# Economic Cooperation of Northeast Asia and Industrial Structuring

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**Abstract**

Using transition matrices of RCA indices for 20-year trade data of three countries (China, Japan and Korea) by 3-SITC digit level, this paper investigates long-run pattern of comparative advantage of each country to the world market and each partner countries. In general it is shown that the main issued faced under economic cooperation is continuous surplus with China but deficit with Japan of trade balance. In terms of transition matrices, foe Korea the industries which are competitive in the world market have fluctuated more than those of Japan. In addition there is more fluctuation in terms of bilateral competitiveness. Finally economic cooperation with China might hurt mainly textile-related industries in Korea while that with Japan might affect significantly glass, ingots and other primary forms of iron or steel and machinery-related products.

Key words: Economic cooperation, Northeast Asia, Transition matrix
JEL Classification: F15;

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## 1. Introduction

As of October 2003, all 146 WTO members, with the exception of Mongolia, currently participated in or are negotiating regional trade agreements (RTAs). As of October 2003, 285 RTAs have been notified to the GATT/WTO: of these, 189 are currently in force and a further 60 are estimated to be operational although not yet notified. In particular, since 1 January 1995 alone, 149 new RTAs have been notified to the WTO, with an average of 15 notifications every year, compared with an annual average of less than three during the four and half decades of the GATT (WTO Secretariat, 2003). While the greatest concentration of RTAs is in the Euro Mediterranean region where over 100 RTAs are currently in force, the main focus of RTA activity has shifted away from Europe towards Asia-Pacific countries which have favored MFN liberalization. In particular, north-east Asian countries have tried to expand their economic cooperation through RTAs.

This paper examines the structural performance and shift of exports and the revealed comparative advantage of three countries (China, Japan and Korea) over the long run period since 1960s. And then it aims to investigate prospective change in their industrial structure by expecting further economic cooperation in the future.

First of all, we have look at the pattern of long-run interdependence of trade among three countries. Frankel (1993) finds that intra-regional dependence in foreign trade in East Asia increased steadily after the World War II and Frankel (1993) also finds in intra-regional bias in foreign trade in the 1980s. Instead of regional inter-dependence, we consider the interdependence of bilateral foreign trade among three countries.

Second, we compare the long-run trend of revealed comparative advantage (RCA) indices of disaggregated industries. Changes in comparative advantages can be brought about in cases where the state played a crucial role in determining the social and economic conditions. Studies on Asian economies (Lee, 1986; Rana, 1990; Carolan et al, 1998) showed support of comparative advantage shift from Japan to the newly industrializing economies (NIEs) of Hong Kong, Singapore, South Korea, and Taiwan. By calculating RCA indices of Korean manufacturing sectors for 1965-92, Lee (1995)

shows that Korea rapidly gained competitiveness in some heavy or medium industries while it maintained competitiveness for a relatively long time in some kight industries. And he showed that Korea gained dynamic comparative advantage by forcing capital-intensive industry within a labor-surplus economy. And for three countries, Japan, Korea and Taiwan, James and Movshuk (2003) find that even though each partner has a statistically significant correlation of RCA indices, export patterns of Korea and Taiwan are converging with that of Japan, while in the case of Korea and Taiwan there is no significant convergence between their export patterns.

Third, by comparing RCA indices of each country to the world, we can expect industrial competitiveness of three countries in the world market. In addition, bilateral RCA indices calculated by using bilateral trade flows lead to expect the effect of economic cooperation through market integration or other forms of cooperation.

This study has several advantages over the previous studies referred above. First, as we already recognized, comparative advantage has not fixed over periods. So it is quite useful to look over long run trends of comparative advantage of all industries across countries. Thus considering all industries all together, we investigate the trends of their comparative advantages. Second, the structure of bilateral comparative advantages among three countries might be different from that in the world. So it might be useful to compare two different RCAs. Finally, there has been no comprehensive study on the comparative studies with China. Thus by using comprehensive and disaggregate data, this study focuses on investigation of trade pattern and comparative advantage trend of Korea to China.

In Section 2, we introduce the data and descriptive statistics. The definition of intra-regional dependence and RCA indices are presented in Section 3 and Section 4 discusses estimation results through transition matrices. Section 5 concludes.

## 2. Data and Descriptive Statistics

Our data are taken from the United Nations database and are comprehensive, multilateral and bilateral commodity trade flows disaggregated to the 3-digit level of the Standard International Trade Classification (SITC) Index. Due to the difference in data available by Revisions, this paper uses the data after 1976 that revision 2 covers.

However, the data for China span only 1989 through 2002.

In order to investigate the trends of regional dependence and comparative advantages of specific industries of three countries, two different indicators are used: intra-regional dependence and RCA index.

Figure 1 presents the trends of trade pattern of Korea to Chin and Japan. As we already know, the figure at the bottom indicates continuous trade deficit of Korea with Japan for the entire periods but trade surplus with China in 1990s.

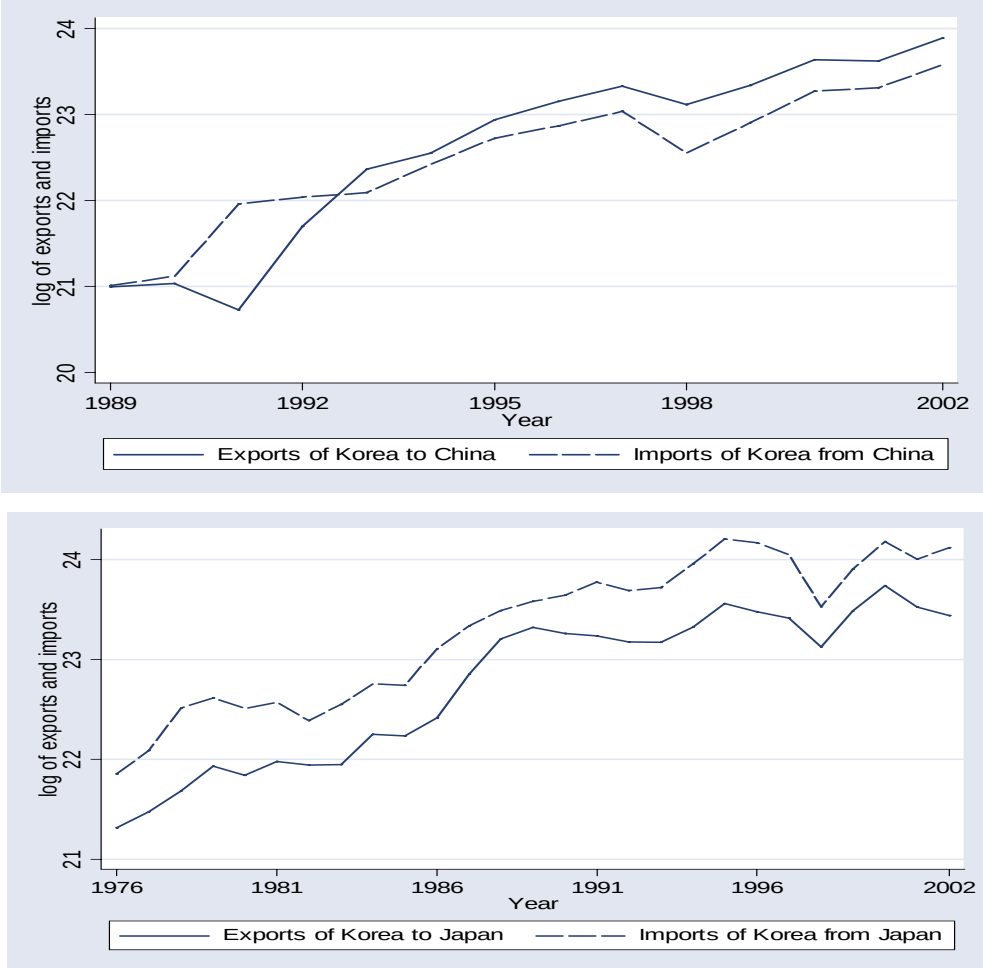



**Figure 1: Trends of Exports and Imports**

Table 1 shows the share of Korean exports to the world exports by SITC 1 digit. In general this table shows a decreasing trend of trade dependence on Japan while the trend on China increased significantly. For example, the share of Korean exports to Japan relative to the world exports was about 23.4% while that share decreased to 11% in 2001. By the way the share to China was 1.39% in 1991 but significantly increased to

about 12% in 2001.

Then by using the share by SITC 1 digit, we can see the trend of trade pattern by industries. The share of exports to Japan relative to world exports has indicated a change of trade pattern. In 1976 the share of Food and live animals (SITC 0) exports to Japan relative to the total world exports was about 4.3%. However, the share decreased to 0.85% in 2001. Between 1976 and 2001, the share of Mineral fuels, lubricants and related materials (SITC 3) increased from 0.97% to 2.09%. Other industries except for Manufactures stayed almost at the same share. The share of Manufacturing (SITC 6) has decreased significantly between 1976 and 2001. The share was 5.90% and 1.59% in 1976 and 2001, respectively.

For China, striking increase of the share is in Chemicals (SITC 5), Manufactures (SITC 6) and Machinery and transport (SITC 7). For example, the share of chemicals increased from 0.27% in 1991 to 2.70% in 2001. And machinery and transport increased from 0.27 to 3.82 during the same period.

**Table 1: Share of Korean Exports to World Exports (%)**

| | to Japan | | | | to China | |
|---|---|---|---|---|---|---|
| Industries | 1976 | 1981 | 1991 | 2001 | 1991 | 2001 |
| 0. Food and live animals | 4.30 | 3.42 | 1.92 | 0.85 | 0.004 | 0.07 |
| 1. Beverages and tobacco | 0.01 | 0.05 | 0.01 | 0.08 | 0.000 | 0.006 |
| 2. Inedible crude materials | 1.55 | 0.52 | 0.48 | 0.16 | 0.16 | 0.27 |
| 3. Mineral fuels and lubricants | 0.97 | 0.62 | 0.92 | 2.09 | 0.02 | 1.14 |
| 4. Animal/vegetable oils and fat | 0.01 | 0.01 | 0.00 | 0.002 | 0.00 | 0.002 |
| 5. Chemicals | 0.63 | 0.95 | 0.70 | 0.68 | 0.27 | 2.70 |
| 6. Manufactures | 5.90 | 4.72 | 4.31 | 1.59 | 0.62 | 3.54 |
| 7. Machinery and transport | 3.26 | 1.91 | 3.38 | 4.20 | 0.27 | 3.82 |
| 8. Miscellaneous manufactures | 6.56 | 4.23 | 5.45 | 1.31 | 0.05 | 0.53 |
| 9. others | 0.08 | 0.05 | 0.02 | 0.00 | 0.00 | 0.00 |
| Total | 23.35 | 16.48 | 17.19 | 10.97 | 1.39 | 12.09 |
| World | 100 | 100 | 100 | 100 | 100 | 100 |

Table 2 presents the share of Korean exports by SITC 1 digit relative to total exports to Japan and China. For Japan the large share in 1976 was in Manufactures (SITC 6), Miscellaneous manufactured articles (SITC 8) and Food and animals (SITC 0). During 25 years the share has changed. For example, the share of Food and live animals decreased from 18.41% in 1976 to 7.78% in 2001. And the share of Manufactures decreased from 25.28% to 14.53% during the same period. However, the

share of Mineral fuels, lubricants and related materials (SITC 3), chemicals (SITC 5) and Machinery and transport (SITC 7) has shown an increasing trend over 25 years. The share of Mineral fuels and lubricants increased from 4.16% to 19.05% between 1976 and 2001. And that of Machinery and transport increased from 13.97% to 38.28% during the same period. For China the export share by SITC 1 digit indicates the similar trend. Foe example the share of Inedible crude materials (SITC 2) and manufactures (SITC 6) showed a decreasing trend between 1991 and 2001 but that of Mineral fuels and lubricants (SITC 3) and Machinery and transport (SITC 7) have an increasing trend during the same period.

As of 2001 the share of Mineral fuels and lubricants and Machinery and transport was relatively higher for Japan while for China Chemicals and Manufactures in addition to two industries with Japan have relatively large share. The share of Food and live animals (SITC 0) for Japan and China was 7.78% and 0.57%, respectively.

**Table 2: Share of Korean Exports to Bilateral Exports (%)**

| | to Japan | | | | to China | |
|---|---|---|---|---|---|---|
| Industries | 1976 | 1981 | 1991 | 2001 | 1991 | 2001 |
| 0. Food and live animals | 18.41 | 20.76 | 11.15 | 7.78 | 0.26 | 0.57 |
| 1. Beverages and tobacco | 0.33 | 0.32 | 0.08 | 0.69 | 0.00 | 0.05 |
| 2. Inedible crude materials | 6.64 | 3.16 | 2.81 | 1.48 | 11.18 | 2.26 |
| 3. Mineral fuels and lubricants | 4.16 | 3.74 | 5.35 | 19.05 | 1.65 | 9.43 |
| 4. Animal/vegetable oils and fat | 0.05 | 0.03 | 0.00 | 0.02 | 0.00 | 0.02 |
| 5. Chemicals | 2.72 | 5.79 | 4.09 | 6.22 | 19.69 | 22.37 |
| 6. Manufactures | 25.28 | 28.63 | 25.06 | 14.53 | 44.76 | 29.30 |
| 7. Machinery and transport | 13.97 | 11.58 | 19.65 | 38.28 | 19.02 | 31.57 |
| 8. Miscellaneous manufactures | 28.08 | 25.65 | 31.68 | 11.93 | 3.44 | 4.35 |
| 9. others | 0.34 | 0.34 | 0.13 | 0.01 | 0.00 | 0.08 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

## 3. Intra-regional Dependence and Revealed Comparative Advantage

We used two different indices: trade dependence and RCA indices. The first one is to look at the trends of trade interdependence and the second one is to consider the pattern of comparative advantages.

Several studies have examined the changes in intra-regional dependence in foreign trade in East Asia. Computing three sets of measures, Petri (1993) finds that

intra-regional dependence in foreign trade in East Asia increased steadily in the post-World War II period, after declining in the pre-World War II period. Frankel (1993) also finds a decline in intra-regional bias in foreign trade in the 1980s by estimating the magnitude of the bias in the gravity model framework.

Following Petri (1993), the following three measures are used: absolute measures (AM), relative-measures (RM), and double-relative measures (DRM).

$$AM = \frac{EX^{CP}}{\sum_{C=1}^{C'}\sum_{P=1}^{P'} EX^{CP}},$$

$$RM = AM \Big/ \left( \frac{EX^{CP}}{\sum_{C=1}^{C'}\sum_{P=1}^{P'} EX^{CP}} \right) = \frac{EX^{CP}}{\sum_{P=1}^{P'} EX^{CP}},$$

$$DRM = AM \Big/ \left( \frac{\sum_{P=1}^{P'} EX_{CP}}{\sum_{C=1}^{C'}\sum_{P=1}^{P'} EX^{CP}} \frac{\sum_{C=1}^{C'} EX^{CP}}{\sum_{C=1}^{C'}\sum_{P=1}^{P'} EX^{CP}} \right) = \frac{EX^{CP}\sum_{C=1}^{C'}\sum_{P=1}^{P'} EX^{CP}}{\sum_{P=1}^{P'} EX_{CP}\sum_{C=1}^{C'} EX^{CP}}.$$

$EX^{CP}$ represents exports from country C to partner country P and thus $\sum_{C=1}^{C'} EX^{CP}$ implies total imports of country P. And $\sum_{C=1}^{C'}\sum_{P=1}^{P'} EX^{CP}$ represents the sum of world imports and exports.

AM compares the size of a particular bilateral trade to world trade volume, which measures the relative influence of different groups of countries in global trade negotiations. RM deflates AM with both either the worldwide export share of the exporting country, or the worldwide import share of the importing country. Thus it shows the extent a country will respond to the interests of a particular partner. DRM, which is commonly called the intensity index, shows the intensity or bias of the bilateral trade by taking into account of its importance in world trade. Thus it assesses the extent of trade biases toward particular partners relative to the neutral of assignment of trade across all partners. The value of unity for the DRM can be interpreted so that the bilateral trade relationship is neutral, while the relationship is more (or less) biased when the measure is greater (or less) than unity.

The RCA approach, pioneered by Balassa (1965, 1979, 1986), assumed that the true pattern of comparative advantage can be observed from post-trade data. The availability of data at different levels of aggregation and the data bias caused by government policy distortions such as non-trade barriers and export subsidies caused immeasurable damage to the true pattern of comparative advantage. Nonetheless, Balassa's "stages of comparative advantage" thesis advocated a "catch up" process that shifts economies from one area of comparative advantage to another. Typically, when developing countries take over the labor-intensive product lines from industrial countries, the production shift provides room for the developed countries to concentrate on the export of technology-intensive products.[2]

Even though a large number of alternative RCA indices have been proposed in the literature, many of these indices are not consistent, producing very different rankings with the same sample of data (Balance, Forstner, and Murray, 1987). Therefore it is important to use RCA indices that have a sound theoretical background. Vollrath (1991) investigated the theoretical underpinning of ten RCA indices, and recommended the following one for i=N products, the country C and the world W at time t:

$$RCA_i^{CW} = \frac{EX_{it}^{CW} / \sum_{i=1}^{N} EX_{it}^{CW}}{EX_{it}^{W} / \sum_{i=1}^{N} EX_{it}^{W}}.$$

For commodity i at time t, $EX_{it}^{CW}$ is exports by country C and $\sum_{i=1}^{N} EX_{it}^{CW}$ is the total exports of country C to the world, $EX_{it}^{W}$ is the total world trade of the product i (summed over all countries), and $\sum_{i=1}^{N} EX_{it}^{W}$ is total world trade (summed over C and i).

This measure analyses a country's world export share of a commodity with the country's total export share of a commodity with the country's total share of total world exports. If country C's share of world exports of commodity j is greater than the commodity j's share of world exports of all goods, the RCA will be greater than 1 which

[2] Admitting that the RCA is not a perfect measure, as it failed to distinguish between a region's factor endowment and changes in trade policy, we believe that the RCA measure is still acceptable as the impact of changes in trade policy can be seen from movement of RCA.

suggests that a country gains a revealed comparative advantage in the production of that particular commodity.

In addition to comparative advantage of a specific country with the world market, it might be more useful to consider comparative advantage of Korea with a partner, for example, Japan and Korea. Thus RCA index above can be revised to that with a specific partner country, P.

$$RCA_i^{CP} = \frac{EX_{it}^{CP} / \sum_{i=1}^{N} EX_{it}^{CP}}{IM_{it}^{PW} / \sum_{i=1}^{N} IM_{it}^{PW}},$$

where $EX_{it}^{CP}$ implies the exports of country C of ith product to the partner country P and $IM_{it}^{PW}$ represents total imports if the product i of the partner country from the world.

## 4. Empirical Results

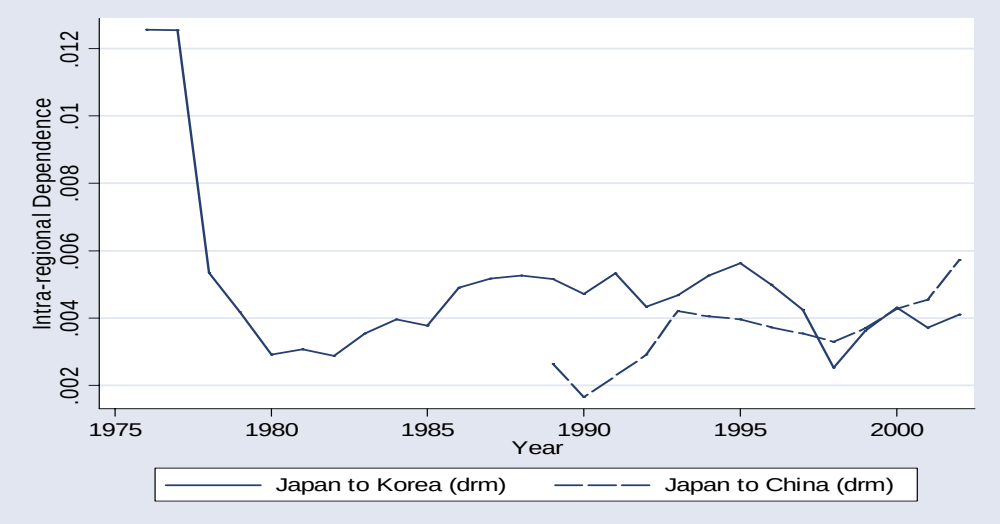
### 4.1 Intra-Regional Dependence

Table 3 shows the trends of three different measures of trade intensity between 1976 and 2001. For Korea to Japan, there is no significant change of trade intensities over time while the trade intensity of Korea with China has shown an increasing trend. For example, the DRM index in 1991 for Korea to China was 0.0003 but it increased to 0.003 which is about ten times higher than 10 years ago.

**Table 3: Intra-Regional Dependence**

| | 1976 | 1981 | 1986 | 1991 | 1996 | 2001 |
|---|---|---|---|---|---|---|
| AM | | | | | | |
| Korea to Japan | 0.002 | 0.0005 | 0.0006 | 0.0008 | 0.0007 | 0.0006 |
| Korea to China | - | - | - | 0.00007 | 0.0005 | 0.0007 |
| RM | | | | | | |
| Korea to Japan | 2.780 | 2.445 | 4.292 | 5.219 | 4.515 | 4.724 |
| Korea to China | - | - | - | 1.572 | 8.195 | 7.469 |
| DRM | | | | | | |
| Korea to Japan | 0.008 | 0.002 | 0.003 | 0.003 | 0.003 | 0.002 |
| Korea to China | - | - | - | 0.0003 | 0.002 | 0.003 |

Figure 2 shows annual trend of DRM index among three countries. As Table 3 indicated, trade intensity of Korea to Japan has shown a quite stable pattern since the end of 1970s. However, the indices of Japan to China and Korea to China have an increasing trend. Furthermore from China's point of view, the trade intensity with Korea and Japan has increased as well. These trends are quite consistent with the findings of Tables 1 and 2 which show that the trade dependence on Japan tends to decrease continuously while that on China increased significantly in the 1990s.



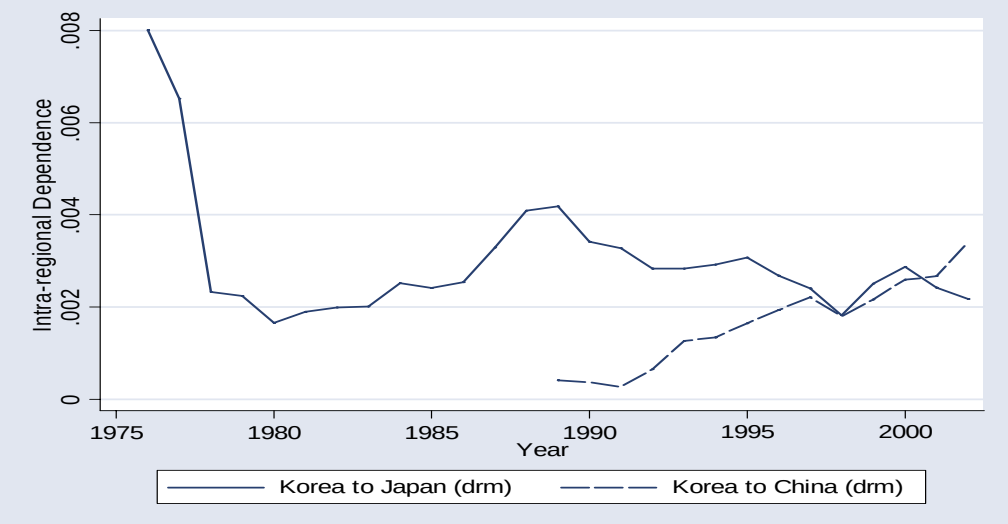




**Figure 2: DRM Indices among Japan, Korea and China**

### 4.2 Comparative Advantage to the World

Tables 4, 5 and 6 report the transition matrices of RCA indices.[3] They reflect comparative advantage of China, Japan and Korea to the world, respectively. Tables 4 and 5 include the transition matrices for 1981-91 and 1981-2001 but Table 6 includes only 1991-2001 due to availability of the data. The rows of each transition matrix are for the five groups based on the quintiles of year t and the columns are for the five groups based on the quintiles of year t+1. For example, in the first table of Table 4, the very first entry 37 (0.82) means that there are 37 industries in the lowest quintile class in 1981, and that the probability of staying in the same lowest quintile class in 1991 is 0.82 (for there were 45 industries in total in the lowest class 1981 and 8 of them moved out in 1991).

In Table 4, between 1981 and 1991, 139 industries, i.e., 62% out of all industries, which summed all diagonal elements, stayed at the same quintile. In order to see the trend of RCA indices which were in the highest quintile in 1981, see the fifth row of each table. Between 1981 and 1991, 32 out of 44 industries stayed at the same quintile while other 12 industries lost their highest level in 10 years. SITC 634 (veneers, plywood, "improved" wood, worked) moved to the second quintile, SITC 61 (sugar and

[3] We used balanced industries for each country between 1981 and 2001. Thus the number of industries included in each table is different.

honey) moved to the third quintile and other 10 industries (SITC 562, 658, 661, 673, 691, 693, 696, 699, 792, and 885) to the fourth quintile. This implies that these 12 industries lost their comparative advantage relative to other 32 industries between 1981 and 1991. For 1981 and 2001, only 19 industries stayed at the same quintile, upper 20% group. Especially SITC 634 and SITC 786 (trailers, and other vehicles, not motorized) lost their comparative advantage which indicated that they moved to the second quintile. Thus over 20 years, it is shown that only 42% remained at the upper quintile, which implies that the structure of comparative advantage has changed significantly.

For Japan to the world in Table 5, 146 (67%) and 135 (62%) industries remain at the same quintile for 1981-91 and 1981-2001, respectively. The difference between two periods is in the highest quintile. Unlike Korea, the structure of comparative advantage to the World did not change significantly. In addition, the number of industries which moved upward was 38 (17%) and 45 (21%) while the number of industries which moved downward was 35 (16%) and 37(17%) for 1981-1991 and 1981-2001, respectively. For China in Table 6, 121 (54%) industries stayed at the same quintile and 54 (24%) and 51 (23%) moved upward and downward, respectively, for 1991-2001.

**Table 4: Transition dynamics of RCA indices of Korea to the World**

| | | 1991 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| | I | 37(0.82) | 8(0.18) | 0(0.00) | 0(0.00) | 0(0.00) | 45(1) |
| | II | 5(0.11) | 26(0.58) | 11(0.24) | 2(0.04) | 1(0.02) | 44(1) |
| 1981 | III | 2(0.04) | 7(0.16) | 22(0.47) | 11(0.24) | 3(0.09) | 45(1) |
| | IV | 1(0.02) | 3(0.07) | 10(0.27) | 22(0.49) | 8(0.16) | 44(1) |
| | V | 0(0.00) | 1(0.02) | 1(0.02) | 10(0.22) | 32(0.73) | 44(1) |
| | Total | 45(0.20) | 45(0.20) | 45(0.20) | 45(0.20) | 44(0.20) | 225(1) |

| | | 2001 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| | I | 34(0.76) | 10(0.22) | 1(0.02) | 0(0.00) | 0(0.00) | 45 (1) |
| | II | 6(0.13) | 20(0.44) | 13(0.29) | 3(0.07) | 3(0.07) | 45(1) |
| 1981 | III | 4(0.09) | 5(0.11) | 16(0.36) | 13(0.29) | 7(0.16) | 45(1) |
| | IV | 1(0.02) | 8(0.18) | 8(0.18) | 12(0.27) | 16(0.36) | 45(1) |
| | V | 0(0.00) | 2(0.05) | 7(0.16) | 17(0.38) | 19(0.42) | 45(1) |
| | Total | 45(0.20) | 45(0.20) | 45(0.20) | 45(0.20) | 45(0.20) | 225(1) |

**Table 5: Transition dynamics of RCA indices of Japan to the World**

| | | 1991 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| 1981 | I | 36(0.82) | 7(0.16) | 1(0.02) | 0(0.00) | 0(0.00) | 42(1) |
| | II | 5(0.11) | 28(0.64) | 11(0.25) | 0(0.00) | 0(0.00) | 44(1) |
| | III | 1(0.02) | 9(0.21) | 20(0.47) | 12(0.28) | 1(0.02) | 43(1) |
| | IV | 1(0.02) | 1(0.02) | 11(0.25) | 26(0.58) | 6(0.13) | 44(1) |
| | V | 0(0.00) | 0(0.00) | 1(0.02) | 6(0.14) | 36(0.84) | 43(1) |
| | Total | 43(0.20) | 45(0.21) | 44(0.20) | 44(0.20) | 43(0.20) | 219(1) |

| | | 2001 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| 1981 | I | 32(0.74) | 10(0.23) | 1(0.02) | 0(0.00) | 0(0.00) | 43(1) |
| | II | 8(0.18) | 25(0.57) | 10(0.23) | 1(0.02) | 0(0.00) | 44(1) |
| | III | 1(0.02) | 6(0.14) | 23(0.53) | 12(0.28) | 1(0.02) | 43(1) |
| | IV | 0(0.00) | 3(0.07) | 9(0.20) | 22(0.50) | 10(0.23) | 44(1) |
| | V | 0(0.00) | 0(0.00) | 2(0.05) | 8(0.19) | 33(0.77) | 43(1) |
| | Total | 41(0.19) | 44(0.21) | 44(0.20) | 44(0.20) | 44(0.20) | 217(1) |

**Table 6: Transition dynamics of RCA indices of China to the World**

| | | 2001 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| 1991 | I | 35(0.78) | 9(0.20) | 1(0.05) | 0(0.00) | 0(0.00) | 45(1) |
| | II | 10(0.22) | 20(0.44) | 11(0.24) | 3(0.07) | 1(0.02) | 45(1) |
| | III | 0(0.00) | 10(0.22) | 20(0.43) | 13(0.28) | 3(0.07) | 46(1) |
| | IV | 0(0.00) | 5(0.11) | 9(0.20) | 18(0.40) | 13(0.29) | 45(1) |
| | V | 0(0.00) | 1(0.02) | 5(0.11) | 11(0.24) | 28(0.62) | 45(1) |
| | Total | 45(0.20) | 45(0.20) | 46(0.20) | 45(0.20) | 45(0.20) | 226(1) |

In order to see the change of the structure of comparative advantage of three countries to the world, Table 7 presents the 3-digit SITC code in 2001 for the industries in the highest 20 % quintile in 1981 (1991 for China).

The table shows that 19 (42%) out of 45 industries for Korea and 33 (77%) out of 43 industries for Japan stayed at the highest 20% quintile for 20 years (1981-2001). Those industries are mostly in Manufactures, Machinery and transports, and Miscellaneous manufactures. Especially 10 industries between Japan and Korea keep the highest comparative advantage in common. They are SITC 625 (Rubber tires, tire cases, inner and flaps, for wheels of all kinds), 672 (Ingots and other primary forms, of iron or steel), 674 (Universals, plates, and sheets, of iron and steel), 699 (Manufactures

of base metals), 761 (Television receivers), 763 (Gramophones, dictating machines and other sound recorders), 764 (Telecommunication equipment), 776 (Thermionic, microcircuits, transistors, valves, etc), 778 (Electrical machinery and apparatus), and 793 (Ships, boats and floating structures). This implies that two countries are competing each other in the World market. Furthermore Korea is competing in 9 industries with China as well. They are 651 (Textile yarn), 653 (Fabrics, woven, of man-made fibres), 699, 764, 778, 843 (Women, girl, infants outwear, textile, not knitted or crocheted), 845 (Outwear knitted or crocheted, not elastic nor rubberized), and 847 (Clothing accessories, of textile fabrics).

**Table 7: Comparison of Comparative Advantage to the World**

| | | Korea to World | Japan to World | China to World |
|---|---|---|---|---|
| 2001 | I | | | |
| | II | 634, 786 | | 261 |
| | III | 61, 562, 654, 661, 696, 831, 885 | 691 | 1, 44, 81, 222, 673 |
| | IV | 34, 36, 652, 658, 673, 691, 693, 697, 762, 792, 842, 844, 846, 848, 851, 894, 899 | 651, 653, 673, 678, 722, 762, 773, 775, 885 | 11, 36, 56, 654, 659, 661, 666, 671, 728, 784, 885 |
| | V | 334, 625, 651, 653, 657, 672, 674, 678, 699, 761, 763, 764, 776, 778, 793, 843, 845, 847, 893 | 583, 625, 672, 674, 699, 713, 716, 723, 724, 728, 736, 741, 743, 744, 749, 751, 761, 763, 764, 772, 776, 778, 781, 782, 784, 785, 793, 874, 881, 882, 884, 894, 898 | 54, 322, 334, 541, 651, 652, 653, 658, 699, 761, 762, 764, 775, 778, 785, 821, 831, 842, 843, 844, 845, 846, 847, 848, 851, 893, 894, 899 |

Note: The initial year for Korea and Japan is 1981 but that for China is 1991.

### 4.3 Bilateral Comparative Advantage

Table 8 reports the trends of bilateral comparative advantage of Korea to China and Japan.

First, see the comparative advantage of Korea to Japan for 1981-1991 and 1981-2001. The number of industries which stayed at the same quintiles was 86 (45%)

and 62 (32%) for 1981-91 and 1981-2001, respectively. This implies that trade pattern of Korea to Japan has shuffled more than that of Korea to World. Comparing Tables 4 and 5, we can see that between 1981 and 2001 101 industries (45%) for Korea to World trade stayed at the same quintiles while only 62 industries (32%) for Korea to Japan stayed at the same quintiles. By identifying the industries at the top 20% quintile in 1981, we can see how industrial structure has been changed. For 1981 and 1991, 10 (26%) out of 39 industries lost their original comparative advantage status. Especially three industries moved downward to the third quintile which are SITC 111 (non-alcoholic beverages), 635 (wood manufactures) and 751 (office machines). Furthermore over 20 years between 1981 and 2001, only 17 industries (44%) remained at the top 20% and other 22 industries (57%) moved downward. In particular 4 industries lost comparative advantages in 2001 indicating downward movement to the lowest 40%. They are SITC 635 (wood manufactures), 686 (zinc), 842 (men's and boys' outerwear, textile fabrics not knitted or crocheted), and 844 (under garments of textile fabrics, not knitted or crocheted).

Part B of Table 8 indicates the trend of RCA indices of Korea to China between 1991 and 2001. Since the data before 1989 are not available, we calculated the index only for 1991 to 2001. Even though it covers only 10 years, it shows that the industrial structure has shuffled significantly. For example, only 59 industries (37%) remained at the same quintiles. And 34 industries (21%) moved downward while 65 industries (41%) moved upward indicating that relatively more industries got more competitive power over 10 years. In particular, 3 industries which were at the lowest 20% in 1991 gained the highest comparative advantage, upper 20%, in 2001. They are SITC 723 (civil engineering, contractor's plant and equipment and parts), 762 (radio-broadcast receivers) and 846 (under-garments, knitted and crocheted).

**Table 8: Transition dynamics of RCA indices of Korea to Japan and China**

Part A: Korea to Japan

| | | 1991 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| 1981 | I | 15(0.42) | 18(0.50) | 1(0.03) | 2(0.06) | 0(0.00) | 36(1) |
| | II | 9(0.24) | 11(0.29) | 11(0.29) | 6(0.16) | 1(0.03) | 38(1) |
| | III | 4(0.10) | 7(0.18) | 15(0.38) | 12(0.30) | 2(0.05) | 40(1) |
| | IV | 0(0.00) | 2(0.05) | 12(0.31) | 16(0.41) | 9(0.23) | 39(1) |
| | V | 0(0.00) | 0(0.00) | 3(0.08) | 7(0.18) | 29(0.74) | 39(1) |
| | Total | 28(0.15) | 38(0.20) | 42(0.22) | 43(0.22) | 41(0.21) | 192(1) |

| | | 2001 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| 1981 | I | 16(0.42) | 11(0.29) | 6(0.16) | 2(0.05) | 3(0.08) | 38(1) |
| | II | 11(0.29) | 9(0.24) | 6(0.16) | 8(0.21) | 4(0.11) | 38(1) |
| | III | 5(0.13) | 8(0.20) | 9(0.23) | 12(0.30) | 6(0.15) | 40(1) |
| | IV | 0(0.00) | 7(0.18) | 11(0.28) | 11(0.28) | 10(0.26) | 39(1) |
| | V | 0(0.00) | 4(0.10) | 10(0.26) | 8(0.21) | 17(0.44) | 39(1) |
| | Total | 32(0.16) | 39(0.20) | 42(0.22) | 41(0.21) | 40(0.21) | 194(1) |

Part B: Korea to China

| | | 2001 | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | Total |
| 1991 | I | 12(0.39) | 12(0.39) | 3(0.10) | 1(0.03) | 3(0.10) | 31(1) |
| | II | 2(0.07) | 9(0.27) | 8(0.24) | 9(0.27) | 5(0.15) | 33(1) |
| | III | 2(0.06) | 1(0.03) | 12(0.38) | 12(0.38) | 5(0.16) | 32(1) |
| | IV | 1(0.03) | 3(0.09) | 11(0.34) | 9(0.28) | 7(0.22) | 32(1) |
| | V | 0(0.00) | 0(0.00) | 6(0.19) | 8(0.26) | 17(0.55) | 31(1) |
| | Total | 17(0.11) | 25(0.16) | 40(0.25) | 39(0.25) | 37(0.23) | 159(1) |

In order to investigate the current status of comparative advantages of Korea, Table 9 compares top 10% of RCA indices of each country to the World and its partner countries as of 2001.[4] Furthermore, the structure of comparative advantage of China and Japan to the World and Korea is shown as well, which is to see the effects of economic cooperation on the Korean economy.

First, we compare the top 10% of RCA indices of three countries to the world. In general Korea has comparative advantage in SITC 6 and 7 while Japan has in SITC 7. China has comparative advantage in SITC 7 and 8. Thus in terms of the comparative

[4] To be consistent with the industries in the transition matrices, we used the balanced data between 1981 and 2001.

advantage to the world, three countries are competitive mostly in SITC 7 even though disaggregated industries of this category are different. China has relatively more industries in SITC 8 (mostly textile industries) implying that they are more competitive than Korea and Japan in the world market.

The industries which belong to top 10% in common are SITC 752 (automatic data processing machines and units thereof), 759 (parts, nes of and accessories for machines of headings of office machines or automatic data processing machines), 763 (gramophones, dictating machines, and other sound recorders), 764 (telecommunication equipment, nes; parts and accessories, nes), 776 (thermionic, microcircuits, transistors, valves etc.) and 778 (electrical machinery and apparatus, nes).

The comparative advantages in terms of bilateral trade show different patterns with those of trade to the world. For Korea, the industries it has comparative advantage in Japanese market are mostly in SITC 6 category (653, 655, 672, 673, 674, 676, 677, 678, 679, 691, 692, 693, 697) while those in Chinese market are in SITC 6 (612, 655, 656, 657, 658, 693) and SITC 8 (831, 842, 846, 851, 896, 897). China has comparative advantages in SITC 8 (including mostly textile-related industries in SITC 6) both in Korea and Japan. And Japan is relatively competitive in SITC 6 and 7 in both markets.

From Table 9, we can infer that textile industries in Korea will be significantly affected through economic integration with China. They are manufactures of leather or of composition leather (SITC 612), cotton fabrics, woven (SITC 652), made-up articles, wholly or chiefly of textile materials, nes (SITC 658), outerwear (SITC 842, 843, 844, 845, 846) and clothing accessories (SITC 847).

In addition, manufacturing and machinery/transport equipment industries (SITC 6 and 7) will be affected by economic integration with Japan. As manufacturing industries, they are glass (SITC 664), ingots and other primary forms of iron or steel (SITC 672), iron and steel bars, reds, shapes, and sections (SITC 673), universals, Plates, and sheets, of iron or steel (SITC 674), and iron or steel not insulated (SITC 677). And machinery and transport equipment includes mostly plants (SITC 711), steam engine (SITC 712), and other machinery-related products.

**Table 9: The Top 10% Industries in 2001**

| Korea |
|---|

| to the World | to Japan | to China |
|---|---|---|
| 334, 511, 582, 583, 625, 641, 653, 655, 657, 674, 741, 752, 759, 761, 763, 764, 775, 776, 778, 781, 784, 793, | 46, 62, 266, 282, 334, 511, 583, 653, 655, 672, 673, 674, 676, 677, 678, 679, 691, 692, 693, 697, 763, | 37, 111, 269, 334, 511, 513, 553, 612, 655, 656, 657, 658, 693, 762, 783, 831, 842, 846, 851, 896, 897 |

| Japan | | |
|---|---|---|
| to the World | to China | to Korea |
| 583, 674, 713, 723, 728, 736, 749, 752, 759, 763, 764, 772, 776, 778, 781, 782, 784, 785, 793, 874, 881, 884 | 37, 266, 282, 511, 652, 654, 658, 663, 664, 678, 693, 695, 712, 713, 723, 761, 781, 783, 784, 882, 884 | 266, 274, 511, 551, 584, 664, 672, 673, 674, 677, 711, 712, 718, 726, 737, 761, 784, 881, 882, 884, 896 |

| China | | |
|---|---|---|
| to the World | to Japan | to Korea |
| 653, 658, 752, 759, 763, 764, 771, 772, 775, 776, 778, 821, 831, 842, 843, 845, 846, 848, 851, 893, 894 | 14, 47, 56, 245, 261, 274, 323, 658, 661, 679, 685, 686, 751, 786, 793, 842, 843, 844, 845, 846, 847 | 35, 42, 75, 223, 261, 323, 612, 652, 658, 685, 686, 762, 785, 786, 842, 843, 844, 845, 846, 847, 961 |

## 5. Conclusion and Policy Implication

Using 20-year balanced data by 3-digit SITC level, we have investigate the trends of trade-dependency and the trends of comparative advantage measured by RCA indices of three north-east Asian countries, China, Japan and Korea.

First, we found that there are structural issues on the trade balance among three countries: continuous trade surplus of Korea with China but trade deficit with Japan. They might be a great obstacle in negotiating economic cooperation among three countries.

Second, there is no significant change of trade intensities with Japan over 1976 and 2001 while the trade intensity with China has shown an increasing trend between 1989 and 2001. In addition trade intensity of Japan with China shows an increasing trend as well.

Third, transition matrices of RCA indices show that the comparative advantage of Korea in the world market has fluctuated more than that of Japan between 1981 and

2001. For example, during the same period, only 42% of industries remained at the same quintile in Korea while 77% of Japanese industries remained at the same quintile.

Fourth, in terms of bilateral trade, there is more change in bilateral trade rather than the trade to the world. For example, for the RCA indices with Japan, only 62 (32%) industries between 1981 and 2001 remained at the same quintile.

Fifth, by using the list of industries in top 10% as of 2001, we aim to find which industries are competitive in the world or trading partner countries. In general Korea has comparative advantage in manufactured goods classified chiefly by materials (SITC 6) and machinery and transport equipment (SITC 7) while Japan has in SITC 7. China has comparative advantage in SITC 7 and mostly textile-related industries in miscellaneous manufactured articles (SITC 8).

Finally, as bilateral comparative advantage with redefined RCA indices, it is shown that the comparative advantages in terms of bilateral trade show different patterns with those of trade to the world. For Korea, the industries it has comparative advantage in Japanese market are mostly in SITC 6 while those in Chinese market are in SITC 6 and SITC 8. China has comparative advantages in SITC 8 (including mostly textile-related industries in SITC 6) both in Korea and Japan. And Japan is relatively competitive in SITC 6 and 7 in both markets.

Thus, we can infer that textile industries in Korea will be significantly affected through economic integration with China. They are manufactures of leather or of composition leather (SITC 612), cotton fabrics, woven (SITC 652), made-up articles, wholly or chiefly of textile materials, nes (SITC 658), outerwear (SITC 842, 843, 844, 845, 846) and clothing accessories (SITC 847).

In addition, manufacturing and machinery/transport equipment industries (SITC 6 and 7) will be affected by economic integration with Japan, which include glass, ingots and other primary forms of iron or steel, and plants (SITC 711), steam engine (SITC 712), and other machinery-related products in machinery and transport equipment.

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