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THE EFFECTS OF THE FREE TRADE AGREEMENT AMONG CHINA, JAPAN AND SOUTH KOREA

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A computable general equilibrium model is used to evaluate the economic effects of a free trade agreement among China, Japan, and South Korea on the world economy. This study is focused on estimating trade creation and diversion effects of the FTA. Results show that there are strong trade diversion effects of the FTA between the member countries and the rest-of-the-world. This is especially true for trade in the high-technology manufacturing sector between the U.S and China. This study also reveals that the member countries under the FTA tend to specialize on the basis of resource endowments, but there exists a significant amount of intra-industry trade among the member countries in all sectors except agricultural and service/utility sectors. In addition, the FTA stimulates the economies of the three countries through increased trade volume, but provides a significant negative effect on economies of non-member countries.

Keywords: Free Trade Agreement, Trade Diversion Effect, Trade Creation Effect, Computable General Equilibrium Model, GTAP
JEL classification: E17, F10, F47

1. INTRODUCTION

The world economy is far from free trade, although economists argue that free trade is the optimal trade policy in terms of welfare of the world population. Most countries, on one side, impose trade restrictions because of various reasons, including protection of their industries or political reasons. However, on the other side, countries seek to have unilateral, multilateral, and regional trade liberalization to increase their exports and also stimulate their economic growth.

There have been 254 free trade agreements (FTAs) around the world since 1948, and

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half of them came after 1995. Some of the FTAs are, for example, the European Union (EU), the Caribbean Community and Common Market (CARICOM), Southern Common Market (MERCOSUR), and the North American Free Trade Agreement (NAFTA). Recently the EU strengthened its operation by adapting a common monetary system among its member countries and also expanding its membership from 15 to 25 countries. The United States also expanded its alliances by completing the US-Central America/Dominican Republic FTA and the US-Australia FTA, and initiating several other FTAs, including the free trade agreement with 33 Western Hemisphere countries, known as FTA of the Americas (FTAA), and the US-Thailand FTA.

Proponents of FTAs argue that they will boost trade in goods and services between member countries and enhance employment opportunities in the countries. It has been said that FTAs usually create some positive effects for member countries, including trade creation. Trade creation is an increase in trade volume among member countries resulting from the reduction or elimination of trade barriers. Trade creation is regarded as beneficial to the member countries and possibly to the welfare of the world as well. However, an FTA also causes trade diversion in which member countries shift import sources from non-member to member countries. The trade diversion is, therefore, beneficial to member countries, but it is harmful to non-member countries. For example, it is expected that with the FTAs recently initiated by the United States, member countries would benefit from increased trade volume, and other trading partners who do not have any FTA with the United States would lose. Likewise, a regional FTA may contribute to more efficient allocation of resources within the region, but possibly at the expense of resource allocation between member countries and non-member countries.

Responding to the FTAs initiated by the United States and the EU, a need for a regional FTA in Asia, mainly among China, Japan, and South Korea, has been growing. If established, the new regional trade region might compete with the EU and FTAA. Resource endowments in China, Japan, and Korea are different from one another; China is labor abundant, Japan is technology and capital abundant, and Korea is high-skilled labor abundant. Therefore, the FTA will bring some positive effects to the countries if it is launched. However, it will also create detrimental effects for other countries, including the United States. Due to its impressive economic growth in the past two to three decades, China experienced its trade with Japan and South Korea rise rapidly. Now the three countries in Northeastern Asia are heavily trade-dependent on each other. In terms of their stages of economic development, Japan has the most advanced economy, and China has the least developed one. South Korea, in terms of both geographical location and economic development, is the middle one. It is therefore important to study the features of trade among them and investigate the prospect and implication of the economic integration of the countries.

The objective of the study is to analyze the effects of a FTA among China, Japan, and South Korea on the world economy, especially estimating trade creation and diversion effects of the FTA. The main hypothesis to be tested here is that because of differences in resource endowments among the countries, the FTA would increase trade

volume through inter-industry trade based on the principle of comparative advantage (Hecksher-Ohlin (1919; 1967)) rather than intra-industry trade based on increasing return to scale (Krugman (1980; 1981)) and national product differentiation (Head and Ries (2001)). An additional hypothesis is that it would create a significant trade diversion effect so that their trading volume with the non-member countries decreases.

A general equilibrium simulation model, in specific, the Global Trade Analysis Project (GTAP) model, is used to estimate the effects of the FTA scenario on the world economy. The GTAP model is desirable for this analysis on at least three reasons. First, the GTAP model is a multi-regional, applied general equilibrium model, which covers most of countries and industry sectors. Second, the model explicitly includes international trade, transport margin, and the global banking sector, which links global savings and investment. Third, it can handle a wide range of economic behavior and also contains powerful capabilities for viewing data and analyzing results.

There are two different scenarios in the analysis for the economies of the northeast Asian countries: (1) the model with the current trade policies in the countries, (2) the model with a free trade agreement among China, Japan and Korea (without all trade barriers). We shall call this agreement the Northeastern Asia FTA (NEAFTA). The GTAP data base originally has five primary factors, 87 world countries and regions, and 57 industrial sectors. In this study, they are regrouped into five primary factors, six world regions, and six industrial sectors.

The remainder of the paper is organized as follows. The second section overviews the general economic conditions and trade structures of China, Japan, and South Korea. The third section details the GTAP model and specification in this study. The fourth section presents simulation results. The final section summarizes and concludes.

2. OVERVIEW FOR THE ECONOMIES OF CHINA, JAPAN, AND SOUTH KOREA

2.1. Economic and Trade Structures of the Countries

If the three countries form a free trade bloc, it would be one of the largest single markets in the world in terms of population and total GDP. These three countries had an aggregate GDP of $US 5,703 billion in 2001 (Table 1). China is a country of 1,269 million people with a GDP of $US 1,159 billion. Japan has a much smaller population (126 million) with a GDP of $US 4,177 billion. South Korea, a remarkably developing and emerging country who already entered the OECD group, has a 47 million population with a GDP of $US 427 billion. In proportion to the size of their economy, their trade volume is near that of the EU. Therefore, a free trade agreement among the three countries might bring a significant shock to the world economy. The United States may receive the largest shock from the FTA mainly because the three countries have been among the largest trading partners with the United States in terms of trade volume.

Table 1. General Economic Statistics of the Selected Countries or Regions

Series	US	China	Japan	South Korea	EU	ROW
Population	277.498	1269.909	126.802	47.582	376.256	4034.483
GDP	10082155.00	1159031.38	4177569.75	427646.09	7929524.50	7502675.00
Merchandize Import	1300885.75	281232.25	413063.28	162578.63	2571408.00	2415503.00
Merchandize Export	907491.00	388381.19	478421.53	191797.38	2603932.00	2574648.00
Land	42102.7	45781.0	8253.4	8594.4	33755.5	156324.3
Unskilled Labor	3156502.8	428191.3	1159898.8	127350.3	1690243.0	2043615.0
Skilled Labor	2230390.8	103172.3	706537.7	54094.2	1160469.4	950645.8
Capital	3644019.8	369013.4	1345034.9	182281.8	3035743.5	3036919.0
Natural Resources	22605.5	17242.2	4821.6	727.6	18637.4	136372.6
Food and Agricultural Sector	944676.8	453862.2	389857.9	70462.0	978181.0	1965700.6
Natural Resource Industry	489780.9	302612.1	144599.9	20294.6	459897.8	1160495.6
Labor Intensive Manufacturing	270677.3	273707.7	102796.6	34838.5	274585.8	532167.8
Mid-tech. Manufacturing	1144492.0	428750.8	614015.9	103409.0	1273633.5	1338538.9
High-tech. Manufacturing	2516019.0	700740.5	1321205.8	264537.9	2439963.0	1986807.6
Utility and Services	12586357.0	976180.6	4759208.0	475944.6	9176874.0	7597960.5

Notes: The unit of population is million people and the units of the other variables are million US dollars. The five rows in the middle (Land to Natural Resources) present distribution of total output to five primary factors for each region under the base scenario. The last six rows present industry output of six sectors. The unit is million US dollars.

With each other China, the European Union, Japan, South Korea, and the United States have been the largest trading partners and have traded over 60 percent of goods traded in the world market. Because of differences in resource endowments among China, Japan, and South Korea, trade patterns among the countries have been more inter-industry trade based on the principle of comparative advantage than intra-industry trade. China has specialized in producing labor intensive manufacturing and agricultural goods and exported them to Japan and South Korea. Japan has specialized in producing high technology manufacturing goods and exported them to China and South Korea. South Korea's trade with China and Japan is based on both inter- and intra-industry trade. South Korea has specialized in producing mid-technology manufacturing and high-technology goods and exported them to Japan and China. Even though most trade among these countries is via inter-industry, there still has been some degree of intra-industry trade of high-technology manufacturing goods among the countries. China's exports of high-technology manufacturing goods to Japan and Korea were about $US 20.5 and 5.5 billion, respectively, while Japanese exports to China and South Korea were $US 34.5 and 19.9 billion, respectively in 2002. South Korea's exports of high-technology manufacturing goods to China and Japan were $US 16.3 and 8.6 billion, respectively.

Trade patterns of these three countries with the European Union and United States have been established on the basis of both intra- and inter-industry trade. In general,

China and South Korea have exported labor intensive manufacturing goods to the EU countries and the United States and imported high-technology manufacturing goods from these two regions. However, the EU and the United States also have imported high-technology manufacturing goods from China and South Korea, indicating that there is a fair amount of intra-industry trade in the high-technology sector among these countries. On the other hand, Japan's trade with the European Union and the United States are intra-industry trade because of similarity of resource endowments.

With respect to the trade specialization index (TSI), Wong *et al*. (2004) show that South Korea exports less specialized products, and consequently, Korea is facing more competition than China and Japan. Therefore, the export structure of South Korea is more vulnerable against domestic and foreign shocks than China and Japan are. Based on export similarity index (ESI), they also show that the export structures of China, Japan, and South Korea are getting similar to each other over time, suggesting that the competition among the three countries in the world market is intensifying. The ESI between China and Japan has increased fast. One implication is that the rapid economic growth of China is a bigger threat to Japan than to South Korea. However, it is important to note that in these years the export competition between Japan and South Korea remained the most severe among the three countries. The results can be compared with those by Park (2003) and Kim (2004).[1]

The three countries had intra-regional shares increasing from 1998 to 2003. A higher intra-regional trade share of a group of countries implies that the countries are more inter-dependent in trade. Intra-regional export share increased from 15.0% in 1998 to 22.2% in 2003, and intra-regional import share also increased from 20.5% to 24.6% during the same period. These figures are remarkably high, albeit lower than the corresponding figures for EU and NAFTA, considering the fact that the countries do not have a free trade agreement. Vertically differentiated industries and geographical adjacency would be reasons for the high intra-regional trade among the countries. Intra-regional trade is an important element in the total composition of trade for the region. Petri (1993) concludes that intra-regional trade has always been a substantial part of the region's trade composition. Some scholars even attribute intra-regional trade as a source of steady East Asian growth throughout the 1990s despite a worldwide recession during the period between 1990 and 1992 (Barfield (1997)).

[1]The former measured the ESIs of Korea, China and Japan using HS 6 digit codes and the latter using HS 4 digit codes. Both Kim and Park found that the ESIs between Korea and Japan were more stable than what Wong *et al*. suggest.

Table 2. Export Sales in the Six Sectors among the Selected Countries or Regions

Series	US	China	Japan	South Korea	EU	ROW
US						
Food and Agricultural Sector	0	2825.48	11316.3	2968.68	7158.89	34884.35
Natural Resource Industry	0	671.66	3182.36	762.18	6566.15	16758.64
Labor Intensive Manufacturing	0	639.48	816.45	295.13	2365.71	15554.65
Mid-tech. Manufacturing	0	2858.11	4867.14	1982.23	17069.26	49178.11
High-tech. Manufacturing	0	18071.59	36232.71	17736.52	119028.01	294844.03
Utility and Services	0	3933.72	15526.31	5660.56	109924.2	85197.46
China						
Food and Agricultural Sector	1370.8	0	4858.33	1447.32	2057.7	6075.85
Natural Resource Industry	9606.1	0	4990.09	1886.47	3323.41	6734.88
Labor Intensive Manufacturing	18823.41	0	19167.74	2962.98	11166.89	36210.18
Mid-tech. Manufacturing	26786.97	0	5949.63	1844.57	14300.42	18908.36
High-tech. Manufacturing	46829.86	0	20505.57	5599.53	30029.89	55573.27
Utility and Services	3616.2	0	1786.84	303.89	9921.04	6829.58
Japan						
Food and Agricultural Sector	423.63	314.9	0	246.31	187.53	2368.89
Natural Resource Industry	1483.52	1119.29	0	1179.32	1012.48	3228.61
Labor Intensive Manufacturing	566.48	5601.67	0	525.65	637.56	2581
Mid-tech. Manufacturing	7274.19	5781.02	0	4347.96	5439.04	16841.55
High-tech. Manufacturing	111064.3	34542.33	0	19994.6	56026.01	130442.94
Utility and Services	4017.14	1205.01	0	1061.25	18738.82	14769.27
South Korea						
Food and Agricultural Sector	274.62	175.42	1288.65	0	164.11	663.04
Natural Resource Industry	256.12	493.63	445.35	0	200.45	702.57
Labor Intensive Manufacturing	3408.83	5232.31	1253.31	0	1513.19	7630.15
Mid-tech. Manufacturing	3838.7	4863.56	3676.97	0	1265.12	7724.17
High-tech. Manufacturing	26350.44	16330.37	8686.87	0	16746.98	45967.11
Utility and Services	3384.04	288.35	1150.59	0	7524.37	5414.23
EU						
Food and Agricultural Sector	9845.31	1115.07	4205.29	883	121660.63	39482.05
Natural Resource Industry	11374.56	1349.68	2466.27	678.45	70935.28	28310.49
Labor Intensive Manufacturing	8304.49	1420.82	3948.33	1107.81	65412.13	36555.09
Mid-tech. Manufacturing	27154.98	3966.14	3994.58	2105.35	190069.45	86667.2
High-tech. Manufacturing	148801.2	29588.35	27144.52	10008.87	715771.75	349538.25
Utility and Services	84297.12	10231.36	36576.19	11274.56	211401.34	156913.44
ROW						
Food and Agricultural Sector	38620.3	8977.72	18655.75	3771.86	52861.42	90017.94
Natural Resource Industry	106448.23	15099.56	51805.1	21948.24	113252.45	110499.02
Labor Intensive Manufacturing	65357.72	8816.13	4120.95	1644.43	63703.38	42475.36
Mid-tech. Manufacturing	90568.55	15390.97	20302.48	7692.07	91189.82	120977.67
High-tech. Manufacturing	316600.56	46677.89	46071.06	14714.22	188058.92	271581.34
Utility and Services	80810.9	23649.92	29848.47	8994.1	169352.11	124239.3

Notes: This table presents export sales of six sectors for each region. The unit is million US dollars. In each cell, the value denotes volume of export from the country in the row to the country in the column.

Table 2 presents export sales of commodities from region *r* to region *s* for the year 2001. The numbers show that China is more important to South Korea's exports than to Japan's, implying that the structure of South Korea's exports are more suited to China. The table also reveals that Japan is a more important market to China than to Korea. It reflects the fact that China's exports are specialized mainly in low-price consumption products such as apparel, clothes, footwear, toys, and furniture and it is suited to the demand by Japan. The table also suggests that Korea's industries depend heavily on Japan.

China imports high-tech manufacturing goods from Japan, the EU, the United States, and South Korea. Japan and the EU are the first and second largest exporting countries, respectively, of high-tech products to China. With the NEAFTA, we expect that China will divert its import sources of high-tech goods from the EU and the United States to Japan and South Korea. China's exports of food and agricultural goods and natural resource products to Japan and South Korea will increase remarkably, while its exports to the EU and the United States will shrink.

Japan has been the most important trading partner with the United States. Japan imported $US 11.3 billion of food and agricultural products from the United States, which is the largest as a single country and is more than all EU countries' import from the United States. Within the northeast Asian region, Japan imported $US 4.8 and 1.2 billion of food and agricultural goods, respectively, from China and South Korea. With the NEAFTA, it is expected that Japan will divert its import sources of food and agricultural goods from the United States to China and South Korea.

South Korea imports food and agricultural products mainly from the United States and China. With the FTA, South Korea will increase its imports especially from China and decrease its import of the goods from ROW including the United States. Main trading partners with South Korea regarding high-technology products are, by the order based on trading volume, Japan, the United States, and the EU. Under the new FTA, it is expected that South Korea will significantly increase the import of the high-technology products from Japan.

2.2. A Free Trade Agreement among the Countries

The ASEAN + 3, a gathering of ASEAN countries plus China, Japan, and South Korea, held its first leaders' meeting in December 1997. Although it would become an important forum for East Asian policy discussions, ASEAN + 3 was too diverse to form the basis for economic integration through a formal free trade arrangement. Thus, from the outset a search began for more practical alternatives, such as bilateral or smaller sub-regional trade agreements. The key change consisted of the decisions by Japan and South Korea in 1999 to break with their long-standing policy of exclusive multilateralism and launch multi-track trade policies that included bilateral, sub-regional, and even cross-regional trade arrangements.

Within Asia, Singapore led the way, acting independently of its ASEAN partners

and announcing that it intended to become the hub of a number of FTAs. Thus, Singapore started negotiations with New Zealand and Australia, followed by talks with the United States and then Japan. Similarly South Korea started negotiations with Chile and also with Singapore. Singapore's independent moves sparked a response among its ASEAN partners, and ASEAN began exploring FTAs with Australia and New Zealand and then with China, Japan, and South Korea. In 2001, as it was completing the accession process for membership in the WTO, China entered the regionalism equation with some force. Earlier, China had proposed discussions with ASEAN of an FTA, and then in November 2001 China and ASEAN agreed to negotiate an FTA within 10 years.

Meanwhile, in January 2002, Japanese Premier Koizumi proposed a Japanese-ASEAN "economic partnership," and his announcement was followed by an announcement from Seoul that Korea likewise was considering a future FTA with ASEAN. In March 2002, during a trip by Japanese PM Koizumi to Korea, the two nations announced that, albeit continuing political problems, they would officially begin discussions leading to a Japan-Korea FTA. The bottom line is that by mid-2004 all East Asian countries (plus Hong Kong and Taiwan separately) were engaged in talks or negotiations leading to bilateral or sub-regional preferential trade arrangements.

To bring the story up to date, Japan had successfully completed negotiations with Singapore and Mexico; Korea had signed an agreement with Chile and was moving toward serious negotiations with Japan, Mexico, New Zealand, Singapore, and the United States. South Korea's talks with the United States is ongoing in 2005/2006 and it will be one of the largest negotiations for the country; China had announced its intention to conclude negotiations with ASEAN during 2004; and on the periphery, the United States had conclude FTAs with Singapore and Australia and was in serious talks with Thailand (Cheong (2004)).

After the Asian financial crisis, there have been debates about regional economic cooperation among China, Japan, and South Korea to counterbalance other regional economic blocs such as the EU and NAFTA. During the trilateral meeting in Manila in November 1999, the three countries initiated the first official attempt toward a stronger economic cooperation. After the meeting, the countries were on the way to the Northeastern Asia FTA.

Following a proposal by Chinese Premier Zhu Rongji in the summit meeting in Phnom Penh in November 2002, a study for the possibility of a trilateral FTA consisting of China, Japan, and Korea was initiated and the trilateral joint research project was undertaken by the Development Research Center (DRC) of the China State Council, the Japan National Institute for Research Advancement (NIRA) and the Korea Institute for International Economic Policy (KIEP). The research was in examining the economic effects of a possible free trade agreement among the three countries and the research results were reported at the trilateral meeting in Bali, October 2003. It mainly pertains to a possibility of the NEAFTA, including trade structure and trade policy of the countries.

In view of the growing importance and mutual trade-dependence of their economies and the fever for free trade areas in Asia, it is quite natural for China, Japan, and South

Korea to consider a tighter integration of their economies. Wong *et al*. (2004) conducted a study as to northeast Asia economic integration and trade relations among the three countries and their study shows that each country's trade policy is getting toward free trade agreements with other countries in Asia. There exists international rivalry in the area and the desire to increase the market share of each country's outputs as a major reason for trying to form an FTA. The discriminatory nature of an FTA provides an incentive to governments to seek trade concession from its important markets. At the same time, another reason for forming a FTA is that governments are afraid of being left behind. If a rival country that has firms competing closely with its own firms forms an FTA with an important overseas market, the country will have a huge desire to form another FTA with the same market in order to get the same preferential treatment.

3. GLOBAL TRADE ANALYSIS PROJECT (GTAP) MODEL

We developed two scenarios: a base scenario with the current trade policies of the countries and a free trade scenario which allows free trade among China, Japan, and Korea (NEAFTA scenario). We qualify and quantify the effects of the NEAFTA by using the Global Trade Analysis Project (GTAP), an empirical global general equilibrium model.

Over the last several decades computable general equilibrium (CGE) has become an important tool for analyzing economic issues. This development is explained by the capability of CGE models to provide an elaborate and realistic representation of the economy including the linkages between all agents, sectors, and other economies. While this complete coverage permits a unique insight into the effects of changes in the economic environment throughout the whole economy, global CGE models very often include an enormous number of variables, parameters, and equations. This model takes cross-sectional data from a single base period, not only for trade but also for production and consumption, and imposes a detailed theoretical structure on the interactions among different data elements. Using certain constraining assumptions, the models are put to use by changing the underlying data and observing how the remaining variables adjust.

The GTAP model is a multi-regional, applied general equilibrium model. It assumes perfect competition and constant returns to scale, and bilateral trade is handled via the Armington assumption. It also includes the treatment of private household preferences using the non-homothetic CDE functional form, explicit international trade and transport margins, and a global banking sector which links global savings and investment. It also gives users a wide range of closure options, including a selection of partial equilibrium closures that facilitate comparison of results to studies based on partial equilibrium assumptions. GTAP can handle a wide range of economic behavior and contains powerful capabilities for viewing data and analyzing results.

The RunGTAP version 5.0 program was used to run the general equilibrium simulations. The GTAPAgg version 6.0 program was used to aggregate the base 6.0

database. The database corresponds to the world economy in the year 2001. The new aggregated dataset for this study consist of five primary sectors, six world regions, and six industrial sectors. The aggregation was implemented in such a way that we focus on the food and agricultural sector, the labor intensive sector, and the high-technology sector. The regrouped sectors are food and agriculture, natural resources, labor intensive manufacturing, mid-technology manufacturing, high-technology manufacturing, and utilities and services. Regional aggregation includes China, Japan, South Korea, the United States, the European Union (EU), and the rest-of-the-world (ROW). The five primary factors are land, unskilled labor, skilled labor, capital, and natural resources.

The results of simulations are static in nature. They represent final effects rather than its immediate impact of the NEAFTA scenario. In fact, tariff reductions under the FTA provisions will be implemented gradually over time. It should be noted that results from the GTAP model are merely approximations.

4. RESULTS FROM GTAP ANALYSIS

The impacts of Northeast Asian regionalism on world trade are arranged in Table 3 through 5. Table 3 shows estimated changes in export sales in the six sectors of China, Japan, South Korea, the United States, the European Union, and the rest-of-the-world. In each cell, the negative (positive) value denotes decreased (increased) volume of export from the country in the row to the country in the column. The values in the cell of the first row and in the third column, for example, represent changes in export sales from China to Japan or changes in Japanese import from China. In specific, 3,792.42 in the food and agricultural sector is interpreted that export sales of food and agricultural goods from China to Japan increase by $US 3,792 million under the NEAFTA scenario compared to the base scenario.

Table 3. Changes in Export Sales in the Six Sectors under the NEAFTA

Series	China	Japan	South Korea	USA	EU	ROW	Sum
China							
Food and Agricultural Sector	0	3792.42	3657.74	-98.36	-144.29	-428.41	6779.1
Natural Resource Industry	0	159.46	666.61	-379.87	-134.37	-261.12	53.71
Labor Intensive Manufacturing	0	7678.4	1685.88	126.7	70.32	132.73	9694.03
Mid-tech. Manufacturing	0	269.12	562.97	-303.9	-189.72	-225.7	112.77
High-tech. Manufacturing	0	1149.76	1753.08	1208.33	603.35	1389.11	6103.63
Utility and Services	0	7.55	9.17	-69.22	-182.75	-139.79	-375.04
Sum	0	13056.71	8335.45	486.68	22.54	466.82	22368.2

Japan							
Food and Agricultural Sector	265.6	0	111.86	-18.88	-8.0	-108.39	242.09
Natural Resource Industry	1076.72	0	753.28	-161.13	-110.1	-344.07	1214.7
Labor Intensive Manufacturing	5351.96	0	209.13	-26.05	-29.63	-126.91	5378.5
Mid-tech. Manufacturing	2221.19	0	754.19	-450.46	-350.09	-1043.83	1131
High-tech. Manufacturing	21651.21	0	4700.99	-7926.9	-4312.55	-9389.38	4723.37
Utility and Services	-45.09	0	3.29	-185.62	-852.32	-702.01	-1781.75
Sum	30521.59	0	6532.74	-8769.04	-5662.79	-11714.59	10907.91
South Korea							
Food and Agricultural Sector	171.72	765.13	0	25.21	15.97	60.83	1038.89
Natural Resource Industry	488.65	34.95	0	-46.92	-36.3	-130.32	310.06
Labor Intensive Manufacturing	4344.68	486.16	0	-73.38	-33.54	-188.72	4535.2
Mid-tech. Manufacturing	2223.59	327.3	0	-268.04	-91.06	-547.48	1644.31
High-tech. Manufacturing	9067.69	-269.23	0	-2505.11	-1680.85	-4372.41	240.09
Utility and Services	-25.93	-86.69	0	-334.05	-737.31	-541.63	-1725.61
Sum	16270.4	1257.62	0	-3202.29	-2563.09	-5719.73	6042.91
US							
Food and Agricultural Sector	80.2	-593.75	-1417.02	0	-0.64	-104.74	-2035.95
Natural Resource Industry	-43.17	49.66	-30.31	0	-6.75	16.96	-13.61
Labor Intensive Manufacturing	-226.41	-227.31	-51.17	0	-10.7	-108.83	-624.42
Mid-tech. Manufacturing	-286.9	118.08	-48.3	0	24.18	135.47	-57.47
High-tech. Manufacturing	-3428.25	1380.27	-837.28	0	538.75	2790	443.49
Utility and Services	38.9	379.84	285.34	0	200.17	-19.3	884.95
Sum	-3865.63	1106.79	-2098.74	0	745.01	2709.56	-1403.01
EU							
Food and Agricultural Sector	29.81	-226.69	-422.73	-36.36	-185.7	-194.62	-1036.29
Natural Resource Industry	-88.62	34.7	-27.78	-12.99	-77.65	-39.62	-211.96
Labor Intensive Manufacturing	-504.93	-1105.42	-193.29	-45.34	-356.35	-315.59	-2520.92
Mid-tech. Manufacturing	-401	93.62	-52.56	60.03	106.11	123.52	-70.28
High-tech. Manufacturing	-5651.48	1000.32	-486.81	1342.13	2444.94	2789.13	1438.23
Utility and Services	92.42	863.52	558.69	20.45	204.06	-169.81	1569.33
Sum	-6523.8	660.05	-624.48	1327.92	2135.41	2193.01	-831.89
ROW							
Food and Agricultural Sector	292.75	-896.85	-1784.68	84.36	202.64	84.12	-2017.66
Natural Resource Industry	-918.71	996.57	-782.59	547.04	351.01	484.94	678.26
Labor Intensive Manufacturing	-3083.79	-1129.62	-277.97	38.62	-15.05	-124.15	-4591.96
Mid-tech. Manufacturing	-1496.79	557.41	-162.53	592.73	399.25	666.5	556.57
High-tech. Manufacturing	-8779.16	1834.59	-669.58	3851.13	1150.17	2977.63	364.78
Utility and Services	310.02	826.32	482.34	348.92	853.63	371.84	3193.07
Sum	-13675.68	2188.42	-3195.01	5462.8	2941.65	4460.88	-1816.94

Notes: This value in each cell presents changes in export sales of six sectors from the country or region in the row to the country or region in the column. The unit is million US dollars.

Looking closely into Japan's import changes, on one hand, Japan increases its import of food and agricultural goods by $US 3,792.42 million from China and $US 765.13 million from South Korea under the NEAFTA scenario. The sum of these increases is $US 4,557.55 million. On the other hand, Japan decreases its import of food and agricultural goods by $US 593.75 million from the United States, $US 226.69 million from the European Union, and $US 896.85 million from the ROW under the NEAFTA scenario. The sum of these decreases ($US 1,717.29 million) represents the trade diversion effect of the FTA in the food and agricultural sector. An increase in trade volume of food and agricultural goods through trade creation effects of the FTA is calculated by subtracting the trade diversion effect ($1,717.29) from the total increase in trade ($4,557.55), which is equal to $US 2,840.26 million.

In general, Japan increases its trade volume with China ($US 13.056 billion) and South Korea ($US 1.257 billion) under the NEAFTA and also increases its imports from non-member countries. This implies that albeit generating trade diversion for some sectors, there is no significant trade diversion effect as a whole between Japan and the non-member countries under the NEAFTA. However, trade diversion effects of the NEAFTA are significant for China and South Korea's trade with non-member countries. Trade diversion amounts to $US 24.1 billion in case of China and $US 5.9 billion in case of South Korea. China especially increases its imports of high-technology manufacturing goods from Japan ($US 21.6 billion), while it decreases its import of high-technology goods from non-member countries ($US 17.8 billion) under the NEAFTA. Korea also increases its imports of high-technology manufacturing goods from Japan ($4.7 billion), while decreasing its imports from the non-member countries. This implies that there are significant trade diversion effects of NEAFTA in the high-technology sector.

China increases imports of high-technology goods from Japan and exports of labor intensive manufacturing goods to Japan, indicating that inter-industry trade between the two countries based on difference in resource endowments becomes intense. Trade between China and South Korea is similar to that between China and Japan; China increases imports of high-technology manufacturing goods from South Korea and exports of labor intensive manufacturing and agricultural goods to Korea. However, the trade pattern between Japan and South Korea is elusive; Korea increases its imports of high-technology manufacturing goods from Japan, but its exports to Japan are limited in all the sectors. Korea's aggregate exports to Japan increase by $US 1.2 billion, while its imports from Japan increase by $US 6.5 billion.

Changes in *terms of trade* are displayed in the first six rows in Table 4. In international economics, terms of trade is expressed as the ratio of the price of an export commodity(s) to the price of an import commodity(s).[2] An improvement in a nation's terms of trade is beneficial to that country in the sense that it has to pay less for the

[2]*Terms of trade* is sometimes used as a proxy for the relative social welfare of a country, but this heuristic is technically questionable and should be used with extreme caution.

products it imports, that is, it has to give up less exports for the imports it receives. The second column represents changes in terms of trade compared to the base scenario. The values show that the NEAFTA improves the terms of trade in Japan and South Korea, while deteriorates the terms of trade in all other regions.

Table 4. Changes in *Terms of Trade*, GDP, Household Income, and Capital Stock

Countries	Change in *Terms of Trade*	Change in GDP	Percentage Change in GDP	Percentage Change in Household income	Percentage Change in Capital Stock
US	-0.00136	-87.00	-0.239	-0.017	-0.010
China	-0.00248	3535.00	0.367	0.283	0.132
Japan	0.01068	1234.00	0.983	0.163	0.030
South Korea	0.01250	4535.13	2.670	1.743	0.256
EU	-0.00038	-283.50	-0.218	-0.015	-0.008
ROW	-0.00170	-939.50	-0.350	-0.072	-0.019

Notes: The second column represents changes in *terms of trade* compared to the base scenario. The value of *terms of trade* under the base scenario was fixed at one for comparison with the value under the FTA scenario. The third column represents changes in GDP and the unit of GDP is million US dollars. The fourth column denotes percentage changes in GDP. The fifth column denotes percentage changes in regional household income using the equivalent variation. The last column represents percentage change in end-of-period capital stock.

The third column and fourth column in Table 4 show changes in each region's GDP. The results show that the FTA positively affects economic growth in the three countries, while it negatively affects growth in the non-member countries. This supports arguments that a FTA is beneficial to member countries, but detrimental to non-member countries. In general, non-members will be at a disadvantage as a result of the trade diversion.

In terms of GDP, under the NEAFTA scenario, South Korea is expected to gain relatively more economic benefits compared to China or Japan. Table 4 shows that South Korea will benefit more in terms of GDP, household income, and capital stock as well as terms of trade. At the equivalent variation,[3] South Korea's household income increases 1.74 percent under the FTA scenario, which is significantly larger than those of other countries or regions.

Greater benefits to South Korea could be generated by the capital accumulation effect under the FTA. This is supported by percentage change in end-of-period capital

[3]The equivalent variation is the amount or percentage of additional income consumers require to achieve the post-simulation level of utility given pre-simulation price level. A positive value indicates welfare improvement and a negative value denotes welfare deterioration.

stock, which is presented in the last column of Table 4. Greater capital accumulation in Korea may be because of increases in Japanese capital invested in Korea, increasing Korea's growth potential.

Table 5. Changes in Industry Output and Price Index under the NEAFTA

Series	China	Japan	South Korea	US	EU	ROW
Changes in Value						
Food and Agricultural Sector	8694.50	-3427.63	-2635.43	-2868.63	-1475.25	-2883.63
Natural Resource Industry	-2113.91	-373.16	-532.92	119.28	-221.34	1663.63
Labor Intensive Manufacturing	3697.38	299.88	4594.07	-1002.09	-3101.63	-5945.56
Mid-tech. Manufacturing	-6094.28	-106.31	407.84	630.50	136.38	2121.63
High-tech. Manufacturing	-12822.56	1631.63	-4847.16	4395.50	2701.25	4152.00
Utility and Services	906.94	1183.00	1725.63	-943.00	1240.00	876.50
Percentage Changes						
Food and Agricultural Sector	1.916	-0.879	-3.740	-0.304	-0.151	-0.147
Natural Resource Industry	-0.699	-0.258	-2.626	0.024	-0.048	0.143
Labor Intensive Manufacturing	1.351	0.292	13.187	-0.370	-1.130	-1.117
Mid-tech. Manufacturing	-1.421	-0.017	0.394	0.055	0.011	0.158
High-tech. Manufacturing	-1.830	0.123	-1.832	0.175	0.111	0.209
Utility and Services	0.093	0.025	0.363	-0.007	0.014	0.012
Changes in Market Price Index						
Food and Agricultural Sector	0.01206	0.00656	-0.02265	-0.00251	-0.00215	-0.00344
Natural Resource Industry	0.00197	0.00925	0.01797	-0.00227	-0.00212	-0.00267
Labor Intensive Manufacturing	-0.00385	0.00351	0.00011	-0.00231	-0.00213	-0.00292
Mid-tech. Manufacturing	0.00014	0.00838	0.00979	-0.00221	-0.00204	-0.00272
High-tech. Manufacturing	-0.00429	0.00897	0.01214	-0.00210	-0.00193	-0.00235
Utility and Services	0.00295	0.00998	0.02364	-0.00232	-0.00209	-0.00315

Notes: The first six rows denote changes in industry output for each country or region and the unit is million US dollars. The second six rows present percentage changes in industry output. The third six rows denote changes in market price indexes of the sectors.

The establishment of northeast Asian regionalism is anticipated to have a great impact on production in countries within the region. The effects of the NEAFTA on production sectors in the six countries or regions are presented in Table 5. Under the FTA, South Korea's industries will be affected the most. Among China's industries, the food and agricultural sector will expand while mid-tech and high-tech industries will be reduced. Production in Japanese high-tech manufacturing will expand. The pattern of production changes is not surprising when we consider resource endowments of the countries. China is labor abundant, Japan is technology and capital abundant, and South

Korea is high-skilled labor abundant. Therefore, the results presented in Table 5 are consistent with trade theory, mainly the Hecksher-Ohlin theorem. It shows that the FTA enables China to increase production of food and agricultural products by $8,649.50 and labor intensive products by $3,697.38 million. In Japan, production in the high-technology manufacturing sector increases as much as $1,631.63 million. South Korea increases its production of labor intensive manufacturing goods and mid-technology manufacturing goods by $4,594.07 and $407.84 million, respectively.

5. PROS AND CONS OF THE FTA

China joined the WTO under its bid to fuel economic growth through increasing exports and attracting foreign capital. Therefore, it is expected that the country will expand ties with Japan and South Korea. Japan, too, has little reason to oppose promoting regional economic cooperation. Japan has shown its sincere attitude toward an FTA with South Korea. Recently, a proposed declaration for economic cooperation among China, Japan, and South Korea was agreed on after a summit meeting between China and South Korea, which will mark an important step toward the formation of the NEAFTA.

It is observed, albeit the prevalent fever for FTAs, that some governments are hesitant in rushing into a free trade agreement, worrying about domestic political resistance on the formation of a new FTA, because some domestic industries could be hurt directly by an FTA. This is the political cost of forming a new FTA.

China is more centralized and thus formation of a FTA in China could be more straightforward, while formation of a FTA in Japan and South Korea is much more complicated and subject to more uncertainties because in such societies there are lobbying, protests, and pressure from the media and interest groups to influence the choice of trade policies. When a country forms an FTA with other countries to gain access to the foreign markets, it should reduce or remove its own trade restrictions. This might cause resistance from the sectors that are currently protected. When an FTA is formed, there will be both gainers and losers. In general, producers of the exportables and consumers of the importables gain while consumers of the exportables and producers of the importables lose. High-tech industry in China and food and agricultural sectors in Japan and South Korea will suffer from the FTA. In reality, in Japan and South Korea farmers have proven to be a group of individuals with strong will to resist any trade liberalization in agricultural products. For governments that care about the political pressure from these groups, the resistance from the agricultural sector would have to be taken into account when planning for a new FTA. Very often such resistance is regarded as additional costs of forming an FTA since the government might suggest a sweetener to the sectors, such as direct payment or tax reduction.

Food and agricultural sectors in Japan and South Korea are anticipated to experience a reduction in production (Table 5). Furthermore, the South Korean food and

agricultural sector will see a decreasing price level (Table 5). Therefore, although South Korea will be the largest gainer from the FTA, this specific sector will resist formation of the FTA. The South Korean government and other sectors in the country that will benefit from the FTA must agree on compensating the protected sector which will be a loser under the FTA. This will also be true for the food and agricultural sector in Japan.

6. CONCLUSION

This study finds that member countries would benefit from the FTA among China, Japan, and South Korea. Evidently, there is no doubt that the FTA will boost the economic systems of the three countries, keeping them close to each other through an economic integration. This will result in substantial economic gains to member countries. Despite negative effects to some sectors in each country, overall benefits of the FTA would be significant for the three countries.

The study also reveals that the FTA stimulates trade among the member countries through trade creation and trade diversion. There is significant trade diversion of high technology manufacturing goods between the member countries and the ROW, including the United States and the European Union. This is especially true for U.S. and China bilateral trade. China diverts its imports of high-technology products from the United States to Japan and South Korea under the FTA. However, U.S. exports of utility/service increase under the FTA.

An interesting observation is that under the NEAFTA, Korea records the highest growth rate in exports, GDP, and welfare level.[4] Meanwhile, the export performances of non-members like the EU countries, the United States, and ROW are anticipated to decline. As trade barriers are eliminated and income level is increased, imports by FTA member countries will rise. Another interesting result is that the member countries under the FTA tend to specialize on the basis of differences in resource endowments, but there exists a significant amount of intra-industry trade among the member countries in all sectors except food/agricultural and utility/services sectors.

It is found from the simulation that the FTA stimulates the economies of the three countries through increased trade volume and provides positive effects on *terms of trade* in the countries. However, the FTA provides a significant negative effect on economies of non-member countries. Trade diversion of the FTA is significant and pervasive.

[4] Regarding quantity exported, China's exports increase the most. However, compared to non-NEAFTA condition, growth rate in exports is the highest for South Korea. The results also show that South Korea benefits the most with respect to industry output growth and terms of trade.

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