efforts of both the US and South Korean government, FTA (i.e., Free Trade Arrangement) agreement between two countries became effective from 15 March 2012, which eliminated discriminatory tariffs and other import restrictions between two countries afterwards. Therefore South Korea's special country bias with the USA is expected to increase in the near future and accordingly South Korea's trade intensity with the USA will also increase in 2013.

Geopolitically, South Korea is located between China and Japan and used to have a very close economic relation with them from an ancient time. Very unfortunately, a whole Korean peninsula became a Japanese colony from 1910 to 1945 due to a Japanese imperialism. Therefore there still exists a strong national sentiment against

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**Prof. Seung Jin Kim, Dept. of International Economics and Law, Hankuk University of Foreign Studies, 270 Imundong, Dongdaemunku, Seoul 130-791, South Korea. Email: seunjkim@hufs.ac.kr

Japan in Korea. Since China helped a North Korean regime during a Korean War (1950-1953) by sending her troops to a Korean peninsula and continued to support a North Korean regime through military and economic aids afterwards, there always exist some tensions between South Korea and China.

Ever since South Korea reached a diplomatic normalization with Japan and China in 1964 and 1992 respectively, South Korea's trade volumes with Japan and China have increased dramatically for the last decades. Despite of this strengthened economic ties between South Korea and Japan (China), there still exist discriminatory tariffs and other import restrictions between South Korea and Japan (China). Therefore FTA agreement between South Korea and Japan (China) should be reached in the near future in order for these three countries in the North East Asia to increase trade volumes among them and accordingly overcome current global economic crisis which all these three countries are now suffering from.

For this purpose, this paper aims to analyze how South Korea's trade intensity with her major trading countries (i.e., China, the USA, and Japan, CUJ in short hereafter) changed over time for the period of 2005-2009. For this purpose, Section 2 will briefly survey a trade intensity index model developed by Yamazawa (1970) and Kim (2004) and methodology and research design of this paper will be suggested in Section 3.

Section 4 will measure a trade intensity index, a trade complementarity index, and a special country bias index between South Korea and CUJ for the period of 2005-2009 by using the OECD trade matrix (2011) and analyze how South Korea's trade intensity with CUJ changed over time. On top of this, this paper will also analyze the determinants of South Korea's trade complementarity with CUJ over the periods at both sectoral and aggregate levels (the analysis on the determinants of trade complementarity at a sectoral level was never attempted in the previous papers and accordingly this paper is the first attempt which tries to analyze the determinants of trade complementarity at both sectoral and aggregate levels so far). Furthermore, South Korea's promising and potential exportable products to CUJ will be identified, which is also the first attempt of this paper.

Section 5 will summarize major empirical results and conclude the paper with a few remarks.

This paper is different from the previous studies (e.g., Kim (2009) and others) in the sense that it is the most updated one, which covers up to the year of 2009, and that it takes care of Korea's trade intensity with her three major trading countries of CUJ.

2. Literature Review

2.1 Multi-Country-Multi-Product-Multi-Factor Trade Model

According to the Heckscher-Ohlin type of two-country-two-product-two-factor model, trade patterns between countries will be determined by the comparative advantage structures between the two countries, determined by factor intensities of two products and factor endowment ratios of two countries. In the multi-country model,

however, various other factors are found to play important roles in determining trade patterns among those countries, as will be elaborated below.

Two alternative models have been developed for analyzing the world trade flows. One is a gravity model (Kim, 2004)[i] and the other is a trade intensity index model, which will be explained in Section 2.2.

2.2 Trade Intensity Index Model[ii]

The trade intensity index model (Yamazawa, 1970; Kim, 2004 and 2009) concentrates on the structure of departures of actual trade flows from trade flows estimated in gravity model. The index of intensity of country i's export trade with country j (in short, trade intensity index) is defined by

$$I_{ij} = \frac{X_{ij}}{X_{i.}} \Big/ \frac{X_{.j}}{X_{..}} \quad \text{---------- (1)}$$

where X_{ij} is country i's export to country j, and $X_{i.}$($\equiv \sum_j X_{ij}$), $X_{.j}$($\equiv \sum_i X_{ij}$), and $X_{..}$($\equiv \sum_i \sum_j X_{ij}$) represent the total export of country i, total import of country j, and the total volume of world trade respectively.[iii]

It is easily proved that, in a simplified gravity model where bilateral trade is solely determined by the GNP's of countries i and j, I_{ij} is always equal to unity.[iv] In other words, I_{ij} equals unity if the value of trade is proportional to the GNP's of the two countries; exceeds unity if the trade becomes more intensive between the countries, and falls short of unity if trade becomes less intensive between the countries i and j. High trade intensity reflects such various factors as the strong complementarity in comparative advantage structures, smaller geographical and psychic distances, and mutually favorable trade agreements between the two countries.

This trade intensity index can be decomposed into trade complementarity index (C_{ij}) and special country bias index (B_{ij}) as follows.

Country i's patterns of exports to and imports from the world are principally determined by its structure of comparative advantage and disadvantage vis-a-vis the world. Assuming a homogeneous commodity is traded in a world where both transport costs and artificial barriers to trade are negligible, the country i's export of commodity h to country j ($\overline{X}_{ij}^{h}$) is expected to be the product of 「*country j's total import of the h-th commodity* ($X_{.j}^{h}$)」 multiplied by 「*the share of country i in the world trade (i.e., export) of commodity h* ($X_{i.}^{h} / X_{..}^{h}$)」 as follows.

$$\overline{X}_{ij}^{h} = X_{.j}^{h} \left(\frac{X_{i.}^{h}}{X_{..}^{h}} \right) \quad \text{---------- (2)}$$

In other words, the exporting country i's expected market share in the importing country j's market in the trade of the h-th commodity ($\overline{X}_{ij}^{h} / X_{.j}^{h}$) is supposed to be determined by the exporting country i's market share in the world market in the trade

of the same commodity ($X_{i.}^{h} / X_{..}^{h}$) assuming that there are no trade barriers and no transportation costs.
This expected value of country i's export of commodity h to country j ($\overline{X}_{ij}^{h}$) can be rewritten as follows.

$$\overline{X}_{ij}^{h} = \frac{X_{i.}^{h} X_{.j}^{h}}{X_{..}^{h}} \quad \text{---------- (3)}$$

The expected value of total exports from country i to country j is defined as the sum of expected values of all commodities.

$$\overline{X}_{ij} \equiv \sum_{h} \overline{X}_{ij}^{h} \quad \text{---------- (4)}$$

The country i's trade complementarity to country j (C_{ij}) or the country i's expected trade intensity to country j (C_{ij}) is obtained by replacing the expected value of trade ($\overline{X}_{ij}$) for the actual one (X_{ij}) in the equation (1) as shown below.

$$C_{ij} = \frac{\overline{X}_{ij}}{\overline{X}_{i.}} / \frac{X_{.j}}{X_{..}} \quad \text{---------- (5)}$$

The divergence between the expected value of trade and the actual value defines the degree of special country bias as follows.

$$B_{ij} \equiv I_{ij} / C_{ij} = \frac{X_{ij}}{\overline{X}_{ij}} = \frac{X_{ij}}{\sum_{h} \overline{X}_{ij}^{h}} = 1 / \{ \sum_{h} (\frac{X_{ij}^{h}}{X_{ij}}) \frac{1}{B_{ij}^{h}} \} \quad \text{---------- (6)}$$

where B_{ij}^{h} is the degree of special country bias in the trade of commodity h ($B_{ij}^{h} = X_{ij}^{h} / \overline{X}_{ij}^{h}$) and B_{ij} turns out to be a weighted harmonic mean of B_{ij}^{h}.

The first line of equation (6) gives a decomposition of trade intensity into two components as follows.

$$I_{ij} = C_{ij} \cdot B_{ij} \quad \text{---------- (7)}$$

which is the basic formula for our analysis.

2.3 Determinants of Trade Complementarity[v]

To find the determinants of trade complementarity (C_{ij}), it can be decomposed as follows:

$$C_{ij} = \sum_{h} (\frac{X_{..}^{h}}{X_{..}}) \; S_{i}^{h} \cdot R_{j}^{h}$$

where $S_{i}^{h} = \frac{X_{i.}^{h}}{X_{i.}} / \frac{X_{..}^{h}}{X_{..}}$, $R_{j}^{h} = \frac{X_{.j}^{h}}{X_{.j}} / \frac{X_{..}^{h}}{X_{..}}$ ---------- (8)

S_i^h and R_j^h are the shares of commodity h in country i's total exports and country j's total imports respectively both divided by commodity h's share in world total trade. (S_i^h is nothing but an RCA (Revealed Comparative Advantage) index of country i for commodity h, which was firstly introduced into a pure trade theory by Balassa (1965).) They measure the degrees of country i's export specialization and country j's import specialization in commodity h respectively. Since their weighted average over all commodities always takes a constant value of unity,

$$\sum_h \left(\frac{X_{..}^h}{X_{..}}\right) S_i^h = \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) R_j^h = 1 \quad \text{---------- (9)}$$

each of them takes value around unity. S_i^h of over (under) unity implies that country i exports commodity h more (less) intensively than the world average, and the higher (lower) the value of S_i^h the stronger (weaker) is country i's export specialization in commodity h. Similarly, the higher (lower) the value of R_j^h, the stronger (weaker) is country j's import specialization in commodity h.

The vector of S_i^h over all commodities, ($S_i^1, S_i^2, \ldots, S_i^n$), shows the structure of export specialization of country i, which reflects country i's structure of comparative advantage. Higher (lower) value of S_i^h indicates that country i has strong (weak) comparative advantage in the production of commodity h. The exactly same thing also applies to the vector of indices of import specialization. The structure of import specialization, however, is affected not only by the structure of comparative disadvantage but also by protective commercial policies much more than that of export specialization.

The degree of concentration or diversification of country i's export specialization and country j's import specialization is affected by such important aspects of comparative advantage as the size of a country, skewed resource endowments, etc.. They can be measured in terms of standard deviations of specialization indexes from their mean (i.e., unity), which are square roots of the variances defined as follows.

$$\sigma^2(S_i) = \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) (S_i^h - 1)^2$$

$$\sigma^2(R_j) = \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) (R_j^h - 1)^2 \quad \text{---------- (10)}$$

It can be easily demonstrated that the lower the standard deviation of export (import) specialization index of a certain country, the more diversified the export (import) specialization pattern of the country.[vi]

Covariance of the indices of country i's export specialization and those of country j's import specialization is defined as follows.

$$\begin{aligned} COV(S_i, R_j) &= \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) (S_i^h - 1)(R_j^h - 1) \\ &= \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) (S_i^h R_j^h - S_i^h - R_j^h + 1) \\ &= \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) S_i^h R_j^h - \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) S_i^h - \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) R_j^h + \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) \end{aligned}$$

$$= \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) S_i^h R_j^h - 1 - 1 + 1 \quad [vii]$$

$$= \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) S_i^h R_j^h - 1$$

$$= C_{ij} - 1 \quad [viii]$$

or $C_{ij} = COV(S_i, R_j) + 1$ ---------- (11)

Therefore, if country i's pattern of export specialization matches country j's pattern of import specialization closely, that is, if the indices of country i's export specialization and country j's import specialization are positively correlated (i.e., $COV(S_i, R_j) > 0$), C_{ij} will take a value greater than unity. On the contrary, if they match poorly, that is, if they are negatively correlated (i.e., $COV(S_i, R_j) < 0$), C_{ij} will take a value less than unity. If they are independent ($COV(S_i, R_j) = 0$), C_{ij} will be equal to unity. Consequently, C_{ij} measures the degree of complementarity in the specialization structures of two trading countries.

The degree of complementarity, however, is not only influenced by the match of the specialization patterns of exports and imports, but also by their concentration or diversification. A country with highly concentrated pattern of export specialization tends to have higher complementarity in her export activities than the country with a similar but more diversified pattern of export specialization.[ix] Therefore, if the correlation coefficient between the specialization structure of exports and imports is calculated, the measure of the degree of match of the two patterns neutral from the degree of concentration or diversification can be obtained as follows.

$$r_{ij} = \frac{COV(S_i, R_j)}{\sigma(S_i) \times \sigma(R_j)} \quad \text{---------- (12)}$$

Since Korea's promising and potential exportable products to CUJ were not identified in the past studies, we will firstly attempt to find them in this paper.

3. Data and Methodology

3.1 Data

To calculate a trade intensity index, a trade complementarity index, and a special country bias index between South Korea and CUJ for the last five years by adopting an above-stated trade intensity index model developed by Yamazawa (1970) and Kim (2009), we used the OECD (2011) trade matrix, which reports all the trade data between each and every OECD member country and non-member countries of OECD from the viewpoint of OECD member countries. As shown in Table 1, our basic sample of industries for the manufacturing sector consists of 35 industries at a SITC 2-digit level, which is an optimal sample size for our research. On top of that, the OECD trade matrix is now published for these 35 manufacturing industries. The classification of manufactured products by factor intensity and end uses is also listed in Table 2.

Table 1: List of 35 Industries in Manufacturing Sector

SITC Code	Name of Industry	SITC Code	Name of Industry
51	Organic Chemicals	71	Power Generating Machinery And Equipment
52	Inorganic Chemicals	72	Specialized Machinery
53	Dyeing, Tanning And Coloring Materials	73	Metal Working Machinery
54	Medicinal and Pharmaceutical Pro ducts	74	Other Industrial Machinery and Parts
55	Essential Oils and Perfume Materials	75	Office Machines And ADP Equipment
56	Fertilizers	76	Telecommunications And Sound Recording Apparatus
57	Plastics in Primary Forms	77	Electrical Machinery, Apparatus And Appliances, n.e.s.
58	Plastics in Non-primary Forms	78	Road Vehicles
59	Chemical Materials and Products, n.e.s.	79	Other Transport Equipments
61	Leather, Leather Manufactures And Dressed Furskins	81	Prefabricated Buildings, Sanitary, Heating and Lighting Fixtures, n.e.s.
62	Rubber Manufactures, n.e.s.	82	Furniture and Parts Thereof
63	Cork and Wood Manufactures (excluding Furniture)	83	Travel Goods, Handbags, etc.
64	Paper and Paper Manufactures	84	Articles of Apparel And Clothing Accessories
65	Textile Yarn, Fabrics and Related Products	85	Footwear
66	Non-metallic Mineral Manufactures, n.e.s.	87	Professional and Scientific Instruments, n.e.s.
67	Iron and Steel	88	Photo Apparatus, Optical Goods, Watches and Clocks
68	Non-ferrous Metals	89	Miscellaneous Manufactured Articles, n.e.s.
69	Manufactures of Metal, n.e.s.		

Table 2: Classification of Manufactured Products by Factor Intensity and End Uses

	SITC 2 digit Code
1) Labor-Intensive Products	61 63 65 66 69 76 81 82 83 84 85 89
2) Capital/Technology-Intensive Products	51 52 53 54 55 56 57 58 59 62 64 66 67 68 71 72 73 74 75 76 77 78 79 86 87 88 89
3) Nondurable Consumer Products	55 57 65 83 84 85 86 88 89
4) Durable Consumer Products	66 69 76 77 78 81 82 88 89
5) Capital Goods	69 71 72 73 74 75 77 78 79 87 88
6) Labor-Intensive Intermediate Products	61 63 65 66 69
7) Capital-Intensive Intermediate Products	51 52 53 54 55 56 58 59 62 64 66 67 68 88

Source: Ministry of International Trade and Industry, Government of Japan, White Paper on International Trade (1986: 405-406).

3.2 Methodology

All the values that are required for this study will be calculated by following the next steps.

(a) By substituting relevant OECD trade data into Equation (1), we can calculate I_{KC}, I_{KU}, and I_{KJ} where a subscript K, C, U, and J denotes South Korea, China, the USA, and Japan respectively.

(b) By substituting relevant OECD trade data into Equation (3), we can calculate $\overline{X}^{h}_{KC}$, $\overline{X}^{h}_{KU}$, and $\overline{X}^{h}_{KJ}$ where *h = SITC 51* to *SITC 89.*

(c) By summating $\overline{X}^{h}_{KC}$ over *h* from *SITC 51* to *SITC 89* as shown in Equation (4), we can calculate $\overline{X}_{KC}$. Both $\overline{X}_{KU}$ and $\overline{X}_{KJ}$ can be calculated in the same manner.

(d) By substituting all the relevant data into Equation (5), we can derive C_{KC}, C_{KU}, and C_{KJ}.

(e) By substituting all the relevant data into Equation (6), we can derive B_{KC}, B_{KU}, and B_{KJ}. These values of B_{KC}, B_{KU}, and B_{KJ} derived by using the first part of Equation (6) should be equal to those values of B_{KC}, B_{KU}, and B_{KJ} by using the last part of Equation (6).

(f) S_K^h, R_C^h, R_U^h, and R_J^h where *h = SITC 51* to *SITC 89* can be calculated by using the latter part of Equation (8). As explained above, S_K^h is South Korea's export specialization index (or RCA (Revealed Comparative Advantage) index) of commodity h; and R_C^h, R_U^h, and R_J^h are import specialization index of commodity h of China, the USA, and Japan respectively. By utilizing the former part of Equation (8), we can derive C_{KC}, C_{KU}, and C_{KJ}. These values of C_{KC}, C_{KU}, and C_{KJ} derived here should be equal to those values of C_{KC}, C_{KU}, and C_{KJ} derived in Step (d).

(g) By utilizing Equation (10), $\sigma(S_K)$, $\sigma(R_C)$, $\sigma(R_U)$, and $\sigma(R_J)$ can be calculated. As explained above, $\sigma(S_K)$ is a standard deviation of South Korea's export specialization; and $\sigma(R_C)$, $\sigma(R_U)$, and $\sigma(R_J)$ are standard deviations of import specialization of China, the USA, and Japan respectively. As shown in Endnote vi, the lower the standard deviation of export (import) specialization index of a certain country, the more diversified the export (import) specialization pattern of the country.

(h) By utilizing the former part of Equation (11), we can calculate COV (S_K, R_C), COV (S_K, R_U), and COV (S_K, R_J). As shown above, COV (S_K, R_C) is a covariance of

the indices of South Korea's export specialization and those of China's import specialization. COV (S_K, R_U) and COV (S_K, R_J) can be defined in the same way. It should be noted that if we add a numerical number of one to COV (S_K, R_C), it will be C_{KC}. Likewise, if we add a numerical number of one to COV (S_K, R_U) and COV (S_K, R_J), it will be C_{KU} and C_{KJ} respectively.

(i) Finally, if we calculate the correlation coefficient between South Korea's export specialization structure and China's import specialization structure (r_{KC}) as shown in Equation (12), it will be the measure of the degree of match of the two patterns neutral from the degree of concentration or diversification. The exactly same thing can be said on r_{KU} and r_{KJ}.

On top of this, this paper will also analyze the determinants of South Korea's trade complementarity with CUJ over the periods at both sectoral and aggregate levels (the analysis on the determinants of trade complementarity at a sectoral level was never attempted in the previous papers and accordingly this paper is the first attempt which tries to analyze the determinants of trade complementarity at both sectoral and aggregate levels so far). Furthermore, South Korea's promising and potential exportable products to CUJ will be identified, which is also the first attempt of this paper.

4. Findings

4.1 South Korea's Trade Intensity, Trade Complementarity and Special Country Bias With CUJ

South Korea's trade intensity, trade complementarity, and special country bias with CUJ in the manufacturing sector for the period of 2005-2009 are displayed in Table 3. The results show that China emerged as South Korea's major trading partner as shown in the fact that South Korea's trade intensity with China was higher than South Korea's trade intensity with the USA and Japan (UJ in short hereafter) for both 2005 and 2009 even if it dropped from 8.17 in 2005 to 7.75 in 2009. This is totally due to the following two facts. One is that South Korea's trade complementarity with China decreased from 1.20 in 2005 to 1.19 in 2009, which means that South Korea's export structure and China's import structure became less complementary over the period of 2005-2009. The other is that South Korea's special country bias with China also decreased from 6.79 in 2005 to 6.52 in 2009, partly due to the decrease in South Korea's foreign direct investment (FDI in short hereafter) to China from US$ 2.83 billion in 2005 to US$ 2.18 billion in 2009.

On the other hand, South Korea's trade intensity with the USA increased from 1.55 in 2005 to 1.69 in 2009, which advocates that the USA became more important as South Korea's major trading partner for the period of 2005-2009. This is totally due to the following two facts. One is that South Korea's trade complementarity with the USA increased from 1.09 in 2005 to 1.17 in 2009, which means that South Korea's export structure and the US import structure became more complementary for the period of 2005-2009. The other is that South Korea's special country bias with the USA increased from 1.42 in 2005 to 1.45 in 2009, partly due to the drastic increase in South Korea's FDI to the USA from US$ 1.26 billion in 2005 to US$ 3.57 billion in 2009.[x]

Table 3: South Korea's Trade Intensity, Trade Complementarity, and Special Country Bias With China, USA, and Japan in the Manufacturing Sector: 2005, 2009

	Year	China	USA	Japan
Trade	2005	8.17	1.55	5.11
Intensity	2009	7.75	1.69	5.49
Trade	2005	1.20	1.09	0.93
Complementarity	2009	1.19	1.17	0.90
Special Country	2005	6.79	1.42	5.51
Bias	2009	6.52	1.45	6.08

Table 3 also tells us that South Korea's trade intensity with Japan increased from 5.11 in 2005 to 5.49 in 2008, which proves that Japan became more important as South Korea's major trading partner over the period of 2005-2009. This is totally due to the following two facts. One is that South Korea's trade complementarity with Japan decreased from 0.93 in 2005 to 0.90 in 2009, which means that South Korea's export structure and Japan's import structure became more competitive over the period of 2005-2009. The other is that South Korea's special country bias with Japan increased from 5.51 in 2005 to 6.08 in 2009, partly due to the increase in South Korea's FDI to Japan from US$ 0.16 billion in 2005 to US$ 0.38 billion in 2009.

South Korea's trade intensity with China in 2009 is higher than her trade intensity with the USA. This is totally due to the fact that South Korea's special country bias with China is much higher than her equivalent value with the USA, along with the fact that South Korea's trade complementarity with China is higher than her equivalent value with the USA. This means that lower transport cost, discriminatory tariffs and other import restrictions, higher economic cooperation which are prevalent in the economic relations between South Korea and China do increase South Korea's special country bias with China and accordingly raise her trade intensity with China, which is also reinforced by the fact that South Korea's trade complementarity with China is higher than her equivalent value with the USA.

South Korea's trade intensity with the USA in 2009 is lower than her trade intensity with Japan. This is totally due to the fact that South Korea's special country bias with the USA is much lower than her equivalent value with Japan, even if South Korea's trade complementarity with the USA is higher than her equivalent value with Japan. This means that higher transport cost, discriminatory tariffs and other import restrictions, lower economic cooperation which are prevalent in the economic relations between South Korea and the USA do reduce South Korea's special country bias with the USA and accordingly lessen her trade intensity with the USA, even if South Korea's trade complementarity with the USA is higher than her equivalent value with Japan.

South Korea's trade intensity with Japan in 2009 is lower than her trade intensity with China. This is totally due to the fact that South Korea's special country bias with Japan is lower than her equivalent value with China, along with the fact that South Korea's trade complementarity with Japan is lower than her equivalent value with China. This means that higher discriminatory tariffs and other import restrictions, lower capital movements and economic cooperation which are prevalent in the

economic relations between South Korea and Japan do reduce South Korea's special country bias with Japan and accordingly lessen her trade intensity with Japan, which is also strengthened by the fact that South Korea's trade complementarity with Japan is lower than her equivalent value with China.

4.2 Determinants of South Korea's Trade Complementarity With China, the USA, and Japan

4.2.1 Determinants of South Korea's Trade Complementarity With China

As shown in Table 4, South Korea has comparative advantage in the production of (a) labor-intensive product, such as *textile yarn, fabrics and related products (SITC 65)* and *articles of apparel and clothing accessories (SITC 84)* and (b) capital/technology-intensive products, such as *telecommunications and sound recording apparatus (SITC 76), electrical machinery, apparatus and appliances, n.e.s. (SITC 77), office machines and ADP equipment (SITC 75), rubber manufactures, n.e.s.(SITC 62), other transport equipments (SITC 79), iron and steel (SITC 67)* and *road vehicles (SITC 78)* in 2005 (refer to Table 2 for the classification of manufactured products by factor intensity and end uses. Also notice that in order to save the space of this paper only SITC code will be listed from now on. Look at Table 1 for the name of each SITC code listed).[xi]

Table 4: Analysis of South Korea's Trade Complementarity With China in Manufacturing Sector: 2005, 2009

	2005					2009				
SITC	S_K^h	R_C^h	$S_K^h \cdot R_C^h$	$\frac{X_{..}^h}{X_{..}}$	$\left(\frac{X_{..}^h}{X_{..}}\right) S_K^h \cdot R_C^h$	S_K^h	R_C^h	$S_K^h \cdot R_C^h$	$\frac{X_{..}^h}{X_{..}}$	$\left(\frac{X_{..}^h}{X_{..}}\right) S_K^h \cdot R_C^h$
51	0.37	***1.64***	0.60	0.04	0.02	0.37	***1.44***	0.54	0.04	0.02
52	0.30	0.66	0.20	0.01	0.00	0.45	0.94	0.42	0.01	0.00
53	0.33	0.96	0.31	0.01	0.00	0.26	0.92	0.24	0.01	0.00
54	0.03	0.12	0.00	0.06	0.00	0.04	0.17	0.01	0.09	0.00
55	0.09	0.26	0.02	0.01	0.00	0.12	0.29	0.03	0.02	0.00
56	0.12	0.90	0.11	0.00	0.00	0.24	0.47	0.11	0.00	0.00
57	0.69	***1.87***	***1.30***	0.02	0.03	0.80	***2.23***	***1.79***	0.02	0.04
58	0.74	0.92	0.68	0.01	0.01	0.74	***1.04***	0.76	0.01	0.01
59	0.25	0.79	0.20	0.02	0.00	0.26	0.80	0.21	0.02	0.00
61	0.13	***2.44***	0.31	0.00	0.00	0.28	***2.87***	0.81	0.00	0.00
62	***1.36***	0.30	0.41	0.01	0.00	***1.41***	0.37	0.52	0.01	0.01
63	0.03	0.18	0.00	0.01	0.00	0.03	0.14	0.00	0.01	0.00
64	0.34	0.38	0.13	0.02	0.00	0.28	0.28	0.08	0.02	0.00
65	***1.28***	***1.61***	***2.06***	0.02	0.04	***1.15***	***1.25***	***1.44***	0.01	0.02
66	0.40	0.57	0.23	0.02	0.00	0.32	0.59	0.19	0.02	0.00
67	***1.07***	***1.56***	***1.67***	0.04	0.06	***1.28***	***1.23***	***1.58***	0.03	0.06
68	0.31	***1.26***	0.39	0.02	0.01	0.40	***1.63***	0.65	0.02	0.01
69	0.73	0.56	0.41	0.03	0.01	0.81	0.63	0.51	0.03	0.02
71	0.29	0.81	0.23	0.04	0.01	0.41	0.97	0.40	0.05	0.02
72	0.74	***2.02***	***1.50***	0.04	0.05	0.82	***1.97***	***1.61***	0.03	0.05
73	0.88	***3.38***	***2.99***	0.01	0.03	***1.13***	***3.55***	***4.01***	0.01	0.03
74	0.62	***1.22***	0.76	0.06	0.04	0.66	***1.29***	0.86	0.06	0.05
75	***1.93***	***1.24***	***2.39***	0.04	0.10	***1.47***	0.90	***1.33***	0.03	0.04
76	***4.30***	***1.19***	***5.11***	0.05	0.25	***5.21***	***1.00***	***5.23***	0.05	0.26
77	***2.08***	***2.19***	***4.56***	0.08	0.36	***1.88***	***2.27***	***4.27***	0.07	0.32
78	***1.06***	0.31	0.33	0.17	0.06	0.92	0.57	0.53	0.14	0.08
79	***1.15***	***1.48***	***1.70***	0.03	0.04	***2.19***	0.62	***1.37***	0.03	0.04
81	0.16	0.18	0.03	0.00	0.00	0.16	0.16	0.02	0.01	0.00
82	0.14	0.22	0.03	0.01	0.00	0.16	0.27	0.04	0.01	0.00
83	0.32	0.11	0.03	0.00	0.00	0.19	0.22	0.04	0.00	0.00
84	***1.01***	0.15	0.15	0.02	0.00	0.37	0.16	0.06	0.02	0.00
85	0.26	0.35	0.09	0.00	0.00	0.16	0.25	0.04	0.00	0.00
87	0.62	***1.80***	***1.12***	0.03	0.03	0.98	***2.27***	***2.22***	0.03	0.07
88	0.40	***1.65***	0.66	0.01	0.01	0.75	***1.84***	***1.37***	0.01	0.01
89	0.49	0.38	0.19	0.05	0.01	0.42	0.34	0.14	0.05	0.01
Standard Deviation	0.72	1.02		∑=1	∑=1.20	0.78	1.03		∑=1	∑=1.19
Covariance & Correlation Coefficient			$COV(S_K, R_C)$ 0.20	r_{KC} 0.30				$COV(S_K, R_C)$ 0.19	r_{KC} 0.24	

In 2008 South Korea continues to have comparative advantage in the production of (a) labor-intensive product, such as *SITC 65* and (b) capital/technology-intensive products, such as *SITC 76, SITC 79, SITC 77, SITC 75, SITC 62, SITC 67,* and *SITC 73.*

On the other hand, China has comparative disadvantage in the production of (a) labor-intensive products, such as *SITC 61* and *SITC 65* and (b) capital/technology-intensive products, such as *SITC 73, SITC 77, SITC 72, SITC 57, SITC 87, SITC 88, SITC 51, SITC 67, SITC 79, SITC 68, SITC 75, SITC 74,* and *SITC 76* in 2003.

In 2008, China continues to have comparative disadvantage in the production of (a) labor-intensive products, such as *SITC 61* and *SITC 65* and (b) capital/technology-

intensive products, such as *SITC 73, SITC 77, SITC 87, SITC 57, SITC 72, SITC 88, SITC 68, SITC 51, SITC 74, SITC 67, SITC 58,* and *SITC 76.*

Consequently, South Korea's promising and potential exportable products to China (i.e., the products which have a high value of $S_K^h \cdot R_C^h$ in Table 4) in 2005 turn out to be (a) labor-intensive product, such as *SITC 65* and (b) capital/technology-intensive products, such as *SITC 76, SITC 77, SITC 73, SITC 75, SITC 79, SITC 67, SITC 72, SITC 57* and *SITC 87.*

In 2009, South Korea's promising and potential exportable products to China changes to (a) labor-intensive product, such as *SITC 65* and (b) capital/technology-intensive products, such as *SITC 76, SITC 77, SITC 73, SITC 87, SITC 57, SITC 72, SITC 67, SITC 88, SITC 79* and *SITC 75.*

As shown in Table 4, the standard deviation of S_K^h increases from 0.72 in 2005 to 0.78 in 2009, which means that South Korea's export specialization becomes more concentrated over time. The standard deviation of R_C^h also increases from 1.02 in 2005 to 1.03 in 2009, which means that China's import specialization becomes more concentrated over time for the period of 2005-2009.

Since South Korea's pattern of export specialization and China's pattern of import specialization were positively correlated in 2005 (i.e., COV (S_K, R_C) = 0.20), C_{KC} (i.e., South Korea's trade complementarity with China) reached 1.20, which means that South Korea's export structure and China's import structure were complementary with each other in 2005. As this positive correlation coefficient between South Korea's pattern of export specialization and China's pattern of import specialization was weakened in 2009 (i.e., COV (S_K, R_C) = 0.19), C_{KC} reached 1.19, which means that South Korea's export structure and China's import structure became less complementary with each other in 2009.

Accordingly, the correlation coefficient between South Korea's export specialization structure and China's import specialization structure (i.e., r_{KC}), which is the measure of the degree of match of the two patterns neutral from the degree of concentration or diversification decreased from 0.30 in 2005 to 0.24 in 2009, which implied that South Korea's export structure and China's import structure became less complementary with each other for the period of 2005-2009.

4.2.2 Determinants of South Korea's Trade Complementarity With the US

As shown in Table 5, the USA has comparative disadvantage in the production of (a) labor-intensive products, such as *SITC 63,* and *SITC 82* and (b) capital/technology-intensive products, such as *SITC 78, SITC 76, SITC 56, SITC 71, SITC 87, SITC 77, SITC 88, SITC 73, SITC 79, SITC 72,* and *SITC 68* in 2005.

Table 5: Analysis of South Korea's Trade Complementarity With the USA in Manufacturing Sector: 2005, 2009

	2005					2009				
SITC	S_K^h	R_U^h	$S_K^h \cdot R_U^h$	$\frac{X_{..}^h}{X_{..}}$	$\left(\frac{X_{..}^h}{X_{..}}\right) S_K^h \cdot R_U^h$	S_K^h	R_U^h	$S_K^h \cdot R_U^h$	$\frac{X_{..}^h}{X_{..}}$	$\left(\frac{X_{..}^h}{X_{..}}\right) S_K^h \cdot R_U^h$
51	0.37	0.87	0.32	0.04	0.01	0.37	***1.05***	0.39	0.04	0.02
52	0.30	0.78	0.23	0.01	0.00	0.45	0.84	0.37	0.01	0.00
53	0.33	0.44	0.14	0.01	0.00	0.26	0.42	0.11	0.01	0.00
54	0.03	0.71	0.02	0.06	0.00	0.04	0.93	0.04	0.09	0.00
55	0.09	0.63	0.06	0.01	0.00	0.12	0.65	0.08	0.02	0.00
56	0.12	***1.22***	0.15	0.00	0.00	0.24	***1.64***	0.39	0.00	0.00
57	0.69	0.51	0.35	0.02	0.01	0.80	0.46	0.37	0.02	0.01
58	0.74	0.58	0.43	0.01	0.01	0.74	0.54	0.40	0.01	0.01
59	0.25	0.55	0.14	0.02	0.00	0.26	0.58	0.15	0.02	0.00
61	0.13	0.55	0.07	0.00	0.00	0.28	0.75	0.21	0.00	0.00
62	***1.36***	0.87	***1.18***	0.01	0.01	***1.41***	0.83	***1.16***	0.01	0.01
63	0.03	***1.56***	0.04	0.01	0.00	0.03	0.88	0.02	0.01	0.00
64	0.34	0.84	0.28	0.02	0.01	0.28	0.74	0.21	0.02	0.00
65	***1.28***	0.67	0.85	0.02	0.02	***1.15***	0.65	0.75	0.01	0.01
66	0.40	0.96	0.39	0.02	0.01	0.32	0.83	0.27	0.02	0.00
67	***1.07***	0.57	0.61	0.04	0.02	***1.28***	0.57	0.73	0.03	0.03
68	0.31	***1.00***	0.31	0.02	0.01	0.40	***1.02***	0.40	0.02	0.01
69	0.73	0.81	0.59	0.03	0.02	0.81	0.75	0.61	0.03	0.02
71	0.29	***1.20***	0.35	0.04	0.01	0.41	***1.24***	0.51	0.05	0.02
72	0.74	***1.02***	0.76	0.04	0.03	0.82	0.98	0.80	0.03	0.03
73	0.88	***1.05***	0.93	0.01	0.01	***1.13***	0.93	***1.05***	0.01	0.01
74	0.62	0.90	0.56	0.06	0.03	0.66	0.93	0.62	0.06	0.04
75	***1.93***	0.89	***1.73***	0.04	0.07	***1.47***	***1.12***	***1.65***	0.03	0.05
76	***4.30***	***1.31***	***5.63***	0.05	0.27	***5.21***	***1.60***	***8.33***	0.05	0.41
77	***2.08***	***1.06***	***2.20***	0.08	0.17	***1.88***	***1.10***	***2.08***	0.07	0.15
78	***1.06***	***1.40***	***1.49***	0.17	0.26	0.92	***1.28***	***1.18***	0.14	0.17
79	***1.15***	***1.04***	***1.19***	0.03	0.03	***2.19***	***1.11***	***2.43***	0.03	0.08
81	0.16	0.82	0.13	0.00	0.00	0.16	0.71	0.11	0.01	0.00
82	0.14	***1.24***	0.18	0.01	0.00	0.16	0.97	0.16	0.01	0.00
83	0.32	0.81	0.26	0.00	0.00	0.19	0.58	0.11	0.00	0.00
84	***1.01***	0.93	0.93	0.02	0.02	0.37	0.62	0.23	0.02	0.00
85	0.26	0.61	0.16	0.00	0.00	0.16	0.50	0.08	0.00	0.00
87	0.62	***1.10***	0.69	0.03	0.02	0.98	***1.26***	***1.23***	0.03	0.04
88	0.40	***1.06***	0.43	0.01	0.00	0.75	0.96	0.72	0.01	0.01
89	0.49	0.90	0.45	0.05	0.02	0.42	0.88	0.37	0.05	0.02
Standard Deviation	0.72	0.90		∑=1	∑=1.09	0.78	0.88		∑=1	∑=1.17
Covariance & Correlation Coefficient			$COV(S_K, R_U)$ 0.09		r_{KU} 0.35			$COV(S_K, R_U)$ 0.17		r_{KU} 0.56

In 2009, the USA continues to have comparative disadvantage in the production of capital/technology-intensive products, such as *SITC 56, SITC 76, SITC 78, SITC 87, SITC 71, SITC 75, SITC 79, SITC 77, SITC 51,* and *SITC 68*.

Consequently, Korea's promising and potential exportable products to the USA (i.e., the products which have a high value of $S_K^h \cdot R_U^h$ in Table 5) in 2005 turn out to be capital/technology-intensive products, such as *SITC 76*, *SITC 77, SITC 75, SITC 78*, *SITC 79,* and *SITC 62*.

In 2009, Korea's promising and potential exportable products to the USA changes to capital/technology-intensive products, such as *SITC 76, SITC 79, SITC 77, SITC 75, SITC 87, SITC 78, SITC 62,* and *SITC 73*.

The standard deviation of R_U^h decreases from 0.90 in 2005 to 0.88 in 2009, which means that the US import specialization becomes more diversified over time for the period of 2005-2009.

Since Korea's pattern of export specialization and the US pattern of import specialization were positively correlated in 2005 (i.e., COV (S_K, R_U) = 0.09), C_{KU} (i.e., Korea's trade complementarity with the USA) reached 1.09, which means that Korea's export structure and the US import structure were complementary with each other in 2005. As this positive correlation coefficient between Korea's pattern of export specialization and the US pattern of import specialization increased in 2009 (i.e., COV (S_K, R_U) = 0.17), C_{KU} reached 1.17, which means that Korea's export structure and the US import structure became more complementary with each other in 2009.

Accordingly, the correlation coefficient between Korea's export specialization structure and the US import specialization structure (i.e., r_{KU}), which is the measure of the degree of match of the two patterns neutral from the degree of concentration or diversification increased from 0.35 in 2005 to 0.56 in 2009, which implied that Korea's export structure and the US import structure became more complementary with each other for the period of 2005-2009.

4.2.3 Determinants of South Korea's Trade Complementarity With Japan

As shown in Table 6, Japan has comparative disadvantage in the production of (a) labor-intensive products, such as *SITC 83* and *SITC 84* and (b) capital/technology-intensive products, such as *SITC 87, SITC 88, SITC 52, SITC 79, SITC 68, SITC 59, SITC 73, SITC 51, SITC 77, SITC 89,* and *SITC 55* in 2005.

Table 6: Analysis of South Korea's Trade Complementarity With Japan in Manufacturing Sector: 2005, 2009

	2005					2009				
SITC	S_K^h	R_J^h	$S_K^h \cdot R_J^h$	$\frac{X_{..}^h}{X_{..}}$	$\left(\frac{X_{..}^h}{X_{..}}\right) S_K^h \cdot R_J^h$	S_K^h	R_J^h	$S_K^h \cdot R_J^h$	$\frac{X_{..}^h}{X_{..}}$	$\left(\frac{X_{..}^h}{X_{..}}\right) S_K^h \cdot R_J^h$
51	0.37	***1.45***	0.53	0.04	0.02	0.37	***1.53***	0.57	0.04	0.02
52	0.30	***2.43***	0.72	0.01	0.01	0.45	***2.99***	***1.33***	0.01	0.01
53	0.33	0.74	0.24	0.01	0.00	0.26	0.75	0.19	0.01	0.00
54	0.03	0.97	0.03	0.06	0.00	0.04	***1.28***	0.05	0.09	0.00
55	0.09	***1.09***	0.10	0.01	0.00	0.12	***1.08***	0.13	0.02	0.00
56	0.12	0.14	0.02	0.00	0.00	0.24	***1.17***	0.28	0.00	0.00
57	0.69	0.74	0.52	0.02	0.01	0.80	0.91	0.73	0.02	0.02
58	0.74	0.61	0.45	0.01	0.01	0.74	0.60	0.44	0.01	0.01
59	0.25	***1.52***	0.39	0.02	0.01	0.26	***1.58***	0.41	0.02	0.01
61	0.13	0.86	0.11	0.00	0.00	0.28	0.89	0.25	0.00	0.00
62	***1.36***	0.41	0.56	0.01	0.01	***1.41***	0.37	0.52	0.01	0.01
63	0.03	0.91	0.03	0.01	0.00	0.03	0.86	0.02	0.01	0.00
64	0.34	0.49	0.16	0.02	0.00	0.28	0.57	0.16	0.02	0.00
65	***1.28***	0.65	0.83	0.02	0.01	***1.15***	0.74	0.85	0.01	0.01
66	0.40	0.90	0.36	0.02	0.01	0.32	0.77	0.25	0.02	0.00
67	***1.07***	0.65	0.70	0.04	0.03	***1.28***	0.59	0.76	0.03	0.03
68	0.31	***1.71***	0.53	0.02	0.01	0.40	***1.58***	0.63	0.02	0.01
69	0.73	0.74	0.54	0.03	0.02	0.81	0.84	0.68	0.03	0.02
71	0.29	0.73	0.21	0.04	0.01	0.41	0.68	0.28	0.05	0.01
72	0.74	0.96	0.71	0.04	0.03	0.82	***1.01***	0.83	0.03	0.03
73	0.88	***1.52***	***1.34***	0.01	0.01	***1.13***	***1.24***	***1.40***	0.01	0.01
74	0.62	0.78	0.49	0.06	0.03	0.66	0.79	0.53	0.06	0.03
75	***1.93***	0.99	***1.92***	0.04	0.08	***1.47***	0.78	***1.14***	0.03	0.04
76	***4.30***	0.68	***2.94***	0.05	0.14	***5.21***	0.83	***4.31***	0.05	0.21
77	***2.08***	***1.31***	***2.73***	0.08	0.22	***1.88***	***1.22***	***2.30***	0.07	0.17
78	***1.06***	0.49	0.52	0.17	0.09	0.92	0.48	0.44	0.14	0.06
79	***1.15***	***2.00***	***2.30***	0.03	0.06	***2.19***	0.60	***1.31***	0.03	0.04
81	0.16	0.62	0.10	0.00	0.00	0.16	0.41	0.07	0.01	0.00
82	0.14	0.63	0.09	0.01	0.00	0.16	0.45	0.07	0.01	0.00
83	0.32	***7.13***	***2.25***	0.00	0.00	0.19	***6.17***	***1.16***	0.00	0.00
84	***1.01***	***1.21***	***1.22***	0.02	0.02	0.37	***1.16***	0.43	0.02	0.01
85	0.26	0.99	0.25	0.00	0.00	0.16	***1.09***	0.17	0.00	0.00
87	0.62	***2.58***	**1.60**	0.03	0.05	0.98	***2.16***	***2.12***	0.03	0.07
88	0.40	***2.54***	**1.02**	0.01	0.01	0.75	***2.54***	***1.90***	0.01	0.02
89	0.49	***1.28***	0.63	0.05	0.03	0.42	***1.29***	0.54	0.05	0.03
Standard Deviation	0.72	1.24		∑=1	∑=0.93	0.78	1.20		∑=1	∑=0.90
Covariance & Correlation Coefficient			$COV(S_K, R_J)$	r_{KJ}				$COV(S_K, R_J)$	r_{KJ}	
			-0.07	-0.14				-0.10	-0.16	

In 2009, Japan continues to have comparative disadvantage in the production of (a) labor-intensive products, such as *SITC 83, SITC 84,* and *SITC 85* and (b) capital/technology-intensive products, such as *SITC 52, SITC 88, SITC 87, SITC 68, SITC 59, SITC 51, SITC 89, SITC 54, SITC 73, SITC 77, SITC 56, SITC 55,* and *SITC 72.*

Consequently, Korea's promising and potential exportable products to Japan (i.e., the products which have a high value of $S_K^h \cdot R_J^h$ in Table 6) in 2005 turn out to be (a) labor-intensive products, such as *SITC 83* and *SITC 84,* and (b) capital/technology-intensive products, such as *SITC 76, SITC 77, SITC 79, SITC 75, SITC 87, SITC 73,* and *SITC 88*.

In 2009, Korea's promising and potential exportable products to Japan changes to (a) labor-intensive product, such as *SITC 83* (b) capital/technology-intensive products, such as *SITC 76, SITC 77, SITC 87, SITC 88, SITC 73, SITC 52, SITC 79,* and *SITC 75.*

The standard deviation of R_J^h decreases from 1.24 in 2005 to 1.20 in 2009, which means that Japan's import specialization becomes more diversified over time for the period of 2005-2009.

Since Korea's pattern of export specialization and Japan's pattern of import specialization were negatively correlated in 2005 (i.e., COV (S_K , R_J) = -0.07), C_{KJ} (i.e., Korea's trade complementarity with Japan) reached 0.93, which means that Korea's export structure and Japan's import structure were competitive with each other in 2005. As this negative correlation coefficient between Korea's pattern of export specialization and Japan's pattern of import specialization was strengthened in 2009 (i.e., COV (S_K , R_J) = -0.10), C_{KJ} reached 0.90, which means that Korea's export structure and Japan's import structure became more competitive with each other in 2009.

Accordingly, the correlation coefficient between Korea's export specialization structure and Japan's import specialization structure (i.e., r_{KJ}), which is the measure of the degree of match of the two patterns neutral from the degree of concentration or diversification decreased from -0.14 in 2005 to -0.16 in 2009, which implied that Korea's export structure and Japan's import structure became more competitive with each other for the period of 2005-2009.

5. Conclusion and Limitation

From the above analysis on South Korea's trade intensity with CUJ, the following policy recommendation can be suggested.

Firstly, it was found that for the period of 2005-2009 South Korea's trade intensity with China decreased due to (a) the decrease in South Korea's special country bias with China and (b) the decrease in South Korea's trade complementarity with China. Therefore South Korea's special country bias with China should further be enhanced by (a) increasing capital movements and economic cooperation and (b) reducing discriminatory tariffs and other import restrictions between South Korea and China. In this respect, FTA discussion between China and South Korea, in which the Chinese government is quite interested, should be started soonest as possible.

Secondly, for the period of 2005-2009 South Korea's trade intensity with the USA increased due to (a) the increase in South Korea's special country bias with the USA and (b) the increase in South Korea's trade complementarity with the USA. Thanks to continuous efforts of both the US and South Korean governments, FTA (i.e., Free Trade Arrangement) agreement between two countries became effective from 15 March 2012, which eliminated discriminatory tariffs and other import restrictions between two countries. Therefore South Korea's special country bias with the USA is expected to increase in the near future and accordingly South Korea's trade intensity with the USA will also increase in 2013.

Thirdly, for the period of 2005-2009 South Korea's trade intensity with Japan increased due to (a) the increase in South Korea's special country bias with Japan and (b) the decrease in South Korea's trade complementarity with Japan. Therefore South Korea's special country bias with Japan should further be enhanced by (a) increasing capital movements and economic cooperation and (b) reducing discriminatory tariffs and other import restrictions between South Korea and Japan. In this respect, FTA negotiation between Japan and South Korea, which was processed a few years ago but suspended later due to sharp conflicts of national interests and sentiments, should be continued.

Fourthly, South Korea's trade intensity with the USA in 2009 is found to be lower than her trade intensity with China and Japan (CJ in short hereafter) due to the fact that South Korea's special country bias with the USA is much lower than her equivalent value with CJ. As mentioned in the above paragraph, FTA agreement between South Korea and the USA eliminated discriminatory tariffs and other import restrictions between two countries from 15 March 2012. Therefore South Korea's special country bias with the USA and accordingly South Korea's trade intensity with the USA is expected to increase in the year of 2013.

Fifthly, South Korea's trade intensity with Japan in 2009 is found to be lower than her trade intensity with China due to the following two facts: (a) South Korea's special country bias with Japan is lower than her equivalent value with China (b) South Korea's trade complementarity with Japan is lower than her equivalent value with China. In this regard, it is again desirable that both South Korea and Japan restart FTA negotiation.

Sixthly, rapid wage hikes from the late 1980s in South Korea forced her to lose international competitiveness in the export of labor intensive manufactured products and start to have comparative advantage in the production of manufactured commodities which are relatively capital/technology intensive such as *SITC 76*, *SITC 79*, *SITC 77, SITC 75, SITC 62, SITC 67,* and *SITC 73*. In order to transform South Korea's export patterns more capital/technology intensive in the near future, the accumulation of physical/human capital through appropriate incentive schemes should be pursued in South Korea along with the increases in R&D expenditures.

Seventhly, South Korea's promising and potential exportable products to China in the manufacturing sector in 2009 are found to be (a) labor-intensive product, such as *SITC 65* and (b) capital/technology-intensive products, such as *SITC 76, SITC 77, SITC 73, SITC 87, SITC 57, SITC 72, SITC 67, SITC 88, SITC 79* and *SITC 75.* Therefore South Korea should try to export more of these products to China from now on, which is an original and timely policy suggestion of this paper.

Eighthly, the South Korean export products in the manufacturing sector became more concentrated during the period of 2005-2009. Since this kind of high concentration of South Korean export products is not desirable for avoiding any potential economic loss associated with unfavorable trade-environmental changes against these export products, it should be diversified very soon.

Ninthly, South Korea's promising and potential exportable products to the USA in the manufacturing sector in 2009 are found to be capital/technology-intensive products,

such as *SITC 76, SITC 79, SITC 77, SITC 75, SITC 87, SITC 78, SITC 62,* and *SITC 73*. Therefore South Korea should try to export more of these products to the USA from now on, which is an original and timely policy suggestion of this paper.

Tenthly, South Korea's promising and potential exportable products to Japan in the manufacturing sector in 2009 turn out to be (a) labor-intensive product, such as *SITC 83* (b) capital/technology-intensive products, such as *SITC 76, SITC 77, SITC 87, SITC 88, SITC 73, SITC 52, SITC 79,* and *SITC 75.* Therefore South Korea should try to export more of these products to Japan from now on, which is an original and timely policy suggestion of this paper.

Even if the above conclusions were drawn from this paper, it has its own limitation. Therefore the more in-depth study on this topic should be pursued in the near future.

Endnotes

[i] Refer to footnote 8 in p. 125 in Kim (2004).

[ii] More detailed survey on the trade intensity model could be seen in pp. 125-131 in Kim (2004).

[iii] The data for X.. is supposed to use the total trade volume of the world. In order to secure consistency of data set, we have to use total OECD trade volume which is smaller than total world trade volume. This might cause some bias to calculate the indices. Furthermore, we cannot utilize the trade data of China who is not an OECD country but is one of the biggest countries in the trade volume. This also could cause a bias of the indexes. These biases that cannot be corrected until when the world trade volume is available might be one of the flaws of our research.

[iv] Refer to footnote 4 in p 62 in Yamazawa (1970).

[v] More detailed explanation about the determinants of trade complementarity could be seen in pp. 125-131 in Kim (2004).

[vi] Refer to pp. 65-66 in Yamazawa (1970).

[vii] According to Equation (9), $\sum_h \left(\frac{X_{..}^h}{X_{..}}\right) S_i^h = \sum_h \left(\frac{X_{..}^h}{X_{..}}\right) R_j^h = 1$.

Furthermore, $\sum_h \left(\frac{X_{..}^h}{X_{..}}\right) = 1$

[viii] By Equation (8).

[ix] Refer to the example of Table 1 in p 66 in Yamazama (1970).

[x] If Korea's FDI to the USA was made in the manufacturing sector, Korea's trade intensity with the USA will increase by promoting trade volume between two countries. For example, Hyundai Automobile Company made FDI to the USA in order to build an automobile factory over there a few years ago. Then this would result in increases of the US imports of Korean automobile parts and components from Korea. Accordingly Korea’s trade intensity with the USA would increase.

[xi] As shown in Tables 4 to 6, the numbers whose value is bigger than one are italicized. On top of that, if the relevant product is labor-intensive, the value is printed in red. If the relevant product is capital/technology intensive, the value is printed in blue.

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