

Competitive and Supplementary Manufacturing Relationship of Korea · China · Japan

1. Introduction

The trade relationship among Korea, China, and Japan has been changing significantly as China recently began to surge drastically into the world trade market, instigating fiercer competition between Korea and Japan. The ultimate direction for the Korean economy in responding to such a change is towards the strengthening of its industrial competitiveness. To achieve such an objective, there is a need for analysis and assessment on the current status and dynamic change in the competitiveness and comparative advantage structure of the Korean industry. Also, the competitiveness of the Korean industry requires careful examination of the trade relationship with Japan and China, since the two countries are considered the major competitors or threats to Korea in the world market.

This study examines the change of respective positions of Korea, China, and Japan in world trade through changes of trade structure and their major characteristics, and then aims to analyze whether the three countries are in a mutually supplementary or competitive relationship in the global trading arena by utilizing a variety of analysis indices.

2. Change in the Trade Structure of Korea, China, and Japan

The trade scale of Korea, China, and Japan has

shown a very high increase for an annual average rate of 7.8%, and from 458.6 billion dollars in 1991 to 900.8 billion dollars in 2000. As a result, the weight of the three countries among the world exports has increased from 13.1% to 14.5% in the same period.

(1) Change in the Trade Scale

However, in the aspect of its structure, the trade of China during 1994~2000 has grown very rapidly, with Japan making a relatively sluggish increase, while Korea showed a moderate increase in the same period. The weight of Korea among the world exports increased from 3.0% in 1994 to 3.6% in 2000, with China making a significant jump from 3.7% to 5.2%, while Japan decreased from 12.2% to 10.1%. In spite of Japan's weak performance, China has made great strides in the world trading market with swift changes in its main export products. The Korea, China, and Japan trade relationship also experienced changes such as the intensifying competition between Korea and China, and China and Japan.

(2) Change in Trade Structure by Industry

After the latter part of the 1990s, the most conspicuous characteristics in the export structure of the three countries was that the export ratio of

Korea's and China's electronic and electrical products had increased drastically, while the electronic and electrical industries have become the largest exporting industry of all three countries. For Korea and Japan, the electronic and electrical industries' ratios had grown to 39.1% and 31.6% of the entire exports in 2000. For China, the weight was only 14.0% in 1994, but it had rapidly grown to 25.6% in the year 2000, emerging as the largest exporting industry, surpassing that of the textiles.

However, with the exception of the foregoing, the export structures of the three countries show some differences as well. For Korea, with the exception of textiles taking the second position in exports, the heavy chemical industries have relatively even export ratios throughout the automobile, chemical, petroleum, shipbuilding, machinery, and steel products by the year 2000. On the other hand, Japan has overwhelmingly high export ratios in automobiles and machines with 18.8% and 14.8%, respectively, and

Table 1. Export Ratio by Industry in Korea, China, and Japan

Unit : %

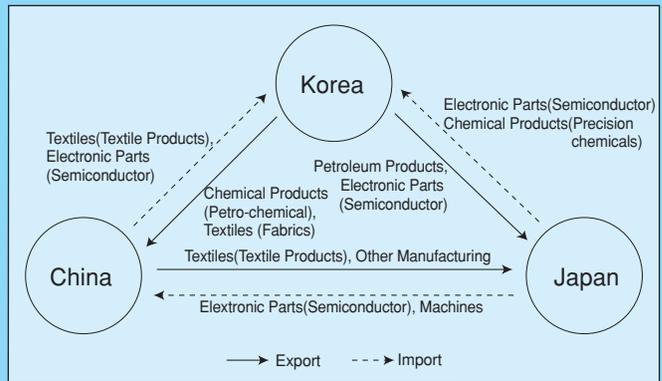
	Export Ratio					
	Korea		China		Japan	
	1994	2000	1994	2000	1994	2000
Electronic Parts (Semiconductors)	15.9 (11.0)	16.0 (12.4)	2.2 (0.4)	5.0 (1.8)	11.2 (6.3)	14.5 (8.5)
Textiles	17.7	10.8	29.3	20.9	2.1	1.8
Computers	3.6	10.7	2.2	6.9	7.5	5.5
Automobiles	6.3	8.9	1.0	1.8	20.7	18.8
Chemical Products	5.8	7.1	4.0	4.1	5.9	6.9
Communication Equipment	4.4	6.1	2.1	3.8	4.3	4.2
Petroleum Products	1.8	5.3	0.8	1.3	0.5	0.3
Home Appliances	7.2	5.1	5.7	6.9	6.0	4.9
Shipbuilding	5.3	4.8	0.5	0.7	3.2	2.4
Machines	4.4	4.6	3.1	4.7	16.4	14.8
Steel Products	6.1	3.9	2.2	2.5	4.2	2.7
Other Manufactured Products	4.0	1.5	11.7	10.2	1.1	1.3
Plastic Products	1.2	1.3	1.8	2.2	0.8	1.0
Non-ferrous Metals	1.0	1.2	1.4	1.5	0.8	1.0
Rubber Products	1.6	1.2	0.3	0.6	1.3	1.3
Papers	0.9	1.1	0.5	0.6	0.6	0.6
Leather Products	1.4	0.8	0.5	0.3	0.1	0.0
Precision Equipment	0.9	0.8	2.6	2.3	3.8	4.7
Metal Products	0.8	0.6	1.2	1.4	0.4	0.3
Non-metallic Mineral Products	0.7	0.5	2.1	1.9	1.2	1.2
Agriculture and Fishery	3.0	1.8	12.7	7.2	0.6	0.5
Mineral Products and Fuel	0.2	0.2	3.2	2.4	0.2	0.2
Manufacturing (Electrics and Electronics)	96.8 (32.2)	98.0 (39.1)	84.1 (14.0)	90.4 (25.6)	99.2 (31.5)	99.3 (31.6)

with the exception of chemical products and precision equipment, the weight of export for other industries is relatively low. For China, the electronic and electrical industries emerged recently as the largest exporting industry. However, it still has a relatively high level of export ratio in light industry products such as textiles and other manufactured products (including shoes and toys).

Due to the difference in the export structure by industry in the three countries, Korea principally exports petroleum products, electronic products (specifically memory semiconductors), computers, textiles, steel products and others to Japan, and imports electronic parts (specifically non-memory semiconductors), communication equipment, machineries, steel products, and others. Particular attention should be given to the fact that the export structure of the two countries are similar, while Korea has a trade surplus of over 1 billion dollars in petroleum products, textile products, and computers, where Korea has been showing a deficit in most other industries due to the weak competitiveness compared with Japan.

When examining the trade between Korea and China, Korea primarily exports chemical products (petro-chemicals), textiles (fiber and fabrics), electronic parts, petroleum products, steel products, machineries, and mainly imports textiles (textile products), electronic parts, computers, chemical products (precision chemicals), and other manufactured products to China since the year 2000. As for Korea and China's trading characteristics in trade are concerned, Korea will likely export intermediary goods necessary for industrialization or export to China intermediary goods and capital goods that are needed in local Korean company plants based in China, while importing low-priced Chinese finished goods and consumer goods (for

Figure 1. Major Imports and Exports among Korea · China · Japan



example: textiles and chemical products). Moreover, once positive attractions and incentives are initiated to promote foreign investment by the Chinese government, China's imports from Korea should increase rapidly in the electronic and electrical fields with items such as computers and electronic parts.

In the meantime, China mainly exports to Japan textiles (32.0% of entire exports), agricultural and fishery products, other manufactured products, home appliances, computers, and other finished goods and consumer goods, while generally imports electronic parts, machineries, chemical products, textiles (fabrics), steel products, precision equipment, home appliances, and other heavy chemical products as of the year 2000. Due to the differences in competitiveness between Japan and China, the trade deficit of China against Japan has been ongoing.

3. Analysis of Mutual Dependence among Korea, China, and Japan

(1) Trade Intensity

1) Definition of Trade Intensity

Trade intensity is an index that analyzes the degree of mutual dependence in trade between the

two countries.

The trade intensity index (I_{ij}) which represents the relative concentration of export of country i on country j is defined as follows:

$$I_{ij} = \frac{X_{ij}}{X_i} / \frac{M_j}{M}$$

Here, X_{ij} indicates the exports of country i to country j , X_i for total exports of country i , M_j for total imports of country j , and M for total imports (exports) of the world. In other words, this indicates that the weight of exports to country j from the total exports of country i is divided into the weight of the total imports of country j from the total imports (exports) of the world. Also, if the trade intensity is greater than '1', it means a higher intensity relationship, and if it is less than '1', the mutual intensity relationship is assumed to be low.

For the sake of convenient analysis, only the export intensity among Korea, China, and Japan is considered here. This is an index illustrating the concentration of exports on a specific country, and it is used in measuring the dependence of a specific market in export, and the figure is shown to be high if there exists a strong supplement in terms of trade structure and proximity to geographic distance.

2) Export intensity of Korea · China · Japan

The export intensity of Korea to Japan has declined from 1.64 in 1994 to 1.44 in 2000, and can be interpreted as the reduction of dependence of Japan as a trade partner, while the trade of Korea and China increased during this period. On the other hand, the export intensity of Japan to Korea has remained around 2.0 with very little fluctuation during the same period where the import dependency of Korea is high but stable.

In addition, the export intensity of Korea to China increased from 1.80 in 1994 to 2.23 in 2000, exhibiting that dependency to the Chinese

market has been on the rise. On the other hand, the export intensity of Japan to China repeatedly fluctuated around 1.80 during this period. For China, the export intensity with Japan is higher than that of Korea during this period, and that means that China has a higher export dependency on Japan than Korea.

Looking into the export intensity by industry, the export intensity of Korea and Japan on the Chinese market exhibited significantly high numbers, commonly in petroleum products, plastic products, textiles, non-metallic mineral products, metal products, and it is relatively low on electronic parts, computers, communication equipment, automobiles, shipbuilding, and others. As such, the low export intensity to China of Korea's and Japan's main export products seems to be caused by China's low income and industrial levels. Conversely, with respect to home appliances, the export intensity of Korea and Japan to China increased during 1994~2000, and this was due to the increase in demand for home appliances and the development of the home appliances industry in China.

Korea's and China's export intensity to the Japanese market revealed to be high, commonly on steel products, non-metallic mineral products, machineries. Based on the trend of shifts during 1994~2000, the export dependency was still high, but steel products, non-ferrous metals, home appliances, electronic parts, communication equipment and others, illustrated a commonly declining trend.

(2) Intra-industry Trade Index

1) Definition of Intra-industry Trade Index

The intra-industry trade index is an index that displays the degree of simultaneous import and export for goods within the same industry, and is utilized in the determination of a close relationship in the trade between two countries in the aspect

Table 2. Export Intensity by Industry Among Korea · China · Japan

	Korean Market				Chinese Market				Japanese Market			
	Export Combination of China		Export Combination of Japan		Export Combination of Korea		Export Combination of Japan		Export Combination of Korea		Export Combination of China	
	1994	2000	1994	2000	1994	2000	1994	2000	1994	2000	1994	2000
Petroleum Products	3.59	1.63	2.48	4.02	3.34	3.65	1.07	3.48	2.13	3.51	0.69	0.84
Plastic Products	0.57	0.73	5.31	6.75	1.91	3.01	2.09	3.21	3.72	4.25	1.75	1.89
Rubber Products	0.97	1.22	1.17	1.57	0.68	1.15	0.88	1.09	0.59	0.84	0.66	0.93
Leather Products	0.76	1.04	1.39	1.97	2.49	3.08	1.73	1.98	0.34	0.55	1.01	0.86
Papers	0.38	1.38	2.49	3.27	6.19	2.91	2.79	2.62	0.67	1.87	1.39	2.60
Textiles	1.90	1.97	4.06	3.42	1.32	2.29	4.58	6.68	1.46	0.80	1.99	2.57
Non-metallic Mineral Products	1.09	1.99	5.41	4.40	0.89	4.31	2.87	3.44	4.31	3.43	1.49	2.29
Steel Products	2.08	2.31	1.97	2.76	1.35	1.99	1.86	2.26	5.41	4.26	3.92	3.70
Non-ferrous Metals	1.41	1.58	2.52	2.41	1.73	1.53	3.34	1.78	1.97	1.08	1.28	1.17
Metal Products	0.31	0.74	4.24	7.03	1.28	3.61	2.19	4.88	1.92	2.70	0.88	1.82
Machines	0.36	0.78	2.00	2.21	2.11	2.48	1.18	1.61	2.61	2.36	2.58	2.97
Precision Machines	0.23	0.73	2.47	2.38	0.88	1.55	1.90	1.90	1.59	1.92	2.21	1.95
Home Appliances	0.57	0.77	2.15	2.68	0.50	1.95	1.60	1.84	1.70	1.39	1.99	1.54
Electronic Parts	0.51	1.35	1.40	1.21	0.34	0.76	1.30	1.22	1.88	1.38	1.92	1.83
Computers	0.98	1.44	1.13	1.07	1.13	0.94	1.26	1.23	0.58	1.22	1.17	0.75
Communication Equipment	0.32	0.97	1.07	3.05	0.21	0.61	1.27	1.61	1.38	0.75	2.39	2.24
Automobiles	0.85	3.66	1.74	1.97	1.51	1.26	1.85	1.69	0.44	0.46	2.60	5.17
Shipbuilding	0.43	0.35	0.46	1.21	0.22	0.08	0.91	1.15	0.24	0.07	1.57	1.89
Other Manufactured Products	1.29	1.54	3.23	2.77	2.11	17.01	2.84	3.09	2.39	1.78	0.81	0.87
Chemical Products	1.70	1.81	3.04	3.09	3.88	3.45	1.63	1.64	1.75	1.18	2.00	2.05

of similarities in the final demand, among others.

The intra-industry trade index has a value between 0 and 1, and as the index approaches 1, it is interpreted as industries on both countries having a more active and close complement relationship for an intra-industry trade. Intra-industry trade is activated as the possibility of horizontal work divisions of each country is heightened for countries with similar economic development and advanced industrial structure.

2) Intra-industry Trade Based on Industry for Korea · China · Japan

During 1994~2000, looking into the change of

the intra-industry trade index between Korea and Japan, Korea and China, and China and Japan, most of the industries exhibited an increasing trend. The data reflected that the intra-industry trade has been on the rise in plastic products, paper, non-ferrous metals, machineries, precision equipment, electronic parts, automobiles, and chemical products.

However, based on the number of increasing industries, it is evident that the order be Korea-Japan>Korea-China>China-Japan, where the intra-industry trade has been most active between Korea and Japan.

This seems to be attributable to the high complementary relationship on the industry in general

between Korea and Japan, and there is significant difference in the competitiveness between China and Japan.

In the year 2000, intra-industry trade was actively made between Korea and Japan in the order of metal products, computers, plastic products, and home appliances; between Korea and China, it was in the order of electronic parts, computers, communication equipment, and metal products; and for China and Japan, it was actively made in the order of communication equipment, metal products, electronic parts, and computers.

These industries were at a relatively high level in 1994, indicating that intra-industry trade had been going on continuously.

Focusing on the top ten industries of the intra-industry trade index between Korea and Japan, Korea and China, and China and Japan, there are 7 industries overlapping in plastic products, metal products, home appliances, electronic parts, computers, communication equipment, heavy electrical equipment and electrical wires, and there is active intra-industry trade with these industries leading the way, as well as having the strongest mutual complement in terms of trading. In particular, for plastic products, electronic parts, heavy electrical equipment and electrical wires, the intra-industry trade index has increased simultaneously while maintaining a relatively high level of ratio for trade in the region.

Table 3. Intra-industry trade index of Korea · China · Japan

	Korea-Japan		Korea-China		China-Japan		Korea, China, Japan ↑
	1994	2000	1994	2000	1994	2000	2000
Petroleum Products	0.15	0.09	0.09	0.13	0.18	0.19	
Plastic Products	0.33	0.34	0.16	0.26	0.25	0.27	◎
Rubber Products	0.18	0.28	0.10	0.25	0.23	0.22	
Leather Products	0.12	0.14	0.09	0.18	0.24	0.15	
Papers	0.13	0.14	0.09	0.17	0.15	0.17	◎
Textiles	0.17	0.22	0.15	0.26	0.18	0.15	
Non-metallic Mineral Products	0.21	0.23	0.17	0.20	0.28	0.27	
Steel Products	0.22	0.17	0.07	0.12	0.11	0.13	
Non-ferrous Metals	0.16	0.21	0.09	0.15	0.17	0.20	◎
Metal Products	0.36	0.37	0.19	0.27	0.40	0.35	
Machines	0.14	0.21	0.11	0.20	0.11	0.19	◎
Precision Equipment	0.15	0.20	0.16	0.21	0.21	0.26	◎
Home Appliances	0.30	0.32	0.23	0.22	0.33	0.27	
Electronic Parts	0.22	0.26	0.26	0.39	0.23	0.35	◎
Computers	0.21	0.35	0.23	0.36	0.33	0.33	
Communication Equipment	0.22	0.26	0.31	0.31	0.27	0.36	
Automobiles	0.15	0.24	0.09	0.16	0.12	0.17	◎
Shipbuilding	0.19	0.15	0.16	0.05	0.25	0.21	◎
Other Manufactured Products	0.21	0.28	0.19	0.23	0.21	0.16	
Chemical Products	0.13	0.16	0.07	0.14	0.20	0.22	◎

Note: ◎ : During 1994 ~ 2000, all indices inter-industry trade have increased between Korea · Japan, Korea · China, and China · Japan
 ◎ : During 1994 ~ 2000, all indices inter-industry trade have decreased between Korea · Japan, Korea · China, and China · Japan

4. Analysis of the Competitive Relationship of Korea · China · Japan

(1) Analysis of the Competitive Relationship through Export Structure

Formulating a simple comparison of the export structure by product and by industry is one of the easiest methods of gaining an understanding of what a competitive relationship for two countries is. For this purpose, the most common top 20 items export products that are exported by two countries based on the HS 2 digit, is compared on the weight and rank from the export of each country.

First, comparing the top 20 products of Korea and Japan as of 2001, the export ratio of the top 20 products among the total exports is 89.2% for Korea and 92.7% for Japan, and the ratio of these overlapping products from the top 20 products among the total exports of each country is very significant, where Korea was at 75.8% and Japan was at 83.9%. In addition, Korea and Japan have electronic and electrical machines and automobiles comprising the top 1~3 position products, and eight products such as ships, plastic products, steel, organic chemical products, synthetic textiles, etc. among the top 10 export items mutually exported by two countries. In 2001, the top 3 products that occupied exports resulted in ratios of 51.0% for Korea and 63.4% for Japan.

When comparing Korea and China, the ratio of the top 20 products taking up the total export as of 2001 is 89.2% for Korea and 77.3% for China. And, in China, unlike Korea, the degree of dependency on a specific product of export is much less.

Out of the top 20 products, the export ratio of goods which are mutually exported is 69.7% for Korea and only 58.9% for China of the total exports. China is not as dependent on specific products in export than Japan and is still relatively small in similarity relationship with Korea. In

2001, Korea and China had electronic and electrical goods as the top export products, followed by machinery. However, there are significant differences in the export structure after the third position, in that no products except petroleum products and plastic products among the top 10 products are the same export item.

When comparing China and Japan, the top 20 export products that overlapped in both countries had a weight of 76.7% among total exports for Japan, while China was only at 42.6%. Except electronic and electrical goods and machineries, the overlapping products among the top 10 products for both countries was only one, plastic products.

From the above simple comparison of export structure, it is known that there is relevant similarities in the export structure between Korea and Japan, but there is no such close relationship between Japan and China. The competition between Korea and China is not as strong as that of Korea and Japan, yet is stronger than the relationship between China and Japan.

(2) Analysis of the Competitive Relationship Based on the Export Similarity Index

1) Meaning of the Export Similarity Index

There would be a high possibility for competition if the export product structure of both countries were more similar. Under such premise, the export similarity index is utilized as a tool to measure the similarity of the export product structure of both countries in a specific market, that is, the degree of mutual competition.

The export similarity index that shows the competition of export products of two countries may be defined as follows:

$$ESI_{ab} = \sum_{i=1}^n \text{MIN} (X_i^a/X_a , X_i^b/X_b)$$

(X_a , X_a^i : the total exports and product i 's exports of country a)

Namely, the export similarity index(ESI_{ab}) of country a and country b in a certain market selects the smaller value from the weight of product i among the total exports of country a and country b (X'_i/X_a , X'_i/X_b) and adds the value to all products. If the export structure of country a and b are similar, the export weight of product i would have a similar value in two countries, and as a result, the value of the export similarity index grows larger. As ESI_{ab} approaches 1, the export structure of both countries are more similarly made and may be considered to be more competitive. In extreme form, if the export structure of both countries is completely consistent (namely, if the export ratio of each product is consistent in all products), the export similarity index would be 1. Bearing this in mind, if the export product of both countries never overlap, the export similarity index would near 0.

2) Export Similarity among Korea · China · Japan in the World Market

On the basis of the HS 2 digit product, the export similarity index among Korea · China · Japan indicates that the competition of Korea and Japan is the largest, and the competition between China and Japan the smallest, as of the year 2000. Also, the export similarity of the three countries during 1994~2000 revealed to be more intensified, and the competition of China and Japan had significantly increased.

From such statistics, the following may be formulated: While Korea and Japan have a relatively close relationship in terms of export structure, China and Japan have relatively less pertinent differences.

3) Export Similarity by Industry of Korea · China · Japan

After reviewing the export similarity index of both Korea and Japan as of the year 2000 by industry, computers (0.907), petroleum products (0.826), shipbuilding (0.794), automobiles (0.639), plastic products (0.645), rubber products (0.579), and machineries (0.547) revealed relatively fierce competition. Following these, leather products, steel products, non-metallic mineral products, communication equipment, textiles, chemical products, non-ferrous metals, metal products, etc. have more intense competition than the average manufacturing industry. On the other hand, electronic parts, papers, and other manufactured products have a relatively less competitive relationship.

Computers, automobiles, machineries, precision equipment have increased the export similarity relationship between Korea and Japan over the past several years. In terms of automobiles, it is affected by the increase of exports of medium-sized Korean automobiles, and machineries is also affected by the development policy of the capital goods industry in Korea. On the other hand,

Table 4. Export Similarity Trend among Korea · China · Japan in the Manufacturing Industry

	Standard	1994	1995	1996	1997	1998	1999	2000
Korea—China	HS 2 Unit	0.548	0.565	0.570	0.573	0.590	0.608	0.614
	HS 6 Unit	0.300	0.290	0.293	0.289	0.291	0.320	0.336
Korea—Japan	HS 2 Unit	0.636	0.658	0.680	0.675	0.666	0.711	0.747
	HS 6 Unit	0.417	0.432	0.397	0.408	0.397	0.418	0.419
China—Japan	HS 2 Unit	0.392	0.448	0.464	0.470	0.493	0.523	0.546
	HS 6 Unit	0.224	0.259	0.268	0.275	0.286	0.294	0.303

home appliances, shipbuilding, communications equipment, electronic parts, etc. have declined in export similarity.

In particular, the export similarity of electronic parts that had a relatively high value of 0.572 in 1994, had greatly declined to 0.276 in 2000, and this was most attributable to the withdrawal of the memory semiconductor from Japan and the expansion of LCD export in Korea.

The export similarity relationship between Korea and China is relatively severe in industries such as shipbuilding (0.815), computers (0.707), communications equipment (0.707), petroleum products(0.687), rubber products (0.556), metal prod-

ucts (0.549), and others. Competition is also fierce in precision equipment, home appliances, plastic products, non-ferrous metals, textiles than the average manufacturing industries. Conversely, automobiles, chemical products, steel products, leather products, papers, electronic parts are relatively less competitive.

For each period, during 1994~2000, competition had significantly increased in computers, communications equipment, shipbuilding, home appliances, electronic parts, and even in leather products. The reason for such an increasing competitive rate between Korea and China in the fields of shipbuilding, and electronic and electrical products

Table 5. Export Similarity Relationship Trend of Korea · China · Japan per Industry

	Korea-Japan		Korea-China		China-Japan	
	1994	2000	1994	2000	2000	2000
Petroleum Products	0.945	0.826	0.645	0.687	0.649	0.734
Plastic Products	0.668	0.645	0.481	0.405	0.375	0.365
Rubber Products	0.540	0.579	0.521	0.556	0.600	0.627
Leather Products	0.432	0.516	0.146	0.312	0.316	0.402
Papers	0.368	0.344	0.293	0.254	0.318	0.382
Textiles	0.457	0.432	0.362	0.346	0.194	0.196
Non-metallic Mineral Products	0.376	0.481	0.380	0.300	0.292	0.227
Steel Products	0.475	0.502	0.232	0.271	0.231	0.242
Non-ferrous Metals	0.394	0.426	0.400	0.400	0.219	0.299
Metal Products	0.389	0.414	0.563	0.549	0.441	0.371
Machines	0.505	0.547	0.383	0.393	0.424	0.451
Precision Machines	0.388	0.443	0.509	0.504	0.313	0.293
Home Appliances	0.541	0.453	0.428	0.494	0.445	0.340
Electronic Parts	0.572	0.276	0.241	0.304	0.422	0.605
Computers	0.589	0.907	0.511	0.707	0.797	0.758
Communication Equipment	0.589	0.459	0.597	0.707	0.444	0.507
Automobiles	0.579	0.639	0.177	0.163	0.245	0.209
Shipbuilding	0.834	0.794	0.625	0.815	0.670	0.850
Other Manufactured Products	0.262	0.337	0.468	0.379	0.154	0.131
Chemical Products	0.381	0.416	0.228	0.217	0.327	0.358
Manufacturing	0.417	0.419	0.300	0.336	0.224	0.303
Computerization Service	0.402	0.398	0.291	0.328	0.205	0.282

is in the significant increase in export from China in these fields, with the active attraction of foreign investment by the Chinese government. Unfortunately, plastic products and other manufactured products experienced a reduction in competition during this period.

Consequently, the export similarity relationship between China and Japan proved to be more fierce in shipbuilding (0.850), computers (0.758), petroleum products (0.734), rubber products (0.627), electronic parts (0.605), communications equipment (0.507). Also, leather products, machineries, home appliances, plastic products, chemical products, metal products, papers have a greater similarity relationship than the average manufacturing industry, whereas textiles, non-metallic mineral products, steel products, precision equipment, automobiles, and other manufactured products have relatively insignificant competition.

For each period, during 1994~2000, the competition had increased significantly in shipbuilding, electronic parts, petroleum products, leather products, non-ferrous metals, etc. The significant increase in the similarity relationship in the shipbuilding fields between China and Japan was likely to have been caused by the development of the shipbuilding industry of China. However, unlike the changes in the similarity relationship between Korea and China, the electronic and electrical fields had only a slight increase in the similarity relationship due to the great differences in the competitiveness of Japan and China. While there was not much change in terms of the similarity relationship during this period for plastic products, rubber products, textiles, steel products, chemical products, machines, precision equipment, computers, furniture, and other manufactured products, the competition was rather weakened in non-metallic mineral products and home appliances. In textiles, machines, precision equipment, furniture, and other manufactured products, there was no change in the competition between China and

Japan since there was a clear difference in the technologies and the competitiveness of both countries. The reasons behind the decrease of competition in home appliances was mostly due to the Japanese companies move of production plants to China, resulting in a reduction of production in Japan, as well as the freezing of export.

5. Conclusion

Recently, with China's sudden emergence into the world trading arena, the trading relationship of Korea · China · Japan too has been making rapid changes, including a vital expansion of competition among Korea · China, and China · Japan, relative to that of the past.

The competition of Korea · China · Japan based on the export similarity index reflects that the competition between Korea and Japan is the fiercest, and the competition between China and Japan relatively weaker due to the differences in competitiveness. However, when focusing on the changes over the past few years, competition has deepened more extensively between China and Japan, and Korea and China, than that of Korea and Japan. As clearly visible through the emergence of the electronic and electrical industry as the largest exporting industry of China, the export structure of China is swiftly converting into a similar structure with that of Korea and Japan.

In particular, Korea has intensified its competition or similarity relationship with China in the main industries, including computers, communications equipment, home appliances, electronic parts, shipbuilding and others, and has weakened its competition in the traditional light industry products such as textiles, plastic products, metal products and other manufactured products. This indicates that the export structure of China is gradually being reorganized into a heavy chemical industry geared towards the electronic and electrical industry, and it also is attributable to the continu-

ing decline in the export weight of Korea's traditional light industry products.

During the period of 1994~2000, the competition of Korea against Japan gradually grew in computers, automobiles, precision equipment, machines, steel products, chemical products, and others. While competition weakened in electronic parts and communication equipment, where this seems to have been attributable to the remarkable export performance of Korea in wireless communication equipment, along with the withdrawal of Japanese companies from memory semiconductors.

In addition, with respect to the export intensity that shows a supplementary relationship in the trades of Korea · China · Japan, Korea has a much larger export dependency on the Chinese market than Japan, and China has a relatively larger export dependency on the Japanese market. Japan has a similar export dependency for both the Chinese and Korean markets. This clearly illustrates that Korea primarily exports intermediary goods to China, and China mainly exports consumer goods to Japan, while Japan exports capital goods and intermediary goods to Korea and China. However, after studying the trends over the past several years, the export intensity of Korea and China is continues to rise.

When referring to the intra-industry trade index, during 1994~2000, in most of the industries of Korea, China, and Japan, the intra-industry trade exhibited a lot more activity. In particular, the intra-industry trade index showed an increasing trend in all three countries in plastic products, papers, non-ferrous metals, machines, precision equipment,

electronic parts, automobiles, chemical products, and others. For the same period, the number of industries with an increase in the trade index within the industry was in the order of Korea · Japan>Korea · China>China · Japan, and in particular, the supplementary relationship between Korea and Japan has been strengthened all the more. However, regarding the largest export industry of the three countries - electronic and electrical, trade within the industry is yet to be activated, and room for industrial cooperation of the three countries in this field is anticipated to be very high.

As shown earlier, Korea, China, and Japan are experiencing an intensifying similarity relationship in recent times, and is being strengthened towards a supplementary relationship. The rapid industrialization of China through foreign investment attraction and reorganization of the world trading order, is significantly affecting trade with its neighboring countries, Korea and Japan. Therefore, in response to such changes, Korea should expand its market influence in the northeast Asian trade market by strengthening the horizontal and vertical division system for the three countries. Along with this, Korea should prepare for even further intensifying of competition or similarity relationship with China in the majority of the main export industry as well as focus on high-quality products with differentiation of export products, in addition to the development of new products through technology development.

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