Static and Dynamic Consequences of a KORUS FTA

Korea Economic Institute
25th Anniversary 1982-2007

CONTENTS

Part IV: Conference Discussion and Conclusions

* Volume 4 in KEI Special Studies Series, published by Korea Economic Institute of America

IMPLICATIONS OF THE U.S.-KOREA FREE TRADE AGREEMENT: A GENERAL EQUILIBRIUM APPROACH

** Renan Zhuang and Won W. Koo*

CONTENTS

** Renan Zhuang is Research Assistant Professor and Won W. Koo is Chamber of Commerce Distinguished Professor and Director, Center for Agricultural Policy and Trade Studies, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo, North Dakota.*

I. Introduction

The bilateral trade volume between the United States and South Korea has been growing dramatically since 1989. According to U.S. statistics (ITA, various years), the bilateral trade volume between the two countries increased from $33.2 billion in 1989 to $78.3 billion in 2006, or an average annual growth of 5.2 percent. The United States has had a trade deficit with South Korea, with the exception of the 1995–97 period. The U.S. trade deficit with South Korea jumped from $6.3 billion in 1989 to $19.8 billion in 2004, a historical record high. During the past two years, the U.S. trade deficit with South Korea has started to improve; it declined to $16.1 billion in 2005 and $13.4 in 2006.

South Korea is the 10th largest economy in the world, with an annual GDP rapidly approaching $1 trillion. While South Korea was the seventh-largest export market for the United States in 2004, the United States was South Korea's third-largest trading partner—its third-largest supplier behind Japan and China—and second-largest export market (behind China) in 2005 (Manyin 2006; CalTrade Report 2006). Moreover, South Korea is the sixth-largest market for U.S. agricultural exports. The United States provides more than one-fifth of South Korea's agricultural imports (Johanns 2006).

Informal discussions on a U.S.-Korea Free Trade Agreement (KORUS FTA) started in the mid-1980s but were suspended in the 1990s owing to disputes over tariff concessions in the agricultural sector under the Uruguay Round of the World Trade Organization (WTO) negotiation and disputes over the screen-quota issue (Cheong 2004; Lee and Lee 2005). The two countries agreed to resume informal talks on a free trade agreement (FTA) at the U.S.-Korea Business Meeting held in Hawaii in January 2001 (Cheong 2004). On 2 February 2006, the two countries formally announced commencement of FTA talks beginning in May 2006 (USTR 2006; Cooper and Manyin 2006), and they concluded historic FTA negotiations on 1 April 2007. For the United States, the KORUS FTA is the most commercially significant FTA in 15 years.

Many previous studies (e.g., Choi and Schott 2001; Cheong 2004; Lee and Lee 2005; Kiyota and Stern 2005) have argued that a U.S.-Korea FTA would benefit the economies of both countries, but with mixed projections. For example, McDaniel and Fox (2001) of the U.S. International Trade Commission argued that U.S. income would increase by $20 billion (or 0.23 percent of GDP) and South Korea's income would increase by $3.9 billion (or 0.69 percent of GDP). Note that the United States would gain more in terms of absolute value, but South Korea would gain more in terms of percentage increase of GDP because South Korea's GDP is much smaller than that of the United States. They also projected that U.S. exports to South Korea would increase by $19 billion, while U.S. imports from South Korea would increase

by $10 billion. Choi and Schott (2001) argued that a U.S.-Korea FTA would substantially increase bilateral trade and contribute to a significant improvement in income for both countries. U.S. income would increase by $8.9 billion (or 0.13 percent of GDP), and South Korea's income would increase by $10.9 billion (or 2.41 percent of GDP). Thus, South Korea would gain more in terms of both an absolute increase in GDP and percentage increase in GDP. They also projected that a U.S.-Korea FTA would produce trade diversion effects for Japan and China. More recently, Lee and Lee (2005) argued that a U.S.-Korea FTA would provide a significantly positive opportunity for long-term and dynamic economic growth for both countries. They projected that a U.S.-Korea FTA would shrink South Korea's bilateral trade surplus with the United States but, in the long run, would improve South Korea's GDP. Johanns (2006) argued that U.S. agricultural exports to South Korea would significantly increase under an FTA.

All the previous studies focused on alternative cuts in tariffs and nontariff barriers under the FTA rather than the actual agreement. Besides, very few researchers have analyzed the trade creation and diversion effects of a U.S.-Korea FTA on various sectors of the two economies. The objective of this study is to fill this gap in the research by examining the effects of the KORUS FTA on the individual sectors of the economy in the two countries. Special attention is given to the following tasks: (1) identifying characteristics of U.S.-Korea bilateral trade; (2) studying the effects of the KORUS FTA on the economies of both countries; and (3) analyzing trade creation and diversion effects of the FTA. The FTA is expected to enhance U.S.-Korea bilateral trade and promote economic growth for the two countries.

The paper is organized as follows. Section II examines the key characteristics of U.S.-Korea bilateral trade by sectors since 1989[1] and provides an overview of the tariff reduction and elimination schedules of the two countries. Section III discusses the data and model used for this study. This section also presents briefly the trade flows in various sectors for the selected countries and regions in the base year (2001). Section IV presents simulation results and discusses our findings. Finally, section V presents conclusions of the paper.

II. U.S.-Korea Bilateral Trade and Tariff Elimination Schedules under the KORUS FTA

Characteristics of U.S.-Korea Bilateral Trade

The predominant mode of U.S.-Korea bilateral trade has shifted from interindustry trade to intraindustry trade (Noland 2003). In particular, the trade pattern prior to1994

1. Data are not available prior to 1989.

was interindustry trade on the basis of differences in resource endowments. The United States exported land-intensive and natural resources–based industry goods (e.g., agriculture and food products) and technology and capital-intensive goods to South Korea and imported labor-intensive products (e.g., textiles) from that country. However, intraindustry trade between the two countries has increased significantly in the high-technology product sector since 1995. A major increase in trade of high-technology products between the two countries demonstrates the surge in bilateral intraindustry trade based on product differentiation (Krugman 1980, 1981; Head and Ries 2001). The two countries have also increased their bilateral trade in differentiated mid-technology products.

Comparisons between trade volumes and trade surpluses, by sectors, can give us insight into the bilateral trade patterns between the two countries. In this study, we examine U.S.-Korea bilateral trade in six sectors: agriculture and food (agri-food), natural resources–based industries (natural-res), textiles, mid-technology products (mid-tech), high-technology products (high-tech), and others. The sectors are determined on the basis of the standard international trade classification (SITC) two-digit code. The agri-food sector includes primary agricultural goods (grains, live animals, fruit, and vegetables) and processed food (beverages, tobacco products, and meat products). The natural-res sector includes coal, gas, wood, and petroleum products. The textiles sector includes apparel, clothing, and footwear. The mid-tech sector includes fertilizers, chemical materials, nonferrous metals, and furniture. The high-tech sector includes machinery, transport equipment, and scientific instruments. Others include transaction services.

Tables 1A* and *1B summarize U.S.-Korea bilateral trade in the six industrial sectors during the 1989–2006 period. The United States has trade surpluses with South Korea in the sectors of agriculture and food and the natural resources–based industries. By contrast, the United States has a trade deficit, which has increased over time, with South Korea in the high-technology sector. The United States also has a trade deficit with Korea in the textiles sector, but this deficit has decreased over time. In fact, both U.S. exports and imports of textile products have decreased since 1990 owing to the third-country effect in the market. Since other countries and regions such as China, Thailand, Indonesia, and Latin American countries have become more competitive in producing textile products, both the United States and South Korea have increased their imports of these products from these "third" countries. For the mid-technology sector, the U.S. trade balance with Korea averaged $0.196 billion, with a standard deviation of $0.940 billion. For the services sector, the United States had a small trade surplus with South Korea prior to 1997 but had a trade deficit afterward.

The relative importance of each sector in the bilateral trade has changed over time. The share of textile products in U.S.-Korea bilateral trade decreased sharply from

Table 1A: **U.S.-Korea Bilateral Trade, by Sector, 1989–2006, in billions of dollars**

U.S. Exports to South Korea							
Year	**Agri-food**	**Natural-res**	**Textiles**	**Mid-tech**	**High-tech**	**Others**	**Total**
1989	1.64	1.38	1.38	3.36	5.58	0.13	13.5
1990	1.59	1.78	1.54	3.42	5.88	0.17	14.4
1991	1.39	1.67	1.22	3.65	7.29	0.29	15.5
1992	1.51	1.50	1.18	3.22	6.94	0.27	14.6
1993	1.29	1.63	1.10	3.25	7.27	0.24	14.8
1994	1.59	1.41	1.23	3.82	9.66	0.31	18.0
1995	2.92	1.79	1.42	5.59	13.24	0.45	25.4
1996	3.22	1.68	1.23	5.11	14.63	0.71	26.6
1997	2.30	1.67	1.20	4.82	14.61	0.46	25.1
1998	1.76	0.75	0.80	3.11	9.79	0.33	16.5
1999	2.26	1.08	0.69	3.87	14.63	0.43	23.0
2000	2.30	1.05	0.94	4.86	18.30	0.46	27.9
2001	2.28	0.86	0.99	4.50	13.18	0.39	22.2
2002	2.47	0.88	0.82	4.89	13.11	0.43	22.6
2003	2.74	1.16	0.84	5.40	13.54	0.42	24.1
2004	2.31	1.51	0.81	6.89	14.41	0.40	26.3
2005	2.10	1.60	0.78	6.70	16.06	0.43	27.7
2006	2.79	2.13	0.74	7.23	19.12	0.44	32.5

Source: ITA (various years).
Note: Agri-food = agriculture and food, Natural-res = natural resources–based industries, Mid-tech = mid-technology products, High-tech = high-technology products.

23.1 percent in 1989 to 3.6 percent in 2006. The share of agriculture and food products decreased slightly from 5.6 percent in 1989 to 4.0 percent in 2006, and the share of mid-technology products decreased from 21.6 percent to 19.2 percent in the same period. The shares of natural resources–based industry products and services are relatively small, with an average share of 4.1 percent and 1.6 percent, respectively. By contrast, trade of high-technology products has taken the lion's share of the bilateral trade between the two countries, jumping from 44.2 percent in 1989 to 64.8 percent in 2006. U.S.-Korea bilateral trade volume in the high-technology sector increased from $14.7 billion in 1989 to $50.8 billion in 2006. The U.S. trade deficit with South Korea in the high-technology sector also increased from $3.5 billion in 1989 to $21.0 billion in 2004 and $12.5 billion in 2006.

Investigation of the data provides five important empirical facts. First, the increase in U.S.-Korea bilateral trade in recent years is due mainly to increased bilateral trade in differentiated high-technology products. Second, while the United States has increased its exports of high-technology products to South Korea, its imports of the products have increased more rapidly, resulting in an increase of the U.S. trade deficit with

Table 1B: **U.S.-Korea Bilateral Trade, by Sector, 1989–2006, in billions of dollars**

U.S. Imports from South Korea							
Year	**Agri-food**	**Natural-res**	**Textiles**	**Mid-tech**	**High-tech**	**Others**	**Total**
1989	0.21	0.19	6.29	3.83	9.10	0.14	19.7
1990	0.19	0.13	6.37	3.89	7.76	0.14	18.5
1991	0.19	0.14	5.35	3.64	7.53	0.17	17.0
1992	0.17	0.21	4.82	3.48	7.85	0.17	16.7
1993	0.17	0.20	4.24	3.13	9.20	0.18	17.1
1994	0.17	0.22	3.61	3.35	12.13	0.18	19.7
1995	0.18	0.21	3.11	3.53	16.90	0.25	24.2
1996	0.18	0.14	2.67	3.42	15.83	0.44	22.7
1997	0.18	0.20	2.82	3.54	15.97	0.45	23.2
1998	0.15	0.29	3.15	4.58	15.28	0.48	23.9
1999	0.18	0.44	3.35	4.75	21.94	0.60	31.3
2000	0.20	0.79	3.62	5.20	29.81	0.67	40.3
2001	0.22	0.84	3.42	4.68	25.28	0.74	35.2
2002	0.25	0.58	3.35	4.54	26.09	0.77	35.6
2003	0.26	0.54	3.04	4.44	27.97	0.72	37.0
2004	0.29	0.98	3.08	5.57	35.39	0.86	46.2
2005	0.33	2.07	2.40	6.80	31.30	0.89	43.8
2006	0.33	3.06	2.10	7.81	31.64	0.88	45.8

Source: ITA (various years).
Note: Agri-food = agriculture and food, Natural-res = natural resources–based industries, Mid-tech = mid-technology products, High-tech = high-technology products.

South Korea over time. Third, the importance of the mid-technology sector in U.S.-Korea bilateral trade tends to decline over time in terms of trade share, even if the trade volume in the sector has increased steadily since 1989. Fourth, trade shares in the textile and agriculture and food sectors are small and tend to decrease over time. This is particularly true for the textiles sector owing to the third-country effect. Finally, bilateral trade in the services sector accounts for only a small portion of the total U.S.-Korea bilateral trade volume, although the sector is the largest in both economies.

Tariff Reduction and Elimination Schedules in the KORUS FTA

Under the KORUS FTA, nearly 95 percent of bilateral trade in consumer and industrial products becomes duty-free within three years after the inception of the agreement, and most of the remaining tariffs will be eliminated within 10 years. In this section, we provide an overview of the tariff reduction and elimination schedules of the United States and South Korea for the six aggregated sectors used in our analysis, based on the KORUS FTA text which is currently under the process of legal review (USTR 2007).

For the agriculture and food sector, the major products that South Korea exports to the United States are vegetables and fruits and other miscellaneous edibles, which belong to the staging categories of A or K. Tariffs on goods in staging category A will be eliminated entirely on the date the KORUS FTA enters into force, and tariffs on goods in staging category K will continue to receive duty-free treatment. Major U.S exports in the sector to South Korea are cereals, meat, and dairy products. While rice is excluded from the KORUS FTA, Korean tariffs on corn for feed, wheat for feed and milling, and soybeans for crushing will be eliminated immediately. Meat products belong to different staging categories depending on meat type (e.g., beef, pork, poultry meat). Tariffs on beef products will be eliminated gradually within 15 years after the FTA enters into force. Tariffs on frozen pork products will be eliminated by 2014, and tariffs on fresh and chilled pork products will be phased out within 10 years. Tariffs on most poultry cuts including legs will be fully removed within 10 years. For dairy products, Korea will use tariff-rate quotas that provide immediate duty-free access on double current shipment volumes of U.S. dairy exports. Almost two-thirds of U.S. agricultural exports to Korea will become duty-free immediately when the KORUS FTA is implemented.

For the natural resources–based industries, most Korean exports to the United States are petroleum products, nonmetallic minerals, and metalliferous ores. These products are in the staging categories of A or K, implying tariffs on Korean exports to the United States will be eliminated immediately after the KORUS FTA enters into force. Major U.S. exports in the sector include cork and wood products, metalliferous ores, nonmetallic minerals, petroleum products, and coal and briquettes. Most products belong to the staging category of A, and thus the tariffs on them will be eliminated immediately once the FTA enters into force. Some of the wood products belong to the staging categories of C and D, which have base tariff rates of about 5 percent, and the tariffs on them will be eliminated in three and five years, respectively.

For the textiles sector, both sides agreed to provide reciprocal duty-free access immediately for most textile and apparel goods. Major U.S. exports to South Korea in the sector include textile yarn and fabrics, textile fibers, hides and skins, and leathers. Major Korean exports in the sector are articles of apparel and clothing, footwear, and fabrics. Apparel products made in South Korea will qualify for preferential treatment under the agreement if they use U.S. or Korean fabric and yarn, thereby supporting U.S. fabric and yarn exports. U.S. and Korean customs authorities may conduct unannounced site visits to Korean producers of textile products, and the United States is allowed to impose a special textile safeguard should U.S. domestic producers experience damage caused by import surges.

For the sector of mid-technology products, major U.S. exports include chemical products, paper and paper board, manufactures of metals, nonferrous metals, and iron

and steel. Major Korean exports to the United States in the sector include travel goods (e.g., handbags), rubber manufactures, iron and steel, miscellaneous manufactured articles, and manufactures of metals. These goods are either in the staging category A (e.g., travel goods) or in the staging category K (e.g., paper and paper board products). Therefore, most mid-technology manufacturing goods will be or will continue to be duty-free after the KORUS FTA enters into force.

As discussed earlier, the United States and South Korea have increased their intraindustry trade of high-technology manufacturing products. These products include motor vehicles, telecommunication equipment, electrical and networking machineries, transport equipment, and professional scientific instruments. Most products in the high-technology sector are in the staging category A or K, meaning the products are duty-free under the KORUS FTA. Some of the high-tech products are in staging category C, which means that tariffs will be fully removed on 1 January of the third year after the FTA enters into force. In particular, the KORUS FTA is expected to increase U.S. competitiveness in the Korean automobile market. Under the agreement, Korean tariffs on most U.S. priority passenger vehicles and trucks will be eliminated immediately. Besides, Korea agreed to address specific auto nontariff barriers to ensure they do not impede the market access of U.S. automobiles.

For the services sector, South Korea significantly improved upon its WTO commitments in services, providing meaningful market access commitments that extend across virtually all major service sectors. Significant progress was made in the area of express delivery services, legal services, health care services, education services, and research and development services, and so on.

III. Model and Data

There are two economic approaches for evaluating the effects of policy changes on a set of endogenous variables: partial equilibrium and general equilibrium models. The partial equilibrium models are relatively simple and typically focus on only a few sectors of the entire economy. By contrast, computable general equilibrium (CGE) models are complex and may capture the complicated interplay of effects that may be induced by policy changes in the entire economy (Lee and Lee 2005). Because the KORUS FTA would cover virtually all traded goods in various industrial sectors between the two countries, a CGE model would surpass an econometric or a partial equilibrium model in the sense that the CGE model allows complex interactions among a wide range of economic variables across various sectors in an economy.

Similar to many previous studies (for example, Choi and Schott [2001], McDaniel and Fox [2001]), we also use the multiregion Global Trade Analysis Project (GTAP) model in this study. However, our aggregation of industries and countries is different from

previous studies. The GTAP model is a static general equilibrium model, and thus simulation results using this model are comparatively static in nature (Hertel 1997; DeRosa and Gilbert 2005). The assumptions in the GTAP model include a constant return to scale and perfect competition, which are similar to basic trade models and theories (e.g., the Ricardian model, the Heckscher-Ohlin model, and the Stolper-Samuelson theorem). Also, the model assumes that input factors such as labor and capital are perfectly mobile across the various sectors in an economy and that traded products are differentiated by country of origin (Armington 1969).

The 87 countries and regions covered in the GTAP Version-6 database are aggregated into seven countries and regions: the United States, South Korea, China (mainland), the European Union,[2] Japan, other Asian countries (OAsia), and the rest of world (ROW). The 57 commodity sectors covered in the original database are aggregated into seven sectors: agriculture and food, rice,[3] natural resources–based industries, textiles, mid-technology products, high-technology products, and services.

The trade flows among the selected countries and regions in the base year 2001 provide the following four observations:

- South Korea, China, and Japan are the most important trade partners in Asia for the United States. U.S. exports (all sectors combined) to Japan alone ($71.94 billion) surpassed U.S. exports to all other Asian countries ($60.32 billion), excluding South Korea and China.

- U.S. exports (all sectors combined) to South Korea ($29.41 billion) surpassed U.S. exports to China ($29.00 billion), even though the U.S. bilateral trade with South Korea is much smaller than trade with China.

- The high-technology sector dominates any other single sector in terms of U.S. bilateral trade volume with any country or region. In particular, the United States imports a tremendous amount of high-tech products from Japan.
- The United States is the most important market for South Korea's high-tech products.

This study uses the standard general equilibrium (GE) closure, which is the classification of the variables in the model as either endogenous or exogenous. For the standard GE

2. This refers to the European Union 15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Republic of Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

3. Because rice is excluded from the KORUS FTA, we treat rice as different from other agricultural products.

closure, the variables for import tariff rates and export taxes are exogenous; thus these variables may be subjected to a shock in order to examine the effects of the changes of these exogenous variables on the endogenous variables. It is assumed that other countries and regions would not retaliate and that all other things such as population and endowment of primary factors remain unchanged from the observations for the base year 2001. One of the limitations of the GTAP model is that it assumes constant return to scale regardless of sectors. However, the high-tech sector may experience an increasing return to scale; in particular, an FTA would encourage the member countries to specialize in production and explore higher degree of scale economies. Thus, it is assumed that the productivity in the high-tech sector in the United States and South Korea would increase by 1 percent under the KORUS FTA.

Two scenarios are considered in our simulation, based on our earlier discussion about the tariff elimination schedules under the KORUS FTA. For scenario 1, U.S. tariffs on imports from South Korea are fully eliminated for all sectors,[4] and Korean tariffs on imports from the United States are fully eliminated for all the sectors except the rice sector and the agriculture and food sector. Rice is excluded from the KORUS FTA; thus we assume Korean tariffs on rice imports would remain unchanged from the base year. Korean tariffs on U.S. agricultural and food products are reduced by 66.7 percent because two-thirds of U.S. agricultural exports to Korea will become duty-free immediately under the KORUS FTA, as we discussed earlier. For scenario 2, Korean tariffs on U.S. agricultural and food products are reduced by 95 percent within 10 years, and tariff cuts in other sectors are the same as in scenario 1.

IV. Results and Discussion

This section is divided into three parts. First, effects of the KORUS FTA on GDP, household income, national welfare, and terms of trade are presented. Second, effects of the FTA on production in various sectors in the two countries are examined. Finally, trade creation and trade diversion effects of the KORUS FTA on each sector of the two economies are discussed.

Changes in GDP, Household Income, National Welfare, and Terms of Trade

Table 2 summarizes the changes in GDP, household income, national welfare, and terms of trade in the selected seven countries and regions under the two scenarios. U.S. GDP would increase by about $18 billion (or 0.18 percent of GDP) under both scenarios. The GDP in South Korea would increase by $3.8 billion (or 0.88 percent of

4. GTAP does not have protection data (import tariffs and export taxes) for the services sector.

GDP) under scenario 1 and $3.6 billion (or 0.85 percent) under scenario two. The GDP in all other countries and regions would tend to decrease slightly—negligible decreases in terms of percentage changes. Household income in the United States would increase by 0.24 percent and 0.25 percent under the two scenarios, respectively. Household income in South Korea would increase by 1.10 percent under scenario 1 and 0.92 percent under scenario 2. Household income for all other countries and regions would decrease slightly by different amounts, ranging from 0.02 percent in ROW to 0.05 percent in China.

The national welfare measured by equivalent variation (EV) in income[5] in the United States would increase by $22.33 billion under scenario 1 and $23.23 billion under scenario 2. The national welfare in South Korea would increase by $4.15 billion and $3.46 billion under each scenario, respectively. The welfare in all other countries and regions would decrease by different magnitudes, ranging from $0.48 billion in other

Table 2: **Changes in GDP, Household Income, Welfare (EV), and Terms of Trade in Selected Countries and Regions**

Country or region	GDP ($, billions)	GDP (%)	Household income (%)	Welfare ($, billions)	Per capita welfare ($)	TOT (%)
Scenario 1: Korean agricultural and food tariffs cut by 66.7 percent						
United States	18.20	0.18	0.24	22.33	80.5	0.30
South Korea	3.75	0.88	1.10	4.15	87.2	0.36
China	–0.11	–0.01	–0.05	–0.56	–0.4	–0.09
Japan	–0.19	–0.01	–0.04	–1.38	–10.8	–0.22
OAsia	–0.10	–0.01	–0.04	–0.47	–0.2	–0.05
EU	0.00	0.00	–0.02	–1.67	–4.4	–0.05
ROW	–0.27	0.00	–0.02	–1.15	–0.5	–0.03
Scenario 2: Korean agricultural and food tariffs cut by 95 percent						
United States	18.12	0.18	0.25	23.23	83.7	0.38
South Korea	3.62	0.85	0.92	3.46	72.7	0.05
China	–0.06	–0.01	–0.05	–0.55	–0.4	–0.09
Japan	–0.24	–0.01	–0.04	–1.40	–11.0	–0.20
OAsia	–0.06	–0.01	–0.04	–0.48	–0.2	–0.06
EU	0.00	0.00	–0.03	–1.79	–4.8	–0.05
ROW	–0.20	0.00	–0.02	–1.32	–0.6	–0.04

Source: Authors' calculations.
Note: EU = European Union, EV = equivalent variation in income, OAsia = other Asian countries, ROW = rest of world, TOT = terms of trade.

Asian countries to $1.79 billion in the EU. U.S. per capita welfare gain would increase slightly by $80.5 under scenario 1 and $83.7 under scenario 2. Similarly, per capita welfare gain in South Korea would increase by $87.2 under scenario 1 and $72.7 under scenario 2. Per capita welfare gain for all other countries and regions would decrease slightly by different amounts, ranging from $0.2 in other Asian countries to $11.0 in Japan.

While the national welfare of other countries and regions would decrease, global welfare would increase by about $21.2 billion under both scenarios. This is not surprising since we assume that the economic situations and trade policies for all other countries and regions remain unchanged under the KORUS FTA. Free trade improves welfare because it encourages efficient producers to produce more and inefficient producers to produce less. South Korea benefits more in terms of percentage increase of GDP and household income than the United States does from the KORUS FTA.

Terms of trade would also change across the countries and regions. The terms of trade for the United States would increase by 0.30 percent under scenario 1 and 0.38 percent under scenario 2. The terms of trade for South Korea would increase by 0.36 percent and 0.05 percent under the two scenarios, respectively. Terms of trade for all other countries and regions would decrease by different amounts, ranging from 0.03 percent in the ROW to 0.22 percent in Japan.

Effects of the KORUS FTA on Production

The KORUS FTA is expected to affect production across the industrial sectors in the two countries. ***Table 3*** summarizes the changes in production in the two countries. In general, changes in production pattern follow the Heckscher-Ohlin theorem. For instance, the United States is more advanced in the high-technology sector than other countries because it is a capital- and technology-abundant country. As expected, the United States would increase its production of high-tech products under the KORUS FTA. Similarly, the United States would increase its production of agricultural and food products (land-intensive products). By contrast, South Korea would dramatically increase its production of textile products (labor-intensive products).

Specifically, U.S. production in the agri-food sector would increase by $10.16 billion (1.07 percent) under scenario 1 and $16.88 billion (1.78 percent) under scenario 2.

5. Equivalent variation is the change in income necessary to make the consumer indifferent to the change in price.

U.S. production in the high-technology sector would increase by $9.71 billion (0.54 percent) and $7.52 billion (0.42 percent) under the two scenarios, respectively. U.S. production in the services sector would increase by 0.60 percent and 0.65 percent,

Table 3: **Changes in Industrial Output Values in the United States and South Korea**

Sectors	Scenario 1[a]		Scenario 2[a]	
	United States	Korea	United States	Korea
	Changes in output values (in billions of dollars)			
Agri-food	10.16	–7.10	16.88	–12.98
Natural-res	–1.40	–0.69	–1.55	–0.71
Textiles	–4.22	5.97	–4.84	7.82
Mid-tech	–5.18	–2.36	–6.02	–1.78
High-tech	9.71	1.07	7.52	1.46
Services	75.64	8.38	82.26	7.36
	Percentage changes (%)			
Agri-food	1.07	–10.87	1.78	–19.88
Natural-res	–0.34	–1.77	–0.38	–1.81
Textiles	–1.56	17.14	–1.79	22.43
Mid-tech	–0.27	–1.61	–0.31	–1.21
High-tech	0.54	0.54	0.42	0.73
Services	0.60	1.76	0.65	1.55

Source: Authors' calculations.
a. For scenarios 1 and 2, Korean tariffs on U.S. agricultural and food products are cut by 66.7 percent and 95 percent, respectively.
Notes: Agri-food = agriculture and food, Natural-res = natural resources–based industries, Mid-tech = mid-technology products, High-tech = high-technology products. Rice is excluded from the KORUS FTA; it is only a tiny industry compared with the six aggregated sectors, and the effect of the FTA on rice is not included in this table.

respectively. Because GTAP does not have protection data for the services sector (thus no tariffs are cut for the sector in our simulation), the removal of tariffs in other sectors indirectly gives more protection to the services sector. Thus, the production in the services sector in the two countries would tend to increase. By contrast, U.S. production in the sectors of textiles, mid-technology, and natural-res would decrease, ranging from 0.27 percent in the mid-technology sector (scenario 1) to 1.79 percent in the textiles sector (scenario 2). Because the GTAP model assumes that factor endowments (capital, labor, land, etc.) remain unchanged from the base year 2001 and that input factors (e.g., labor and capital) are perfectly mobile among the sectors of each economy, the increase in production in the sectors of agri-food, high-tech, and

services means that, while more resources are allocated to those sectors, the resources allocated to other sectors such as natural-res, textiles, and mid-tech sectors are reduced, which in turn would result in a decrease in the production in these sectors. If factor endowments were allowed to increase (e.g., capital accumulation and increase of labor force) and if factors have limited mobility, the U.S. production in these other sectors would not be reduced as much. Based on our results, we conclude that U.S. farmers, high-tech product producers, and the consumers of textile products would benefit from the FTA. However, U.S. producers of textile products might suffer from the FTA.

For South Korea, production of textiles products would increase by $5.97 billion (17.14 percent) under scenario 1 and $7.82 billion (22.43 percent) under scenario 2. Production in the high-tech sector would increase by $1.07 billion (0.54 percent) and $1.46 billion (0.73 percent) in scenarios 1 and 2, respectively. Production in the services sector would increase by $8.38 billion (1.76 percent) and $7.36 billion (1.55 percent), respectively. Production in all other sectors including the sectors of agri-food, natural-res, and mid-tech would decrease by a different amount. In particular, production in the agri-food sector would decrease by $7.1 billion (10.87 percent) under scenario 1 and $12.98 billion (19.88 percent) under scenario 2. Production in natural-res and mid-tech sectors would decrease by less than 2 percent. Again, since the model assumes that all factor endowments are fixed, an increase in production in some sectors would necessarily result in a decrease of production in other sectors in the economy. Producers in the agriculture and food sector in South Korea would suffer from the KORUS FTA, while producers in the textiles sector would benefit from the FTA.

Trade Creation and Trade Diversion Effects

Table 4 summarizes the changes in exports in the six sectors for the seven selected countries and regions under scenario 1. As expected, U.S.-Korea bilateral trade would increase essentially for all sectors. In particular, U.S. exports to South Korea in the agriculture and food sector would increase by $6.44 billion. U.S. exports to South Korea in the high-tech and mid-tech sectors would increase by $2.89 and $1.75 billion, respectively. South Korea's export sales to the United States in the textiles and high-tech sectors would increase by $4.97 and $2.02 billion, respectively. Total U.S.-Korea bilateral trade (all sectors combined) would increase by $19.71 billion (export sales for the United States and South Korea would increase by $11.91 billion and $7.80 billion, respectively).

For the agriculture and food sector, trade creation occurs because South Korea would reduce its production of agricultural and food products by about 10.9 percent (Table 3) and increase its imports from the United States. Specifically, U.S. agricultural and food exports to South Korea would increase by $6.44 billion while its exports to all

Table 4: **Changes in Exports by Sectors under the KORUS FTA, in billions of dollars**

Sectors	United States	Korea	China	Japan	OAsia	EU	ROW	Total
United States								
Agri-food	0	6.44	–0.10	–0.41	–0.14	–0.25	–0.95	4.59
Natural-res	0	0.54	–0.02	–0.11	–0.06	–0.25	–0.62	–0.52
Textiles	0	0.24	–0.03	–0.04	–0.03	–0.10	–0.62	–0.58
Mid-tech	0	1.75	–0.24	–0.52	–0.32	–1.89	–3.72	–4.94
High-tech	0	2.89	0.21	0.29	0.34	1.53	2.38	7.64
Services	0	0.06	–0.11	–0.43	–0.37	–2.67	–1.65	–5.17
Total	0	11.91	–0.29	–1.21	–0.58	–3.63	–5.18	1.02
Korea								
Agri-food	0.14	0	0.04	0.27	0.04	0.04	0.10	0.62
Natural-res	0.11	0	–0.09	–0.09	–0.03	–0.01	–0.05	–0.15
Textiles	4.97	0	–0.07	–0.02	–0.04	–0.02	–0.05	4.77
Mid-tech	0.68	0	–0.57	–0.23	–0.32	–0.16	–0.49	–1.08
High-tech	2.02	0	–0.02	–0.05	–0.06	0.00	–0.13	1.77
Services	–0.12	0	–0.02	–0.06	–0.06	–0.38	–0.21	–0.85
Total	7.80	0	–0.72	–0.18	–0.46	–0.53	–0.82	5.09
China								
Agri-food	0.03	–0.85	0	0.00	0.00	0.00	0.02	–0.80
Natural-res	0.03	–0.04	0	0.01	0.01	0.01	0.03	0.04
Textiles	–0.32	0.25	0	–0.09	0.00	0.00	0.10	–0.06
Mid-tech	0.76	–0.06	0	0.02	0.02	0.03	0.17	0.94
High-tech	–0.47	–0.20	0	–0.25	–0.17	–0.19	–0.41	–1.70
Services	0.06	0.01	0	0.00	0.00	0.02	0.01	0.10
Total	0.10	–0.90	0	–0.32	–0.15	–0.14	–0.08	–1.49
Japan								
Agri-food	0.01	–0.17	0.00	0	0.00	0.00	0.01	–0.15
Natural-res	0.02	–0.02	0.01	0	0.01	0.01	0.03	0.07
Textiles	–0.01	0.05	0.04	0	0.01	0.00	0.01	0.11
Mid-tech	0.44	–0.13	0.16	0	0.13	0.10	0.27	0.98
High-tech	–0.29	–0.55	–0.04	0	–0.22	0.03	–0.30	–1.37
Services	0.08	0.04	0.00	0	0.02	0.10	0.07	0.32
Total	0.26	–0.79	0.18	0	–0.05	0.25	0.09	–0.05
OAsia								
Agri-food	0.13	–0.60	0.00	–0.01	–0.02	0.00	0.04	–0.47
Natural-res	0.02	–0.07	0.01	0.00	0.00	0.00	0.02	–0.02
Textiles	–0.43	0.09	0.00	–0.02	–0.01	–0.03	0.02	–0.38
Mid-tech	0.30	–0.07	0.04	0.01	0.04	0.00	0.13	0.46
High-tech	–0.49	–0.30	–0.14	–0.32	–0.67	–0.21	–0.43	–2.56
Services	0.20	0.07	0.00	–0.01	0.00	0.05	0.04	0.34
Total	–0.28	–0.88	–0.10	–0.36	–0.65	–0.18	–0.17	–2.62

Sectors	United States	Korea	China	Japan	OAsia	EU	ROW	Total
EU								
Agri-food	0.17	–0.49	0.00	–0.02	–0.01	–0.30	0.05	–0.60
Natural-res	0.06	–0.01	0.00	0.00	0.00	0.05	0.08	0.17
Textiles	–0.16	0.09	0.00	–0.03	–0.01	–0.16	0.00	–0.27
Mid-tech	1.23	–0.12	0.04	0.00	0.03	–0.07	0.97	2.08
High-tech	–1.44	–0.34	–0.30	–0.29	–0.43	–4.90	–3.37	–11.08
Services	1.27	0.41	–0.02	–0.12	–0.01	0.13	0.18	1.84
Total	1.12	–0.45	–0.29	–0.46	–0.43	–5.25	–2.10	–7.86
ROW								
Agri-food	0.54	–1.48	–0.03	–0.08	–0.06	–0.18	0.01	–1.28
Natural-res	0.33	–0.56	–0.01	–0.09	–0.07	–0.25	0.06	–0.58
Textiles	–0.91	0.04	–0.03	–0.01	–0.03	–0.21	–0.04	–1.20
Mid-tech	2.00	–0.16	0.06	–0.04	–0.02	–0.33	0.44	1.94
High-tech	–3.14	–0.22	–0.21	–0.23	–0.32	–1.20	–1.34	–6.69
Services	0.97	0.25	–0.06	–0.10	–0.02	–0.03	0.05	1.06
Total	–0.21	–2.13	–0.29	–0.55	–0.53	–2.20	–0.83	–6.74

Source: Author's calculations.
Note: Agri-food = agriculture and food, Natural-res = natural resources–based industries, Mid-tech = mid-technology products, High-tech = high-technology products, OAsia = other Asian countries, ROW = rest of world. Numbers in the table represent the changes in exports from the country in the row to the country in the column. For example, 6.44 in the first row and second column represents U.S. exports of agricultural and food product to South Korea or South Korea's imports from the United States.

other countries and regions would decrease slightly, by $1.85 billion. As a result, the net increase in U.S. total exports (with its all trading partners) of agricultural and food products would be $4.59 billion under the KORUS FTA. For U.S. imports in the sector, the United States would increase its imports of agricultural and food products from both South Korea and all other trading partners. Total U.S. imports in the sector would increase by $1.02 billion. South Korea's total imports in the sector would increase by $2.84 billion, even though its imports from all countries except the United States would decrease by a sum of $3.60 billion. South Korea would increase its exports to all countries slightly, by a sum of $0.62 billion.

Trade creation also occurs for the sector of natural resources–based industries. The United States and South Korea would reduce their production by 0.34 percent and 1.77 percent, respectively (Table 3). However, the two countries would increase their exports in the sector to each other while their exports to all other countries and regions would decrease slightly. Specifically, the United States would increase its exports to South Korea (by $0.54 billion) while decreasing its exports to all other countries and regions (by $1.06 billion). As a result, total U.S. exports in the sector would decrease by $0.52 billion. The United States would increase its imports from all countries and

regions, with a total increase by $0.57 billion. South Korea would divert its imports in the sector from other countries and regions to the United States, with a net decrease in imports by $0.16 billion (an increase of $0.54 billion in imports from the United States and a decrease of $0.70 billion in imports from other countries and regions). South Korea would also slightly decrease its total exports in the sector by $0.15 billion.

For the textiles sector, both trade creation and trade diversion occur because the United States would decrease its production of textile products, and the reduced production would be replaced solely by an increase in imports from South Korea. Specifically, U.S. imports from South Korea would increase by $4.97 billion (trade creation effect) while its imports from all other countries and regions would decrease by a sum of $1.82 billion (trade diversion effect). Because the trade creation effect dominates the trade diversion effect, U.S. total imports in the sector would increase by $3.15 billion. It is generally believed that the third countries (China, OAsia, and ROW) are more efficient producers of textile products than South Korea because of lower labor costs in those developing countries. However, the United States would divert its imports from these more efficient nonmember countries and regions to less efficient South Korea under the KORUS FTA. While U.S. exports to South Korea in the sector would increase slightly ($0.24 billion), its exports to all other countries and regions would decrease by $0.82 billion, resulting in a net decrease of $0.58 billion. While South Korea's exports of textile products to the United States would increase by $4.97 billion, its exports to all other countries and regions would decrease slightly by $0.20 billion, resulting in a net increase in exports of $4.77 billion. South Korea's imports of textile products from all its trading partners would increase slightly, with a total increase of $0.75 billion.

For the sector of mid-technology products, the United States and South Korea would decrease their production by 0.27 percent and 1.61 percent, respectively (Table 3). However, the two countries would increase their exports of mid-tech products to each other. Thus, trade creation occurs. Specifically, U.S. exports to South Korea would increase by $1.75 billion, and its exports to all other countries and regions would decrease by a total of $6.69 billion. As a result, total U.S. exports in the sector would decrease by $4.94 billion. U.S. imports from all countries and regions would increase, with a total increase of $5.41 billion. South Korea would increase its exports of mid-tech products to the United States, but it would reduce its exports to all other countries and regions, resulting in a net decrease of $1.08 billion in exports. Similarly, South Korea would increase its imports of mid-tech products from the United States by $1.75 billion and divert its imports from all other countries and regions by $0.54 billion. As a result, South Korea's total imports in the sector would increase by $1.21 billion.

For the sector of high-technology products, both the United States and South Korea would increase their production in the sector by about 0.54 percent (Table 3). Total U.S. exports would increase dramatically, by $7.64 billion. In particular, U.S. exports to South Korea, ROW, and the EU would increase by $2.89, $2.38, and $1.53 billion, respectively. While U.S. imports from South Korea would increase by $2.02 billion, its imports from all other countries and regions would decrease by a total of $5.83 billion. As a result, total U.S. imports would decrease by $3.81 billion. For South Korea, while its exports to the United States in the high-tech sector would increase by $2.02 billion, its exports to all other countries and regions would decrease slightly, by a sum of $0.25 billion, resulting in a net increase of $1.77 billion in exports. South Korea would also divert its imports of high-tech products from other trading partners to the United States. While South Korea's imports from the United States would increase by $2.89 billion, its imports from other countries and regions would decrease by $1.62 billion. Thus, South Korea's total imports in the high-tech sector would increase by $1.27 billion.

For the sector covering services, while U.S. exports to South Korea would increase slightly ($0.06 billion), its exports to all other countries and regions would decrease ($5.23 billion), resulting in a net decrease of $5.17 billion. In contrast, U.S. imports in the sector from South Korea would decrease slightly, by $0.12 billion, while its imports from all other countries and regions would increase by $2.57 billion, resulting in a net increase of $2.45 billion. South Korean exports in the sector to all destinations would decrease by a sum of $0.85 billion, while imports from all sources would also increase by a sum of about $0.85 billion.

U.S. trade (with all countries and regions) would increase in all sectors except the services sector. In particular, U.S. trade in the sectors of agri-food, high-tech, and textile products would increase by $5.61,[6] $3.83, and $2.57 billion, respectively. Similarly, South Korea's trade would increase in all sectors except the natural resources–based industries sector. South Korea's trade in the above sectors would increase by $3.47, $3.04, and $5.52 billion, respectively. Under the KORUS FTA, the U.S. bilateral trade balance with South Korea in the sectors of agri-food, natural-res, mid-tech, high-tech, and services would improve by $6.30, $0.43, $1.06, $0.86, and $0.18 billion, respectively. However, the U.S. trade balance with South Korea in the textiles sector would deteriorate by $4.73 billion.

For scenario 2, in which Korean import tariffs on U.S. agriculture and food products are cut by 95 percent, the changes in exports are not reported in Table 4 (they are available upon request). U.S. exports to South Korea in the agriculture and food sector would increase further when the trade barriers for agriculture and food products

6. Which is equal to $4.59 billion (increase in exports) plus $1.02 billion (increase in imports).

are reduced by a larger amount. Specifically, U.S. exports of agricultural and food products to South Korea would increase by $11.35 billion, and Korean exports of textile products would increase by $5.45 billion under scenario 2. The changes in U.S.-Korea bilateral trade in other sectors are similar in magnitude to those under scenario 1. U.S.-Korea overall bilateral trade (all sectors combined) would increase by about $25.3 billion.

V. Summary and Conclusions

In this study, we have examined the characteristics of U.S.-Korea bilateral trade since 1989. We used a general equilibrium model (a multiregion GTAP model) to examine the effects of the KORUS FTA on various sectors of the economy under two different scenarios in the two countries.

The U.S.-Korea bilateral trade volume has been growing dramatically since 1989. This is especially true for bilateral trade of differentiated high-technology products between the two countries. While U.S. exports of high-technology products to South Korea have increased, its imports of high-technology products from South Korea have increased more rapidly, resulting in a growing U.S. bilateral trade deficit. The relative importance of other sectors (e.g., mid-technology and textiles) in U.S.-Korea bilateral trade tends to decline over time because an increase in South Korean wages makes its labor-intensive goods less competitive.

Under the KORUS FTA, bilateral trade between the United States and South Korea could increase through both interindustry and intraindustry trade. Major increases in interindustry trade would include an increase in U.S. exports of agricultural and food products to South Korea and an increase in Korean exports of textile products to the United States. The two countries could also increase their intraindustry trade of high-technology manufacturing products. The overall bilateral trade (all sectors combined) between the United States and Korea would increase dramatically, and the U.S. trade balance with South Korea could improve for all sectors except the textiles sector.

The KORUS FTA would improve the national welfare for both countries. The effects of the FTA on GDP and household income in both countries would be positive. South Korea benefits more from the FTA in terms of per capita welfare gain and per capita GDP increase. While U.S. producers in the agri-food and high-tech sectors would benefit from the FTA, South Korea's producers in the textiles and high-tech sector would benefit from the FTA. By contrast, producers in the U.S. textiles sector and producers in the agri-food sector in South Korea might suffer from the FTA. Thus, it is important to compensate those groups in order to smoothly implement the KORUS FTA.

The limitations of the study may include the following two aspects. First, the data are based on the year 2001. There have been some major changes during the past five years across the sectors in the economies throughout the world, particularly in the high-technology sector. Second, assumptions in the GTAP model including constant return to scale, fixed resource endowment, perfect competition, and perfect mobility of labor across the sectors may be too restrictive and could lead to biased results. However, the study provides useful information regarding the effects of the KORUS FTA on the various sectors of the two economies and their interdependency.

REFERENCES

Armington, P. S. 1969. A Theory of Demand for Products Distinguished by Place of Production. *IMF Staff Papers* 16:159–78.

CalTrade Report. 2006. US, Korea to Start FTA Negotiations. Los Angeles: CalTrade Report. 7 February.

Cheong Inkyo. 2004. East Asian Economic Integration: Implications for a U.S.-Korea FTA. Paper prepared for American Enterprise Institute, Washington, D.C. www.aei.org/docLib/20041026_Cheong.pdf.

Choi Inbom and Jeffrey J. Schott. 2001. *Free Trade between Korea and the United States?* Washington, D.C.: Institute for International Economics.

Cooper, W. H., and M. E. Manyin. 2006. The Proposed South Korea-U.S. Free Trade Agreement (KORUSFTA). Report no. RL33435. Washington, D.C.: Congressional Research Service.

DeRosa, Dean A., and John P. Gilbert. 2005. Predicting Trade Expansion under FTAs and Multilateral Agreements. Working Paper no. 05-13. Institute for International Economics, Washington, D.C. October.

Head, K., and J. Ries. 2001. Increasing Returns versus National Product Differentiation as an Explanation for the Pattern of US-Canada Trade. *American Economic Review* 91:858–76.

Hertel, T. 1997. *Global Trade Analysis: Modeling and Applications.* New York: Cambridge University Press.

ITA (International Trade Administration). Various years. TradeStats Express. Washington, D.C.: U.S. Department of Commerce, International Trade Administration. http://tse.export.gov/.

Johanns, Mike. 2006. Statement by Agriculture Secretary Mike Johanns Regarding the Initiation of Free Trade Agreement Talks with South Korea. Release no. 0034.06. Washington, D.C.: U.S. Department of Agriculture, Foreign Agricultural Service.

Kiyota, K., and R. M. Stern. 2005. An Assessment of the Economic Effects of the Menu of U.S. Trade Policies. *Global Economy Journal* 5, no. 4. www.bepress.com/gej/vol5/iss4/22/.

Krugman, P. R. 1980. Scale Economies, Product Differentiation, and the Pattern of Trade. *American Economic Review* 70:950–59.

Krugman, P. R. 1981. Intraindustry Specialization and the Gains from Trade. *Journal of Political Economy* 89:959–73.

Lee Jun-yu and Lee Hong-shik. 2005. *Feasibility and Economic Effects of a Korea-U.S. FTA*. Seoul: Korea Institute for International Economic Policy.

Manyin, M. E. 2006. South Korea-U.S. Economic Relations: Cooperation, Friction, and Prospects for a Free Trade Agreement (FTA). Report no. RL30566. Washington, D.C.: Congressional Research Service.

McDaniel, Christine, and Alan Fox. 2001. *U.S.-Korea FTA: The Economic Impact of Establishing a Free Trade Agreement (FTA) between the United States and the Republic of Korea.* Investigation no. 332-425; USITC publication no. 3452. Washington, D.C.: United States International Trade Commission. September.

Noland, M. 2003. The Strategic Importance of US-Korea Economic Relations. International Economics Policy Brief no. PB 03-6. Institute for International Economics, Washington, D.C. www.iie.com/publications/pb/pb03-6.pdf.

USTR (Office of the United States Trade Representative). 2006. United States, South Korea Announce Intention to Negotiate Free Trade Agreement. Washington, D.C.: USTR. 2 February.

USTR (Office of the United States Trade Representative). 2007. Final—United States–Korea FTA Texts. Washington, D.C.: USTR. www.ustr.gov/Trade_Agreements/Bilateral/Republic_of_Korea_FTA/Draft_Text/Section_Index.html.

KORUS FTA Conference Cosponsored By:

The Korea Economic Institute
The Peterson Institute for International Economics

In Conjunction With:

The Korea-America Economic Association

May 1, 2007

Korea Economic Institute of America
1201 F Street NW, Suite 910, Washington D.C. 20004
Ph: 202.464.1982 Fx: 202.464.1987 www.keia.org

Peterson Institute for International Economics

KEI