研究ノート

How Does a Trilateral Free Trade Agreement Lead to Export Growth? Implications from an Analysis of Japan's Position as an Outsider to the China-Korea Bilateral FTA[i)]

Iwao Tanaka / Lihong Fang

Abstract

Japan and South Korea export numerous similar commodities to China. Out of 50 major commodities of the HS 4-digit classifications, 31 were overlapping in 2017. This means that there is severe competition facing both Japanese and Korean firms in the Chinese market. China and Korea agreed on a bilateral Free Trade Agreement (FTA) in 2015, and since then, Japan has been outside of the FTA. Although a Japan-China-Korea trilateral FTA was also proposed and has been discussed at the administrative level since the early 2000s, it has not yet been completed. This study, therefore, aims at theoretically investigating how Japanese industries could be paying the cost as an outsider to the bilateral FTA or could be benefiting from the trilateral FTA. For this purpose, our focus is particularly placed on the pattern of comparative advantage of Japan and Korea in China. We calculate the revealed comparative advantage (RCA) index and the elasticity of substitution for those 31 commodities. Using the estimated elasticities, we conducted a simulation analysis on how much of the actual decrease in Japanese exports to China could be attributed to the substitution by Korean exports between 2013 and 2017. Our HS 6-digit commodity analysis shows that for some type of polyesters (HS390799) and plastics (HS392010) exported from Japan, about 3 and 11 percentage of the decreases, respectively, could be attributed to exports diverted to Korea. Since these commodities have lower RCA indices in terms of the Chinese market compared to the world market with lower elasticity of substitution, the potential competitiveness of Japanese exports would be overlooked under the bilateral FTA, and if the trilateral or even larger FTA came into effect, their exports might grow.

(JEL Classification Code: F15, F17)

Key Words : Trade diversion, Comparative advantage, Elasticity of substitution, Japan-China-Korea FTA, Exports to China

1. Introduction

Regional trade agreements have been burgeoning around the world in our modern age. Many countries are now involved in multiple Free Trade Agreements (FTAs), and some FTAs are about to converge into an even larger arrangement, frequently called a mega FTA. One such example is the Trans-Pacific Partnership agreement (TPP). When Mr. Trump became president of the United States in 2017, however, the U.S. decided to withdraw from the TPP. This incident implied that the U.S. appeared to turn its policy from freer trade to a more protectionist approach, and that there are costs and benefits when making a preferential trade agreement. The Japanese government had often argued whether TPP could bring more benefits than costs to its economy before the agreement was signed among 11 countries.

When we evaluate the welfare effects of FTA, trade creation and trade diversion effects are of importance. But it is also indispensable to see the costs of being outside of an agreement for the third country. For example, China and Korea made a bilateral FTA effective in December 2015. On the other hand, to date, Japan does not have a bilateral FTA either with China or Korea. The three countries have long been trying to make the trilateral FTA since 2001 but have not yet concluded it. Japan is currently outside of the China-Korea FTA, and its economy is expected to be negatively impacted by being a third country. Data shows that trade between China and Korea has increased, whereas the trade between Japan and China, and between Japan and Korea have both decreased in recent years. According to the Ministry of Foreign Affairs of Japan, the Japanese Government considers that the trilateral FTA is purported to be beneficial for the Japanese economy. This is because China and Korea both have a significant GDP in the world standings and they are the first and third biggest trading partners with Japan. Madhur (2013) argues that the agreement can be one of the steps toward an even larger agreement, such as the Regional Comprehensive Economic Partnership (RCEP) and Free Trade Area of the Asia-Pacific (FTAAP).[ii] Thus, Japan should pay more attention to speeding up the process of negotiations toward the trilateral agreement. This study aims at investigating to what extent the bilateral China-Korea FTA has a negative effect on Japanese exports and how the FTA could provide evidence to support a trilateral or even larger trade agreement.

Welfare analysis is the main analytical tool of a preferential trade agreement. In the literature, Caves, Frankel, and Jones (2002) explain that the welfare effects of an FTA and Customs Union (CU) are the total of trade creation and trade diversion effects and terms of trade effect. Baldwin and Venables (1995) show that the free trade welfare effects are decomposed into three parts: the effects in terms of perfect competition, which correspond to what Caves et al. explained, the effects of increasing returns-to-scale and imperfect competition, and the effects of accumulation of factors. Based on those theories, Melchior (2018) conducts estimation and simulation with a world trade model. Clausing (2001) analyzed the trade creation and trade diversion effects of the U.S.-Canada FTA and concluded that the former effects exceeded the latter. A macro impact of the Japan-China-Korea trilateral FTA has also been estimated in studies, one of which reports that welfare gains would be about 20 billion U.S. dollars for Japan while welfare loss to the U.S. would amount to nearly 4 billion U.S. dollars (Abe, Urata, and NIRA, 2008). Ishikawa, Umada, and ITI (2015) show that the trilateral FTA would increase the Japanese real GDP by 0.75%, compared to the FTAAP that would increase it by 1.36%, and the TPP which increasing it by 0.54%. Concerning the impact of the China-Korea FTA on the third country, Okuda (2010) and Okuda and Watanabe (2011) show that the overall impact on Japanese economy would be about negative 7 billion U.S. dollars.

Various kinds of manufacturing commodities are commonly exported to China both from Japan and Korea. In this circumstance the China-Korea FTA induces the condition of competition to change in a different way for Japanese and Korean firms. A trade theory simply suggests that under free trade, an industry with a comparative advantage increases its export, whereas an industry without a comparative advantage decreases it. We suppose that a Japanese industry which does not have a comparative advantage over a Korean counterpart in China but does have a comparative advantage in the world may have decreased its export by being outside of the bilateral FTA, or by being diverted to Korean exports. If Japan joins with the two countries in some free trade arrangement, the industry would be able to increase its export to China since the industry is already competitive worldwide.

In the empirical analysis, we first calculate a revealed comparative advantage (RCA) index to measure the relative competitiveness of Japanese exports over Korea. It is possible that a Japanese industry is competitive but forced to reduce exports by tariffs being kept high while tariffs for Korea are being reduced due to the FTA. Thus, we calculate RCA in two ways: one is for the world, and the other for China. We then estimate the elasticity of substitution between Japanese exports and Korean ones to China. Using these estimated elasticities, we conduct a simulation on how much of the Japanese export was decreased because of the tariff reduction of China's imports from Korea. Based on the HS 4-digit commodity classifications, we find that 8 Japanese industries out of 31 have lower values of RCA in China while having higher values of RCA in the world market. The simulated amount of export decrease due to the trade diversion is computed at the HS 6-digit commodity classifications and shown as a ratio over the actual export decrease. We find that for some type of polyesters (HS390799) and plastics (HS392010), the ratios are about 3 and 11%, respectively, which implies that these industries may experience a negative impact of being an outsider to the bilateral FTA. The past studies rarely consider the pattern of comparative advantage in their FTA analyses, and thus, we argue that our study can add new insights to the literature.

The rest of the paper is as follows. The next section presents the recent trends in GDP and trade for Japan, China, and Korea. The research framework is given in Section 3, and the results of data analysis and simulation are shown in Section 4, and Section 5 concludes the paper.

2. Trends in real GDP and international trade among Japan, China, and Korea

The three countries, Japan, China, and Korea are geographically very closely located and have been developing and maintaining economic relationships for a long time, even without any official legal set-up. Table 1 shows that the economic size of those countries is very large: in 2017, Chinese real GDP was about 12 trillion U.S. dollars, the world's second largest, and Japanese real GDP was about 4.9 trillion U.S. dollars, next to China. Korean real GDP was about 1.5 trillion U.S. dollars, ranked 14th in the world. As a result, the combined amount of the three countries becomes over 18 trillion U.S. dollars, accounting for 23% of the world GDP, smaller than NAFTA's share but greater than the E.U. share.

The three countries trade a substantial amount of goods with each oth-

Table 1. Real GDP and Its Share: NAFTA, EU, Japan-China-Korea combined, and selected countries, in 2000 and 2017, Current U.S. Dollars

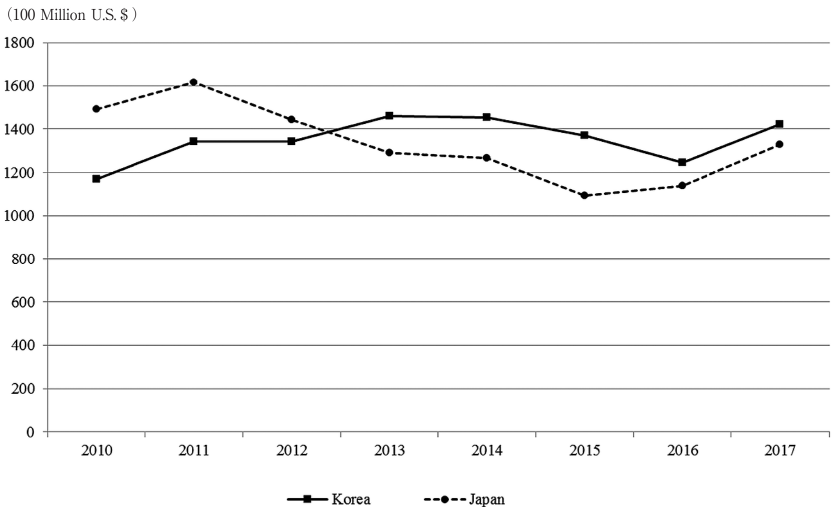
	Value (100 Million U.S. $)		World Share	
	2000	2017	2000	2017
World	335,712	806,838	1.00	1.00
NAFTA	125,428	225,590	0.37	0.28
E.U.	89,063	172,777	0.27	0.21
Japan-China-Korea	66,605	186,406	0.20	0.23
United States	102,848	193,906	0.31	0.24
China	12,113	122,377	0.04	0.15
Japan	48,875	48,721	0.15	0.06
India	8,028	26,295	0.02	0.03
Korea, Rep.	5,616	15,308	0.02	0.02

Source: World Bank, http://databank.worldbank.org/data/source/world-development-indicators#.

er, as is consistent with the gravity hypothesis of International Trade theory. Those countries which are in close proximity to each other trade with each other more than they do with countries which are further away. For Japan, China, and Korea, they are also mutually important trade partners. The two countries are usually listed within the top five countries for the third country both in exports and imports. Potential economic benefits of forming the trilateral FTA among these three countries would be considered significant. In this section, therefore, we will focus on two aspects of trade patterns: first, the change in the relative significance of Japanese exports to China compared to that of Korea due to the China-Korea FTA; and second, the similarity of the industry's structure between Japanese and Korean exports to China.

Figure 1 depicts the trends in Japanese and Korean exports to China

Figure 1. Recent Trends in Exports to China: Japan and Korea, 100 million U.S. Dollars



Sources: Ministry of Finance, Trade Statistics, Trade Statistics of Japan, Korean International Trade Association.

from 2010 to 2017. In 2013 exports from Korea overtook those from Japan and the former continues to exceed the latter. It was the year 2015 when the China-Korea bilateral FTA was completed, but the increase in Korean exports to China started a few years earlier. Its exports slightly decreased in 2015 and 2016[iii] and increased again in 2017. During the downturn periods Korean exports were still larger than Japanese ones.

Table 2 presents a trade matrix among the three countries. Panel A shows percentage changes in exports between 2007 and 2012 on the left-hand side, and those changes between 2012 and 2017 on the right-hand side. During the first period, each of the three countries increased exports with the partner countries. During the second period, however, Japanese exports both to China and Korea, and Chinese and Korean exports to Japan all decreased. On the contrary, exports between China and Korea increased. Panel B shows percentage changes in imports among the three

Table 2. Trade Matrix: Japan, China, and Korea, Percentage Change (%)

Panel A. Exports

2007–2012 Exporter	to			2012–2017 Exporter	to		
	Japan	China	Korea		Japan	China	Korea
Japan	—	31.9	13.4	Japan	—	−1.1	−13.3
China	48.4	—	56.2	China	−9.2	—	17.6
Korea	47.1	63.8	—	Korea	−31.6	5.1	—

Panel B. Imports

2007–2012 Importer	from			2012–2017 Importer	from		
	Japan	China	Korea		Japan	China	Korea
Japan	—	47.5	48.4	Japan	—	−12.8	−30.6
China	32.7	—	60.1	China	−6.7	—	6.6
Korea	14.4	28.2	—	Korea	−15.5	20.1	—

Sources: Downloaded from the IMF: http://data.imf.org/regular.aspx?key=61013712.

Table 3. Top 10 Commodities Exported to China by Japan and Korea, HS 4-digit Classifications, 2017

	A. Japanese Exports			B. Korean Exports		
	HS Code	Commodity Name	Value (1000 U.S. $)	HS Code	Commodity Name	Value (1000 U.S. $)
1	*8708*	Motor vehicles; parts and accessories, of heading no. 8701 to 8705	7231611	*8542*	Electronic integrated circuits	35188042
2	*8542*	Electronic integrated circuits	6993078	*9013*	Liquid crystal devices not constituting articles provided for more specifically in other headings; lasers, not laser diodes; other optical appliances and instruments n.e.c. in this chapter	9753465
3	*8486*	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor boules or wafers, semiconductor devices, electronic integrated circuits or flat panel displays; machines and apparatus specified in note 9-C to this Chapter	6557634	*2902*	Cyclic hydrocarbons	8203799
4	0000	Re-exports	6434389	2710	Petroleum oils and oils from bituminous minerals, not crude; preparations n.e.c, containing by weight 70% or more of petroleum oils or oils from bituminous minerals; these being the basic constituents of the preparations; waste oils	5270548
5	8703	Motor cars and other motor vehicles; principally designed for the transport of persons (other than those of heading no. 8702), including station wagons and racing cars	4924688	8529	Transmission apparatus; parts suitable for use solely or principally with the apparatus of heading no. 8525 to 8528	3763862
6	*9013*	Liquid crystal devices not constituting articles provided for more specifically in other headings; lasers, not laser diodes; other optical appliances and instruments n.e.c. in this chapter	4027686	8548	Waste and scrap of primary cells, primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators; electrical parts of machinery or apparatus, n.e.c. or included elsewhere in chapter 85	3350596
7	8479	Machinery and mechanical appliances; having individual functions, n.e.c. in this chapter	3378672	*8486*	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor boules or wafers, semiconductor devices, electronic integrated circuits or flat panel displays; machines and apparatus specified in note 9-C to this Chapter	3116176
8	*2902*	Cyclic hydrocarbons	2870655	*8708*	Motor vehicles; parts and accessories, of heading no. 8701 to 8705	2750790
9	8536	Electrical apparatus for switching, protecting electrical circuits, for making connections to or in electrical circuits, for a voltage not exceeding 1000 volts; connectors for optical fibres, optical fibre bundles or cables	2490892	*8541*	Diodes, transistors, similar semiconductor devices; including photovoltaic cells assembled or not in modules or panels, light-emitting diodes (LED), mounted piezo-electric crystals	2485619
10	*8541*	Diodes, transistors, similar semiconductor devices; including photovoltaic cells assembled or not in modules or panels, light-emitting diodes (LED), mounted piezo-electric crystals	2273740	2901	Acyclic hydrocarbons	2375255

Sources: Ministry of Finance, *Trade Statistics of Japan*, and Korean International Trade Association's database.

Notes: Panel A shows the list of top 10 commodities of Japanese exports to China, and Panel B shows the list of top 10 commodities of Korean exports to China. The common HS code numbers appearing in the both panels are represented in italic.

countries, which repeat the same pattern as exports. During the first period, each country increased imports from the partner countries. During the second period, Japanese imports from the other two countries and Chinese and Korean imports from Japan all decreased, whereas China and Korea increased imports from each other. These data suggest that there is a significant negative impact of the China-Korea FTA on Japanese trade.

As is common for an electric and electronic industry, the structure of Korean exports is more pronounced by strong manufacturing sectors. Especially when exporting to China, the structures of Japan and Korea represent greater similarity. Table 3 presents the Japanese and Korean top 10 export commodities to China in 2017. Based on the HS 4-digit classifications, 6 out of 10 commodities are commonly ranked in. Those examples are motor vehicles and their parts, electronic integrated circuits, liquid crystal devices etc., and so on. We first selected the 50 largest exporting commodities to China, whose export values are over or equal to 6.5 billion U.S. dollars for Japanese exports and 4.1 billion U.S. dollars for Korean exports. From those 50 commodities, 31 industries are commonly listed. As an export-destination market, China is now a very competitive place for Japanese and Korean firms to compete with each other. The bilateral free trade agreement between China and Korea is supposed to have a significant effect on the trade competitiveness of Korean industries. In the following sections, thus, we conduct data analysis starting with these 31 exporting industries.

3. Research framework

Our focus is on analyzing the costs of being outside of an FTA, or in other words, trade diversion. We consider that an industry with a comparative advantage over Korea in the Chinese market would be paying the costs as the third country of the China-Korea bilateral FTA, since freer trade would help the industry increase the exports. Without the Japan-China-Korea trilateral FTA, those industries must stay with a lower level of exports. If some industries do not have a comparative advantage over Korea, on the contrary, they might prefer to be outside of the FTA.

Even if the industry does not have a comparative advantage, however, if their goods are differentiated in a way, then the industry could compete with rivals in the Chinese market. In our study, we calculate the elasticity of substitution between Japanese and Korean exports to China, which implies a value of being the only one (Melchior, 2018). The lower elasticity means that Japanese goods are not easily replaced by Korean counterparts, and thus they would expand the exports if free trade is realized. In this section we explain our empirical research framework.

3-1. Revealed comparative advantage (RCA) and elasticity of substitution

We first explain how we calculate the revealed comparative advantage (RCA) index. We calculate it in two ways. One is to measure the degree of Japanese industries' competitiveness relative to both Korea and China in the world market, and the other is to measure the degree of Japanese industries' competitiveness over Korea in the Chinese market. We follow the formula used in Tanaka and Nakazawa (2008), which is based on Balassa (1979), to calculate the RCA indices.

$$RCA_{J,i} = (X_{J,i} / X_{J,t}) / (X_{JCK,i} / X_{JCK,t}), \qquad (1)$$

where

$X_{J,i}$: Japanese export of industry i to the world,

$X_{J,t}$: Japanese total exports to the world,

$X_{JCK,i}$: Sum of industry i exports of Japan, China, and Korea to the world,

$X_{JCK,t}$: Sum of the total exports of Japan, China, and Korea to the world,

and

$$RCA^{c}_{J,i} = (X^{c}_{J,i} / X^{c}_{J,t}) / (X^{c}_{Jk,i} / X^{c}_{Jk,t}). \qquad (2)$$

$X^{c}_{J,i}$: Japanese export of industry i to China,

$X^{c}_{J,t}$: Japanese total exports to China,

$X^{c}_{Jk,i}$: Sum of industry i exports of Japan and Korea to China,

$X^{c}_{Jk,t}$: Sum of the total exports of Japan and Korea to China.

The equation (1) means that if the RCA takes a value greater than or equal to unity, Japan has a comparative advantage in industry i over both China and Korea in the world market, otherwise that industry does not have a comparative advantage. Similarly, the equation (2) means that if the RCA takes a value greater than or equal to unity, Japan has a comparative advantage in industry i over Korea in the Chinese market. Most industries are predicted to have consistent patterns: they have or do not have a comparative advantage in both cases. Even so, it is also expected that some industries have a comparative advantage for the world market, but do not have it in the Chinese market, or vice versa.

Next we show the estimation formula of the elasticity of substitution between Japanese and Korean exports to China. As explained in Tanaka (2013), we define the elasticity of substitution (σ) as equation (3).

$$\sigma = \frac{d\,ln\,[X_J / X_K]}{d\,ln\,[P_J / P_K]}. \qquad (3)$$

where

X_J : Japanese export quantity to China,

X_K : Korean export quantity to China,

P_J : Japanese export unit price to China,

P_K : Korean export unit price to China.

The estimation formula is as follows.

$$\ln\left(\frac{X_J}{X_K}\right) = \alpha_0 + \alpha_1 \cdot \ln\left(\frac{P_J}{P_K}\right) + \varepsilon. \qquad (4)$$

$$\alpha_1 < 0.$$

Using equation (4), we regress the Japanese relative export quantity over Korea on the Japanese relative export unit price over Korea in logarithms. The estimated coefficient of the relative price term in absolute value indicates the elasticity of substitution (σ). We use monthly data from the U.N., *COMTRADE* database for the period from 2013 to 2017. We use these estimated values of the elasticity in simulation of the costs of being outside of FTA since as Hertel, Hummels, Ivanic, and Keeney (2004) argue, we consider that simulation results are very sensitive to values of trade elasticity, and so estimated values would be better to use than values obtained from the literature.

3-2. Simulation methodology

Using the estimated values of the elasticity of substitution, we conduct simulation analyses. The costs of being outside of the China-Korea FTA, or the amount of trade diversion from Japan to Korea can be basically captured by the reduction of Japanese exports to China. Since the FTA was in effective in 2015, the data is available for the period including both before and after the FTA installation, which makes it possible to compare actual decreases with simulated ones. We estimate the decreased amount in the following formula, which is based on Okuda (2010).

$$\Delta M_{ijh} = M_{ijh} * r_{ijh} * \eta_h, \qquad (5)$$

where

ΔM_{ijh} : export shift of commodity h from exporter j in country i's imports,

M_{ijh} : country i's imports from country j in the base year 2013,

r_{ijh} : tariff reduction $(|\tau_{2013} - \tau_{2017}|)$, and

η_h : the elasticity of substitution for commodity h among imports of country i in an absolute value.

Here, ΔM_{ijh} means export shifts accruing to all the third countries. Thus, we single out the export reduction only for one country, which is Japan, by using the following formula.

$$\Delta M_{ijkh} = \Delta M_{ijh} * [M_{ikh} / (M_{ih} - M_{ijh})], \qquad (6)$$

or

$$\Delta m = n_J * \Delta M, \qquad (7)$$

where

$\Delta M_{ijkh} = \Delta m$: export shift of commodity h from country k, Japan, to country j, Korea, that is the Japan's costs of being outside of FTA,

M_{ikh} : imports of commodity h from country k, Japan, for country i, China,

M_{ih} : total imports of commodity h for country i, China,

$M_{ih} - M_{ijh}$: total imports of commodity h from all the third countries,

$M_{ikh} / (M_{ih} - M_{ijh}) = n_J$: import share of country k, Japan, to total imports from all the third countries for country i, China, and,

$\Delta M = \Delta M_{ijh}$: export shifts for all the third countries.

The actual decrease in imports is calculated by subtracting the Chinese import value in 2013 from that in 2017.

$$\Delta \text{am} = 2017m_J^C - 2013m_J^C \ , \qquad (8)$$

where

$2013m_J^C$: Chinese imports from Japan in 2013,

$2017m_J^C$: Chinese imports from Japan in 2017.

Because of the bilateral FTA in 2015, Chinese imports from Japan are supposed to decrease from 2013 to 2017. We compare the actual decrease in imports ($|\Delta \text{am}|$) with the simulated amount of decrease ($\Delta m > 0$). We then take a ratio of the simulated amount over the actual amount to see if there is a case where the ratio is meaningfully high. By so doing we can investigate the extent that the reduction of Chinese imports can be attributed to the shift of sourcing from Japan to Korea. We consider this shift as the cost of being outside of the FTA and a kind of trade diversion effect for the third country.

4. Results of data analysis and simulation

Our data is obtained from various sources: the U.N., *COMTRADE database*, Ministry of Finance, *Trade Statistics of Japan*, Korean International Trade Association's database, and the WTO, *Tariff Downloaded Facility*. Trade data and Chinese import tariff rates for Japan are collected at the HS 4-digit classifications, and Chinese import tariff rates for Korea are collected at the HS 6-digit classifications. We first selected top 50 industries, and then chose 31 industries that are common to both Japanese and Korean exports.

Table 4 shows the calculated RCA indices (Equations 1 and 2) and estimates of the elasticity of substitutions (Equation 4), together with the Japanese export values and China's tariff schedule imposed on Japanese and Korean 31 commodities in 2017. We can consider 4 patterns: whether RCA is greater than unity or not, and whether the elasticity of substitution is relatively smaller or not. The most concerned pattern is, however, the case where an industry does not have a comparative advantage in China while does have it in the world, and at the same time, the substitution elasticity is relatively low in an absolute term. This case suggests that the industry is faced with the difficulty caused by Chinese reduced tariffs on Korean imports with tariffs being kept same for the Japanese exporters. In other words, those Japanese industries are expected to have a greater potential of expanding exports if free trade arrangement with China happens.

Table 4 also shows that the RCA indices are diverse from higher to lower than unity. Overall the magnitude of RCA is in a moderate range. Figure 2 plots the two types of RCA indices together for the 31 industries. We can observe that there is a positive relationship between them. That is, most industries that have a comparative advantage over Korea and China in the world market also have a comparative advantage over Korea in the Chinese market. There are 6 industries that do not have a comparative advantage either in the world or in China. However, 8 industries have a comparative advantage in the world but do not have it in China. These industries are represented by the dots located in the fourth quadrant in the figure.

We turn to look at the estimates of the elasticity of substitution in Table 4. For 10 industries the elasticity could not be estimated unfortunately because of the data availability, and for another 10 industries the estimates are not statistically significant. The remaining estimates for 11 industries are statistically significant. For three of them, however, the sign is posi-

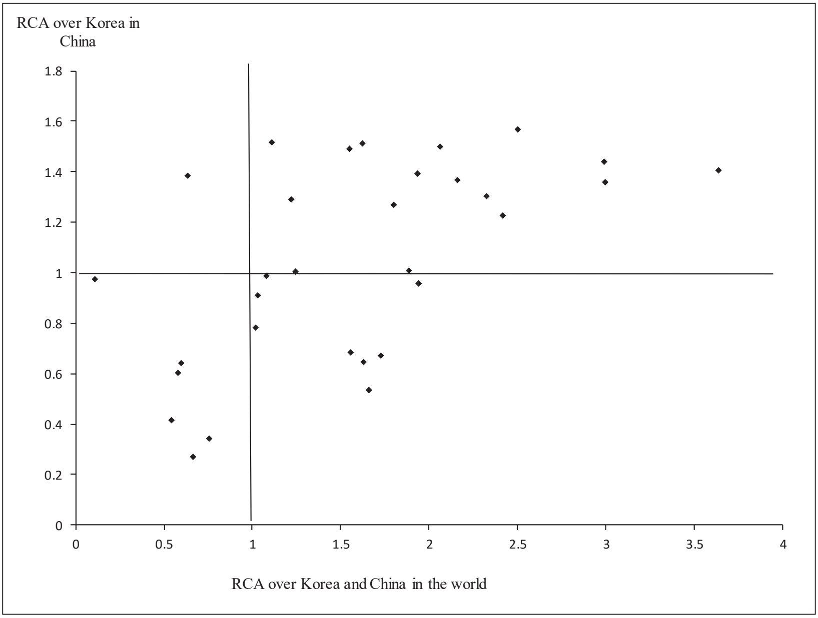
Table 4. Calculations and Estimates: Revealed Comparative Advantage (RCA), Elasticity of Substitution, and Chinese Tariff Rates, 31 HS 4-digit Classifications

HS Code	Japanese exports to World, 1000U.S. $	Japanese exports to China, 1000U.S. $	RCA over China and Korea in the world	RCA over Korea in China	Estimates of Elasticity of Substitution	t-value		Tariff Rate for Japan, HS 4-digit, %	Tariff Rate for Korea, HS 6-digit, %
2710	8897024	783794	0.66	0.27	0.17	1.04		6.31	271012(6.88), 271019(6.38)
2901	1588955	1137866	1.72	0.67	0.48	0.56		2.00	
2902	5154141	2870655	1.66	0.54	3.14	2.10	**	2.00	290250(1.4)
3304	2622169	722414	1.55	0.68	0.80	5.29	***	6.50	
3824	3663611	791749	2.16	1.37	−0.87	−10.53	***	6.83	382475(6), 382476(6), 382478(6), 382481(6), 382482(6), 382483(6), 382484(5.2), 382485(5.2), 382486(5.2), 382487(5.2), 382488(5.2), 382491(5.2), 382499(3.76)
3907	2516904	865154	1.01	0.78	−0.63	−2.10	*	6.76	390710(6), 390720(6), 390730(6), 390740(6.1), 390750(9.5), 390761(5.35), 390769(5.35), 390770(6.2), 390799(5.43)
3919	2558506	834221	1.80	1.27	−0.29	−1.56		6.09	391990(4.53)
3920	1732879	5500702	1.93	1.39	−0.67	−2.28	**	7.42	392010(4.6), 392030(4.6), 392043(4.5), 392049(4.5), 392051(4.6), 392061(4.6), 392062(4.6), 392069(9), 392094(7)
7208	7356491	1077974	2.98	1.44	−0.50	−1.70	*	5.36	720853(5.1), 720854(5.1)
7225	4665638	1181057	1.55	1.49	−1.10	−3.73	***	4.63	722511(2.1)
7403	3230128	1146215	2.41	1.23	−0.63	−0.40		1.57	
8408	3896687	861715	2.99	1.36	0.00	0.04		5.00	840810(2.5), 840820(11.9), 840890(5.5)
8414	5186311	947871	1.22	1.29	−0.01	−0.51		8.78	841430(8.24), 841459(7.18), 841480(5.04), 841490(8.08)
8479	9623088	3378672	2.32	1.30	—	—		5.13	847910(5.6), 847960(9), 847981(9), 847982(4.9)
8481	4650038	1331322	1.11	1.51	−0.53	−1.43		5.78	848180(4.92)
8486	22743309	6557634	3.63	1.40	0.07	0.71		1.36	848640(2.83), 848690(2.05)
8504	3942387	818238	0.63	1.38	−0.80	−2.74	**	7.33	850423(5.88), 850431(4.3), 850440(4.23), 850490(4.74)
8507	4469794	856683	1.03	0.91	0.11	0.85		10.88	850710(6.9), 850720(6.9), 850730(8), 850740(9.6), 850750(9.6), 850760(9.6), 850780(9)
8517	4973091	1986902	0.11	0.97	—	—		0.66	851770(1.21)
8525	3460844	907479	1.24	1.00	—	-		0.50	852580(1.5), 852580(8.1)
8529	2541695	948742	0.54	0.42	−0.59	−5.34	***	5.59	852990(8.57)
8532	5049233	1404540	2.50	1.57	—	—		0.00	
8534	2583950	816833	0.59	0.64	—	—		0.00	
8536	8323214	2490892	1.62	1.51	—	—		6.38	
8538	3064769	925770	1.63	0.64	0.00	0.02		6.39	853810(3.85)
8541	8855686	2273740	1.08	0.99	—	—		0.00	
8542	26675246	6993078	0.75	0.34	—	—		1.91	854231(2.28), 854232(1.73), 854233(1.73), 854239(1.73)
8708	34545687	7231611	2.06	1.50	0.98	4.03	***	9.84	870810(9.6), 870829(9), 870830(8.02), 870850(8.77), 870880(9), 870895(9)
9001	4638243	1810621	1.94	0.96	—	—		11.25	900110(4.5), 900120(5.8), 900190(6.35)
9013	5667577	4027686	0.58	0.61	−1.67	−11.08	***	5.98	901380(6.7)
9031	1052451	4118679	1.88	1.01	—	—		3.50	903110(5.05), 903180(4.14)

Sources: Ministry of Finance, *Trade Statistics of Japan*; Korean International Trade Association; United Nations, *COMTRADE Database*; World Trade Organization, *Tariff Download Facility*.

Notes: The t-values show the significance level of the estimates of the elasticity of substitution, and asterisks mean 1% level of significance by ***; 5% level of significance by **; and 10% level of significance by *. On the WTO database, we can obtain tariff rates only at the 6-digit commodities of Chinese imports from Korea.

Figure 2. Japanese Industries' Revealed Comparative Advantage (RCA): World market and Chinese market, 2017



Notes: Authors' calculations. 31 commodities of the HS 4-digit classifications. The comparative advantage is defined as is over China and Korea in the world market, and as is over Korea in the Chinese market. With the value taking greater than or equal to unity, the industry is considered to have a comparative advantage. The industries located in the fourth dimension have a comparative advantage in the world market while they do not have it in the Chinese market.

tive, which is not consistent with the theory, and accordingly we exclude them from simulation analysis. The rest of 8 industries with negative estimates of the substitution elasticity are used for simulation to investigate the diversion effects. The elasticity in an absolute value can be classified into two cases: relatively higher elasticity and relatively lower elasticity. The relatively higher elasticity means that the commodities are more likely substitutable with rivals' exports as generic products, whereas the relatively lower elasticity means that the commodities are not easily replaced by others, since the product has a specific characteristic (Tanaka, 2013).

Next, we look at the simulation results shown in Table 5. The actual changes in Chinese imports from Japan show both positive and negative. Even though the China-Korea FTA is effective, Japanese exports to China do not decrease for some industries. It is obvious that trade values would change for many reasons other than free trade agreements. In particular, when China increases total imports, Japanese exports to China would not necessarily decrease even if Korean exports increase due to the FTA. Alternatively, when China decreases total imports, both Korean and Japanese exports to China would naturally decrease. It is also noticed that even in this case, the reduction of Japanese exports could be larger than that of Korean exports because of trade diversion from Japan to Korea. Our data show that 18 Japanese industries experienced a decrease of imports rather than an increase of imports during the sample period.

We focus on the ratio presented in the previous section ($\Delta m/|\Delta am|$), whose estimates are shown in the column of "Due to Trade Diversion" in Table 5. The ratio is represented as a percentage of the simulated value over actual value. We consider that if this ratio is relatively bigger with a lower RCA in China than for the world, it could be inferred that at least some part of the actual decrease in Chinese imports from Japan can be attributed to the trade diversion.

Among those 18 commodities whose Chinese imports from Japan decreased in 2017, polyacetals (HS3907) should be given particular consideration. The RCA of this industry in the world shows the level of just about unity, but it is 0.78 in China, which implies that the industry is competitive worldwide, but it is not so in China. This might be caused due to the bilateral FTA. Looking at the HS 6-digit classifications within that industry, we find that for some type of polyesters (HS390799), Chinese imports de-

Table 5. Simulation Results of the Effects of Trade Costs of the China-Korea FTA for Japan: 8 HS 4-digit Commodities, Including 18 HS 6-digit Commodities

HS Code4-digit	Commodity Name	Elasticity of Substituti on	RCA in the World	RCA in China	HS Code 6-digit	Commodity Name	Due to Trade Diversion (Δm/ Δam, %)	Tariff Reduction (2013 -2017)	Import Reduction Rate (2013-2017, %)			Estimated Trade Diversion Effect for Japan (Δm)	Actual Change in Import (Δam)
									Japan	Korea	World		
2902	Cyclic hydrocarbons	3.14	1.66	0.54	290250	Cyclic hydrocarbons; styrene	1.17	0.006	−72.0	−27.4	−36.8	7429783.0	−632889909
3304	Cosmetic and toilet preparations	0.80	1.55	0.68			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
3824	Prepared binders for foundry moulds or cores	−0.87	2.16	1.37	382475	Mixtures containing halogenated derivatives	n.a.	0.005	n.a.	n.a.	n.a.	n.a.	n.a.
					382476	Mixtures containing halogenated derivatives	n.a.	0.005	n.a.	n.a.	n.a.	n.a.	−7597
					382478	Mixtures containing halogenated derivatives	0.002	0.005	93.0	171.5	19.3	1.3	59124
					382481	Mixtures and preparations	0.03	0.005	−45.4	n.a.	−44.5	10.3	−38576
					382482	Chemical products, mixtures and	n.a.	0.005	n.a.	n.a.	n.a.	n.a.	n.a.
					382483	Chemical products, mixtures and	n.a.	0.005	n.a.	n.a.	−38.5	n.a.	n.a.
					382484	Chemical products, mixtures and	n.a.	0.05	n.a.	n.a.	n.a.	n.a.	n.a.
					382485	Chemical products, mixtures and	n.a.	0.052	n.a.	n.a.	n.a.	n.a.	n.a.
					382486	Chemical products, mixtures and	n.a.	0.052	n.a.	n.a.	n.a.	n.a.	n.a.
					382487	Chemical products, mixtures and	n.a.	0.052	n.a.	n.a.	n.a.	n.a.	n.a.
					382488	Chemical products, mixtures and	n.a.	0.052	n.a.	n.a.	n.a.	n.a.	n.a.
					382491	Chemical products, mixtures and	n.a.	0.052	n.a.	n.a.	n.a.	n.a.	n.a.
					382499	Chemical products, mixtures and	n.a.	0.04	n.a.	n.a.	n.a.	n.a.	n.a.
3907	Polyacetals, other polyethers and epoxide resins, in primary forms	−0.63	1.01	0.78	390710	Polyacetals; in primary forms	27.13	0.005	0.2	39.2	22.9	44313.5	163322
					390720	Polyethers; in primary forms, excluding	0.59	0.005	−7.0	−9.6	−5.0	49939.4	−8506320
					390730	Epoxide resins; in primary forms	1.53	0.005	−4.3	16.9	13.8	72518.9	−4728078
					390740	Polycarbonates; in primary forms	0.44	0.004	15.5	0.5	0.1	243275.6	54769354
					390750	Alkyd resins; in primary forms	0.02	0.005	−53.1	−36.3	−27.9	324.7	−1781611
					390761	Poly(ethylene terephthalate); in	n.a.	0.05	n.a.	n.a.	n.a.	n.a.	7469659
					390769	Poly(ethylene terephthalate); in	n.a.	0.05	n.a.	n.a.	n.a.	n.a.	38311933
					390770	Poly(lactic acid); in primary forms	0.06	0.003	−10.3	−75.0	52.1	49.8	−88602
					390799	Polyesters; n.e.c. in heading no. 3907,	3.03	0.01	−1.6	28.3	10.7	124854.5	−4117990
3920	Plastics	−0.67	1.93	1.39	392010	Plastics; plates, sheets, film, foil and strip (not	11.07	0.02	−4.8	17.7	−1.0	1857969.0	−16776778
					392030	Plastics; of polymers of styrene, plates,	2.52	0.02	6.8	−41.7	−8.3	65424.7	2600739
					392043	Plastics; polymers of vinyl chloride,	2.30	0.02	8.0	36.0	−15.4	30368.5	1319109
					392049	Plastics; polymers of vinyl chloride,	0.52	0.02	34.6	−13.6	−1.0	21604.4	4133978
					392051	Plastics; of acrylic polymers, polymethyl	0.42	0.02	63.8	45.1	−18.1	99111.5	23862851
					392061	Plastics; plates, sheets, film, foil and strip (not	0.58	0.02	−32.5	−33.3	−29.4	181646.4	−31524055
					392062	Plastics; plates, sheets, film, foil and strip (not	4.35	0.02	−9.7	−47.5	−31.4	4072909.9	−93663174
					392069	Plastics; plates, sheets, film, foil and strip (not	0.33	0.01	−56.0	−4.4	−21.3	77438.4	−23799314
					392094	Plastics; plates, sheets, film, foil and strip (not	17.22	0.03	6.3	−90.7	−42.3	6713.2	38981
7208	Iron or non-alloy steel	−0.50	2.98	1.44	720853	Iron or non-alloy steel; (not in coils), flat-	0.001	0.009	−76.7	711.4	−62.8	17.5	−1859290
					720854	Iron or non-alloy steel; (not in coils), flat-	0.01	0.009	−57.3	−88.9	−64.4	33.4	−292217
7225	Alloy steel flatrolled products, of a width	−1.10	1.55	1.49	722511	Steel, alloy; flat-rolled, width 600mm or more, of silicon-electrical steel, grain-oriented	0.44	0.009	−97.2	−81.4	−91.9	684169.9	−156652108
8504	Electric transformers, static converters (e.g. rectifiers) and inductors	−0.80	0.63	1.38	850423	Electrical transformers; liquid dielectric, having	0.24	0.03	−39.1	−74.7	−4.9	2.5	−1051
					850431	Electrical transformers; n.e.c. in item no.	0.05	0.007	16.0	7.6	−9.2	2786.6	5103946
					850440	Electrical static converters	0.06	0.02	−31.9	24.4	−17.5	222814.2	−370892378
					850490	Electrical transformers, static converters and	1.70	0.03	−18.9	−83.1	−61.8	571075.8	−33654780
8529	Transmission apparatus	−0.59	0.54	0.42	852990	Reception and transmission apparatus; for use with	−0.17	−0.0007	7.1	97.1	65.0	−112147.0	67826392
8708	Motor vehicles; parts and accessories, of heading no. 8701 to 8705	0.98	2.06	1.50	870810	Vehicles; bumpers and parts thereof, for the	0.10	0.004	−32.3	−39.3	−10.9	18623.8	−18898790
					870829	Vehicles; parts and accessories, of bodies,	1.25	0.01	−19.4	−43.6	−3.0	1342180.3	−107014676
					870830	Vehicle parts; brakes, servo-brakes and parts	0.22	0.008	−45.6	−2.0	−3.7	364372.0	−167230258
					870850	Vehicle parts; driveaxles with differential,	0.14	0.004	41.8	−3.6	42.3	70076.3	49375886
					870880	Vehicle parts; suspension systems	1.30	0.01	12.6	53.9	18.2	300028.3	23075857
					870895	Vehicle parts; safety airbags with inflater	0.12	0.01	60.6	−56.0	11.9	63599.9	52697079
9013	Liquid crystal devices not constituting articles provided	−1.67	0.58	0.61	901380	Optical devices, appliances and instruments; n.e.c. in heading no. 9013 (including liquid	7.42	0.02	−23.0	−50.3	−38.6	92806073.4	−1250669731

Sources: Ministry of Finance, *Trade Statistics of Japan*; Korean International Trade Association; United Nations, *COMTRADE Database*; World Trade Organization, *Tariff Download Facility*.

Notes: Authors' calculations and estimations. In the table, the positive estimates of the elasticity of substitution are written in italic. For the commodity HS852990, the Chinese tariff rate was actually raised for Korea from 2013 to 2017.

creased, and that the ratio of the simulated decrease indicates 3%.[iv] Since the elasticity of substitution of this commodity is 0.6 in an absolute term, which is lower, this product should be well differentiated from a Korean counterpart in the Chinese market, but a small part of its export could be possibly diverted to Korea. This argument could also be supported by China's import reduction rates: total imports and import from Korea increased while import from Japan decreased.

The commodity category, HS3920, plastics, also presents an important case. Its competitiveness seems to be kept in China, since the RCA in China is 1.39, which is above unity even though slightly lower than the RCA for the world (1.93). The elasticity value is 0.67 in absolute terms, and so that the product could be well differentiated. Within this category, HS 6-digit commodity, HS392010, experienced about 11% of the trade diversion effect.[v]

Those industries exporting the commodities above can be considered as facing the negative effect of a China-Korea bilateral FTA. But if we turn to the other categories, iron and non-alloy steel (HS7208), and its sub-categories (HS720853 and HS720854), the ratios of trade diversion for the two sub-categories show only 0.001% and 0.01%, respectively.[vi] We consider that the source of strength can be attributed to the uniqueness of products that Japanese makers provide.

Liquid crystal devices (HS9013), on the other hand, show that the elasticity of substitution is 1.67 in absolute terms, the RCA for the world is 0.58, and the RCA in China is 0.61, which means that the commodity is less competitive with lower extent of uniqueness not only in China but also in the world. For the sub-category, HS901380, the ratio of trade diversion is 7.4%.[vii] In this case, it would be ambiguous whether a free trade arrangement would help increase its exports.

5. Conclusion

The China-Korea FTA was completed ahead of the Japan-China-Korea FTA. Past studies provide insightful simulation results of the bilateral and trilateral FTA, but their discussions lack an argument on comparative advantage. This study, therefore, has tried to deepen the discussion on FTA impacts by explicitly considering the pattern of comparative advantage.

Out of 50 largest export commodities to China, 31 commodities are commonly listed in Japanese and Korean exports. This is the evidence that both countries are competing very harshly with each other in the Chinese market, and therefore, we consider that a closer look at the patterns of comparative advantage between Japan and Korea is very important. At the HS4-digit classifications level, we find that many Japanese industries who have a comparative advantage over China and Korea in the world market do have a comparative advantage over Korea in China. The elasticity of substitution is estimated to be lower values, implying that the Japanese goods are rather unique and not easily replaced by other countries' goods.

We conducted simulation analyses to verify the existence of trade diversion effects. Taking a ratio of the simulated amount of decrease in imports by China over its actual decrease in imports, we find that some Japanese industries experienced a relatively significant impact of the bilateral FTA. Some kinds of polyesters (HS390799) and plastics (HS392010), for example, have a comparative advantage worldwide and lower values of the elasticity of substitution, but are faced with the significant reduction of imports by China. The portion of the trade diversion accounts for 3% and 11%, respectively. We consider that these industries may be paying the costs of being outside of the China-Korea FTA, and thus, a trilateral or even larger FTA should be formed.

In this study, both a comparative advantage and trade elasticity are explicitly considered to argue the impact of a preferential trade agreement. Concerning the elasticity, however, we could estimate for only 11 industries. Thus, we need to increase samples in the future. Regarding the simulation of trade diversion effects, the tariff data on Chinese imports from Korea could be obtained only at the HS 6-digit classifications, whereas tariff rates on the imports from Japan could be obtained at the HS 4-digit classifications. In the simulation, therefore, we had to use the elasticity of substitution estimated at the HS 4-digit level, together with the tariff reductions of Chinese imports from Korea calculated at the HS 6-digit level. We consider that this inconsistency must be solved in the next study.

Notes

i) This study is based on the Lihong Fang's Master thesis submitted to the Graduate School of Toyo Gakuen University in March 2019. The authors are grateful for helpful comments from participants of the 15th WEAI International Conference held at Keio University in March 2019. Remaining errors are all due to the authors' responsibility.

ii) The Regional Comprehensive Economic Partnership (RCEP) Agreement was signed among 15 countries in November 2020, ahead to the Japan-China-Korea trilateral FTA. The RCEP includes these three countries. The positive impact of the agreement would be larger than the FTA consisting of just three countries as many more countries are going to reduce tariff levels within the region.

iii) There may be negative effects of the THAAD treatment of 2016, which accelerated to heighten the Chinese restrictions against Korean imports.

iv) The commodity name of the category, HS390799, is Polyesters; n.e.c. in heading no. 3907, saturated, in primary forms.

v) The commodity name of the category, HS392010, is Plastics; plates, sheets, film, foil and strip (not self-adhesive), of polymers of ethylene, non-cellular and not reinforced, laminated, supported or similarly combined with other materials.

vi) The commodity names of these categories, HS720853 and HS720854, are Iron or non-alloy steel; (not in coils), flat-rolled, of a width 600mm or more, hot-rolled, without patterns in relief, of a thickness of 3mm or more but less than 4.75mm, and Iron or non-alloy steel; (not in coils), flat-rolled, of a width 600mm or more, hot-rolled, without patterns in relief, of a thickness of less than 3mm, respectively.

vii) The commodity name of the category, HS901380, is Optical devices, appliances and instruments; n.e.c. in heading no. 9013 (including liquid crystal devices).

References

Abe, Kazutomo, Shujiro Urata, and NIRA, *Japan-China-Korea FTA*. (in Japanese) Nihon-keizai Hyoron-sha, 2008.

Balassa, Bela, "The Changing Pattern of Comparative Advantage in Manufactured Goods," *The Review of Economics and Statistics*, Vol.61, No.2, 1979, pp.259-266.

Baldwin, Richard, and Anthony Venables, "Regional Economic Integration," G. Grossman and K. Rogoff eds., *Handbook of International Economics*. Vol. III, Elsevier Science, 1995, pp.1597-1644.

Caves, Richard, Jeffrey Frankel, and Ronald Jones, *World Trade and Payments: An Introduction*. 9th Edition. Addison Wesley, 2002.

Clausing, Kimberly, "Trade creation and trade diversion in the Canada-United States Free Trade Agreement," *The Canadian Journal of Economics*, Vol.34, No. 3, 2001, pp.677-696.

Hertel, Thomas, David Hummels, Maros Ivanic, and Roman Keeney, "How Confident Can We Be in CGE-Based Assessments of Free Trade Agreements?" NBER Working Paper No.10477, May 2004.

Ishikawa, Kouichi, Keiichi Umada, and Research Group of International Trade and Investment (ITI) eds., *Trends in FTA Strategies*. (in Japanese) Bunshindo, 2015.

Madhur, Srinivasa, "China-Japan-Korea FTA: A Dual Track Approach to a

Trilateral Agreement," *Journal of Economic Integration*, Vol.28, No.3, September 2013, pp.375-392.

Melchior, Arne, *Free Trade Agreements and Globalisation: In the Shadow of Brexit and Trump*. Palgrave Macmillan, 2018.

Okuda, Satoru, *FTA of Korea*. (in Japanese) IDE-JETRO, 2010.

Okuda, Satoru, and Yuichi Watanabe, "Impacts of Korea-China FTA and Japan-China FTA," (in Japanese) IDE-JETRO, 2011. Downloaded at http://www.ide.go.jp.

Tanaka, Iwao, "Uniqueness of Japanese Auto Inputs: An Investigation by the Concept of Incomplete Contract and the Elasticity of Substitution," *Business and Economic Review*, Vol. 3, No. 2, Toyo Gakuen University, 2013, pp.73-97.

Tanaka, Iwao, and Eiichi Nakazawa, "Cross-border Trade in ICT Services and Products: Scale, Pattern, and Comparative Advantage in OECD Countries with Special Focus on Japan," (in Japanese) *Business and Economic Review*, Vol. 2, No. 2, Toyo Gakuen University, 2008, pp.62-96.

Appendix Table 1. 31 HS Code Numbers and Commodity Names Used in This Study

HS Code	Commodity Name
2710	Petroleum oils and oils from bituminous minerals, not crude; preparations n.e.c, containing by weight 70% or more of petroleum oils or oils from bituminous minerals; these being the basic constituents of the preparations; waste oils
2901	Acyclic hydrocarbons
2902	Cyclic hydrocarbons
3304	Cosmetic and toilet preparations; beauty, make-up and skin care preparations (excluding medicaments, including sunscreen or sun tan preparations), manicure or pedicure preparations
3824	Prepared binders for foundry moulds or cores; chemical products and preparations of the chemical or allied industries (including those consisting of mixtures of natural products), not elsewhere specified or included
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms
3919	Self-adhesive plates, sheets, film, foil, tape, strip and other flat shapes, of plastics, whether or not in rolls

3920	Plastics; plates, sheets, film, foil and strip (not self-adhesive); non-cellular and not reinforced, laminated, supported or similarly combined with other materials, n.e.c. in chapter 39
7208	Iron or non-alloy steel; flat-rolled products of a width of 600mm or more, hot-rolled, not clad, plated or coated
7225	Alloy steel flat-rolled products, of a width 600mm or more
7403	Copper; refined and copper alloys, unwrought
8408	Compression-ignition internal combustion piston engines (diesel or semi-diesel engines)
8414	Air or vacuum pumps, air or other gas compressors and fans; ventilating or recycling hoods incorporating a fan whether or not fitted with filters
8479	Machinery and mechanical appliances; having individual functions, n.e.c. in this chapter
8481	Taps, cocks, valves and similar appliances for pipes, boiler shells, tanks, vats or the like, including pressure-reducing valves and thermostatically controlled valves
8486	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor boules or wafers, semiconductor devices, electronic integrated circuits or flat panel displays; machines and apparatus specified in note 9-C to this chapter
8504	Electric transformers, static converters (e.g. rectifiers) and inductors
8507	Electric accumulators, including separators therefor; whether or not rectangular (including square)
8517	Telephone sets, including telephones for cellular networks or for other wireless networks; other apparatus for the transmission or reception of voice, images or other data (including wired/wireless networks), excluding items of 8443, 8525, 8527, or 8528
8525	Transmission apparatus for radio-broadcasting or television, whether or not incorporating reception apparatus or sound recording or reproducing apparatus; television cameras, digital cameras and video camera recorders
8529	Transmission apparatus; parts suitable for use solely or principally with the apparatus of heading no. 8525 to 8528
8532	Electrical capacitors; fixed, variable or adjustable (pre-set)
8534	Circuits; printed
8536	Electrical apparatus for switching, protecting electrical circuits, for making connections to or in electrical circuits, for a voltage not exceeding 1000 volts; connectors for optical fibres, optical fibre bundles or cables
8538	Electrical apparatus; parts suitable for use solely or principally with the apparatus of heading no. 8535, 8536 and 8537

8541	Diodes, transistors, similar semiconductor devices; including photovoltaic cells assembled or not in modules or panels, light-emitting diodes（LED）, mounted piezo-electric crystals
8542	Electronic integrated circuits
8708	Motor vehicles; parts and accessories, of heading no. 8701 to 8705
9001	Optical fibres and optical fibre bundles; optical fibre cables not of heading no. 8544; sheets, plates of polarising material; lenses, prisms, mirrors, of any material; unmounted; not non optical glass
9013	Liquid crystal devices not constituting articles provided for more specifically in other headings; lasers, not laser diodes; other optical appliances and instruments n.e.c. in this chapter
9031	Measuring or checking instruments, appliances and machines, n.e.c. or included in this chapter; profile projectors

（たなか・いわお／東洋学園大学現代経営学部教授）
（ほう・れいこう／中国銀行）