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The China-Korea Free Trade Agreement and Its Economic Impact in Explicit Consideration of Foreign Direct Investment: A CGE Approach

Prof. Dr. Jong-Hwan Ko
Division of International and Area Studies
Pukyong National University, Korea
jonghko@pknu.ac.kr

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1. Introduction

- The Korea-China Free Trade Agreement (FTA) was declared to be concluded in the summit meeting of Korean President Park Geun-hye and Chinese President Xi Jinping on the sidelines of the 22nd APEC Economic Leaders' Meeting held in Beijing on 10 November 2014.
 - Since Korea and China launched negotiations on a Korea-China FTA in May 2012, 14 rounds of negotiation talks have been held between them



1. Introduction

- The C-K FTA includes 22 chapters.
 - 1. Trade in goods
 - 2. Rules of origin
 - 3. Customs and trade facilitation
 - 4. Trade remedy
 - 5. Sanitary and phytosanitary (SPS) measures
 - 6. Technical barriers to trade
 - 7. Trade in services
 - 8. Financial services
 - 9. Communications
 - 10. Movement of natural persons
 - 11. Investment



1. Introduction

- The C-K FTA includes 22 chapters.
 - 12. Intellectual property rights
 - 13. Competition
 - 14. Transparency
 - 15. Environment
 - 16. E-transaction
 - 17. Economic cooperation
 - 18. Initial regulations and definitions
 - 19. Exceptions
 - 20. Dispute resolution
 - 21. Institutional issues
 - 22. Final clauses



1. Introduction

- China is the second largest economy after the United States, Korea's largest trading partner and largest market for Korean exports, while Korea is China's 3rd largest trading partner and was the 5th biggest source of foreign investment in 2013.
 - The bilateral trade between Korea and China totaled US\$274 billion in 2013.
- Therefore, the Korea-China FTA is expected to affect the economies of Korea and China, which will be an important exogenous factor for Korea's growth in years to come.



1. Introduction

- The establishment of the Korea-China FTA is said to be of landmark importance and expected to effectively promote regional integration of the Asia-Pacific.
- The two leaders of Korea and China said that the setting up of the free trade area between Korea and China is a good news for global economic recovery as well as development and prosperity in Asia.



1. Introduction

- It is of great importance to estimate the potential economic effects of the Korea-China FTA for both the government and business.
- Some empirical studies have been conducted:
 - Cheong (2004, 2006, 2014)
 - Ko (2000, 2005, 2010)
 - Lee et al. (2005)
 - The Joint Study Committee for Korea-China FTA (2013)
 - Zhao (2008)



1. Introduction

- Cheong (2004, 2004), Ko (2000), Lee et al. (2005) and Zhao (2008) used a static Computable General Equilibrium (CGE) model to quantify the potential economic effects of a Korea-China FTA.
- A static CGE model captures only static effects of the Korea-China FTA which come from more efficient reallocation of resources caused by the elimination of tariffs, which implies that a static CGE model cannot unravel its dynamic impacts to be derived from capital accumulation over time.



1. Introduction

- A static CGE model is of comparative statics in nature: given the pattern of world output and trade at one moment of time, it generates what the pattern of output and trade would be after all the economies included in the model adjusted to the trade liberalization of the Korea-China FTA, which implies that a static CGE model cannot take into account the timing of implementation of concessions agreed upon in the FTA.



1. Introduction

- Cheong (2014), Ko (2005, 2010) and The Joint Study Committee for Korea-China FTA (2013) used a dynamic CGE.
- However, the assumptions for trade liberalization based on tariff reductions between Korea and China were made by the authors on their own and are different from those finally agreed between Korea and China.
- The empirical results might be not so realistic.



1. Introduction

- Against this backdrop, the objective of this study is to conduct a quantitative assessment of the potential economic effects of the Korea-China FTA using a dynamic multi-region, multi-sector CGE model in order to take into account the different timing of policy implementations related to the Korea-China FTA and to incorporate capital accumulation effects.

II. Trade Relations between Korea and China

Korea's Major Trading Partners in 2013 (US\$ million)

Country	Exports	Imports	Trade
1. China	145,869	83,053	228,922
2. U.S.A	62,052	41,512	103,564
3. Japan	34,662	60,029	94,692
4. Hong Kong	27,756	1,929	29,686
5. Singapore	22,289	10,369	32,658
6. Vietnam	21,088	7,175	28,263
7. Taiwan	15,699	14,633	30,332
8. India	11,376	6,180	17,556
9. Indonesia	11,568	13,190	24,758
10. Mexico	9,727	2,301	12,028

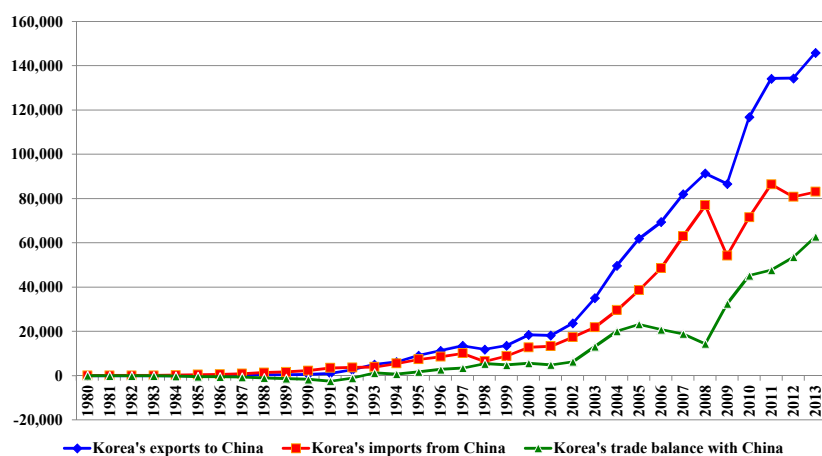
Source: Korea International Trade Association, KITA.net

China's Major Trading Partners in 2013 (US\$ million)

Country	Exports	Imports	Trade
1. U.S.A.	366,268	144,276	510,543
2. Hong Kong	390,085	43,465	433,550
3. Japan	148,674	159,091	307,765
4. Korea	90,653	179,359	270,011
5. Germany	67,084	93,765	160,849
6. Netherlands	60,176	10,552	70,728
7. Vietnam	48,544	16,361	64,905
8. England	50,614	18,811	69,425
9. India	48,352	16,708	65,060
10. Russia	49,518	39,352	88,870

Source: Korea International Trade Association, KITA.net

Korea's Bilateral Trade with China, 1980-2013 (US\$ million)



Source: Korea International Trade Association, KITA.net

Matrix of Exports at FOB Prices in 2011 (US\$ million)

	1 KOR	2 CHN	3 ASEAN	4 USA	5 EU28	6 JPN	7 A_N	8 ROW	Total
1 KOR	0.0	139.7	55.6	63.6	66.9	38.7	8.3	164.4	537.1
2 CHN	96.4	88.0	166.4	442.6	432.4	172.5	46.1	574.2	2,018.6
3 ASEAN	44.0	164.4	207.6	136.6	169.0	102.2	38.1	219.3	1,081.2
4 USA	62.1	144.3	94.3	0.0	406.6	106.2	39.8	855.7	1,709.1
5 EU28	57.0	241.5	128.9	486.7	3,778.3	102.2	61.9	1,376.0	6,232.5
6 JPN	69.3	198.0	113.3	138.6	112.9	0.0	19.7	197.4	849.2
7 A_N	21.6	80.5	29.7	18.2	29.2	39.0	13.2	55.7	287.1
8 ROW	144.7	547.8	216.0	1,086.2	1,355.0	230.8	40.5	1,436.8	5,057.8

Source: GTAP database pre-release version 9.2 (October 2014)

Matrix of Exports Shares in 2011 (percent)

	1 KOR	2 CHN	3 ASEAN	4 USA	5 EU28	6 JPN	7 A_N	8 ROW	Total
1 KOR	0.0	26.0	10.3	11.8	12.5	7.2	1.6	30.6	100.0
2 CHN	4.8	4.4	8.2	21.9	21.4	8.5	2.3	28.4	100.0
3 ASEAN	4.1	15.2	19.2	12.6	15.6	9.5	3.5	20.3	100.0
4 USA	3.6	8.4	5.5	0.0	23.8	6.2	2.3	50.1	100.0
5 EU28	0.9	3.9	2.1	7.8	60.6	1.6	1.0	22.1	100.0
6 JPN	8.2	23.3	13.3	16.3	13.3	0.0	2.3	23.2	100.0
7 A_N	7.5	28.0	10.3	6.4	10.2	13.6	4.6	19.4	100.0
8 ROW	2.9	10.8	4.3	21.5	26.8	4.6	0.8	28.4	100.0

Source: GTAP database pre-release version 9.2 (October 2014)

Matrix of Imports at CIF Prices in 2011 (US\$ million)

	1 KOR	2 CHN	3 ASEAN	4 USA	5 EU28	6 JPN	7 A_N	8 ROW
1 KOR	0.0	146.2	58.3	65.8	69.0	40.4	8.8	170.7
2 CHN	100.8	90.1	175.7	465.0	452.7	181.2	48.7	606.5
3 ASEAN	47.1	175.3	219.2	142.2	175.0	108.9	40.0	232.4
4 USA	64.5	153.4	97.8	0.0	411.4	110.4	41.2	898.7
5 EU28	58.7	249.8	132.2	498.0	3,845.7	105.0	63.8	1,424.5
6 JPN	72.4	205.6	118.1	142.5	116.3	0.0	20.5	204.5
7 A_N	24.6	90.3	31.5	18.9	30.1	44.7	14.1	60.3
8 ROW	153.4	593.7	226.5	1,138.9	1,409.5	248.8	42.1	1,522.3
Total	521.4	1,704.5	1,059.2	2,471.2	6,509.6	839.4	279.1	5,119.8

Source: GTAP database pre-release version 9.2 (October 2014)

Matrix of Imports Shares in 2011 (percent)

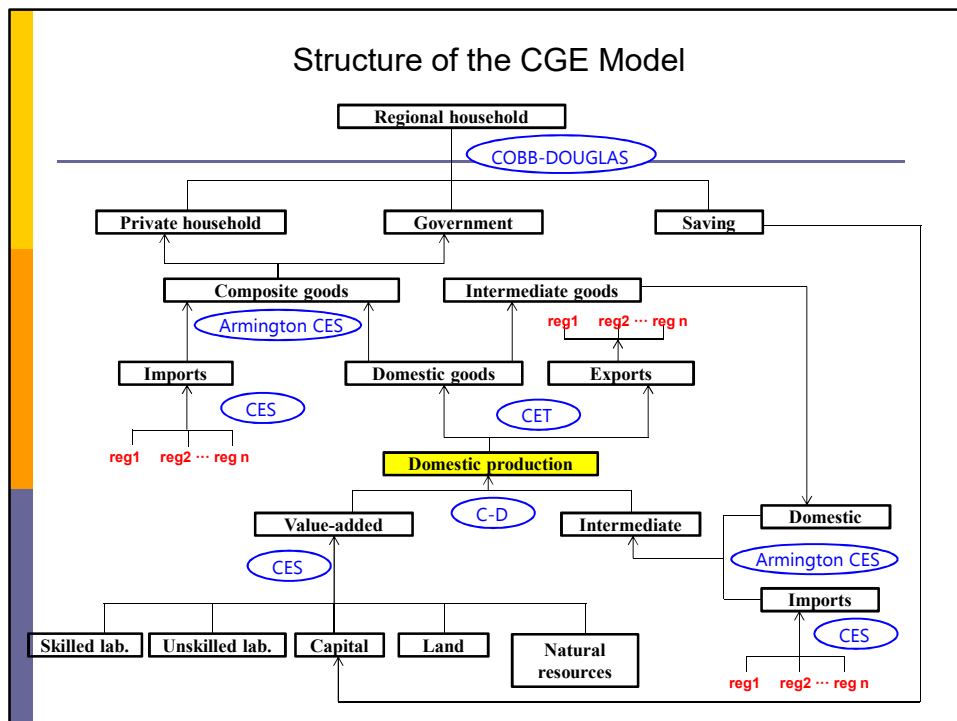
	1 KOR	2 CHN	3 ASEAN	4 USA	5 EU28	6 JPN	7 A_N	8 ROW
1 KOR	0	8.6	5.5	2.7	1.1	4.8	3.1	3.3
2 CHN	19.3	5.3	16.6	18.8	7	21.6	17.4	11.8
3 ASEAN	9.0	10.3	20.7	5.8	2.7	13	14.3	4.5
4 USA	12.4	9.0	9.2	0	6.3	13.2	14.8	17.6
5 EU28	11.3	14.7	12.5	20.2	59.1	12.5	22.9	27.8
6 JPN	13.9	12.1	11.1	5.8	1.8	0	7.3	4
7 A_N	4.7	5.3	3	0.8	0.5	5.3	5	1.2
8 ROW	29.4	34.8	21.4	46.1	21.7	29.6	15.1	29.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: GTAP database pre-release version 9.2 (October 2014)



3. Method: CGE Model

- A Computable General Equilibrium (CGE) Model can be defined as a system of non-linear simultaneous equations describing the constrained optimization of behaviors of economic agents, such as producers, consumers, exporters, importers, savers, investors, and the government.



What is a CGE Model?

- A CGE Model is different from
 - A partial equilibrium model
 - A macro econometric model
 - An input-output model

Data Base of a CGE Model

- Data base: **SAM** (Social Accounting Matrix) which consists of an Input-Output Table, NIPA (National Income and Product Accounts) data, and so on

Applications of CGE Models

- **To analyze the economic impacts of a variety of economic policies, such as**
 - **Tax policy: VA tax, consumption tax, income tax, corporate tax, etc.**
 - **Energy policy**
 - **Environmental policy: Kyoto protocol, Post-Kyoto protocol, greenhouse effect**
 - **Trade Policy: UR, DDA, economic integration such as FTAs**

CGE Model

- The static aspects of the CGE model is neoclassical in spirit and is part of a long tradition of models that have been widely used to analyze the impact of global trade liberalization and structural adjustment programs.
- The earliest world CGE models were developed by Whalley (1985) and Deardorff and Stern (1990) to analyze the impact of the Tokyo Round of GATT negotiations.
- The model used in this study applies Whalley (1985) to endogenize all regions including the rest of the world and incorporates the macroeconomic specifications from Devarajan, Lewis and Robinson (1990), Ko (1992) and Hertel (1997).

CGE Model

- The CGE model has solid micro-foundations that are theoretically transparent.
 - Consumers maximize their utility subject to budget constraint.
 - Producers maximize their profit under consideration of production technology.
 - Production structures are represented by nested production functions consisting of Cobb-Douglas and CES (Constant Elasticity of Substitution) functions.
 - Firms supply commodities to domestic and export markets via a CET (Constant Elasticity of Transformation) function, while minimizing production costs.

CGE Model

- The model includes five primary factors of production such as skilled and unskilled labor, capital, land and natural resources; and intermediate inputs.
- Labor and capital are employed by all sectors, but land is used only in agricultural sectors, and natural resources are utilized in mining sectors.
- It is assumed that intermediate inputs and capital are traded between regions, whereas labor, land and natural resources are not traded.

CGE Model

- Product differentiation between domestic goods and imports, and imports by country of origin allows for two-way trade in each product category, depending on the ease of substitution between products from different regions (Armington approach).

CGE Model

- Within each region, the model solves for commodity and factor prices that equate demand and supply in all commodity and factor markets.
- The model also solves for world prices, equating demand and supply of sectoral exports and imports across the world economy.
- In addition, for each region, the model specifies an equilibrium relationship between the balance of trade and the real exchange rate that measures the average price of traded goods relative to the average price of domestically produced goods sold in the domestic market.

Dynamic CGE Model

- Some of the main features of the dynamic CGE model (Ianchovichina and McDougall, 2000) are as follows:
 - In each region, a single regional household collects income from primary factors of production such as labor, capital, land, and natural resources as well as all kinds of taxes and financial assets, and allocates them across private consumption, government expenditure, and savings according to a Cobb-Douglas utility function.
 - Financial assets represent claims on earnings from regional physical capital, which is owned by both domestic and foreign households via a global trust.

Dynamic CGE Model

- The global trust collects all the regional savings, and allocates them across regions to foreign investment.
- In the absence of policy reforms, the share of each regional household's wealth in domestic and foreign firms and the share of each region's capital stocks owned by domestic and foreign firms are held as close as possible to their initial values, subject to adding-up constraints, which means that their shares are likely to change, but the change is minimized.

Dynamic CGE Model

- Explicit modeling of the ownership of regional investment makes it possible to track the accumulation of wealth by foreigners, thereby ascertaining how the Korea-China FTA might affect foreign investment and ownership in each region.
- The income accruing from the domestic and foreign ownership of assets can be appropriately incorporated into regional income, and hence the calculation of welfare, both for Korea, China and for all other regions.

Dynamic CGE Model

- The investment theory in the model makes it possible to link economic activity over time, while keeping track of endogenous regional capital stocks and financial wealth, international investment and income flows.
- Investment funds are used for the purchase of physical investment goods (in the form of FDI), which are then added to the existing stock of physical capital.

Dynamic CGE Model

- A disequilibrium approach for allocating investment across regions:
 - Investors respond to expected rates of return and act so as to eliminate errors in their expectations gradually over time.
 - In the process of adjustment, investors gradually eliminate any differences in the rates of return across regions that might exist in the short run by allocating capital from regions with lower rates of return to regions with higher rates of return, leading to equalization of rates of return across regions in the long run.

Dynamic CGE Model

- Investment in a particular year is determined by three mechanisms.
 - The first one is the desire to eliminate errors in expectations (the second part of Eq 1). The expected rate of return falls by a portion (μ^r) of the error in expectations ($\log(R^r_A/R^r_E)$) during the period (dY). Over time as the expected and actual rates of return converge, this error will be eliminated.

Dynamic CGE Model

$$Eq1: \hat{R}_E^r = -\phi^r (\hat{K}^r - \Omega^r dY) + \mu^r \log \left(\frac{R_A^r}{R_E^r} \right) dY$$

where

- R_E^r : Expected rate of return in region r
- \hat{R}_E^r : Proportionate change in the expected rate of return in region r
- R_A^r : Actual rate of return in region r
- K^r : Quantity of capital stock in region r
- ϕ^r : Elasticity of the rate of return with respect to capital stock in region r
- Ω^r : Normal growth rate of capital in region r
- μ^r : Rate at which errors in expectations are eliminated in region r
- dY^r : Change in years in region r

Dynamic CGE Model

- The second one is the gradual equalization across regions of rates of return, which is reflected in *Eq 2*.
- This requires the movement of the expected rate of return in all regions towards the temporary equilibrium global rate of return (R_T), common to all regions.
- Differences between the target (R_T) and expected rates of return (R_E^r) determine the expected rate of growth in the gross rate of return (Γ_E^r). These differences are gradually eliminated at a rate determined by Λ^r .

Dynamic CGE Model

$$Eq 2 : \Gamma_E^r = \Lambda^r \left[\hat{R}_T - \hat{R}_E^r \right]$$

where

Γ_E^r : Expected rate of growth in the expected rate of return in region r

Λ^r : Rate at which differences in the target and expected rate of return are eliminated in region r

\hat{R}_T : Proportionate change in the target rate of return

Dynamic CGE Model

- The third one is the equalization of all three rates of return.
 - In the long run, the target and expected rates of return will have converged, leading to an expected rate of growth in the rate of return of zero (Eq 2).
 - Errors will also have been eliminated ($R_A^r/R_E^r = 1$) and there will be no tendency for the expected rate of return to change ($\dot{R}_E = 0$).
 - For this to happen, the growth rate of capital must equal the normal growth rate of capital (first part of Eq 1) and investment and capital must be changing at the same rate (Eq 3).
 - Additionally, there should be no tendency for the normal growth rate of capital to change ($\omega^r=0$ in Eq 4).

Dynamic CGE Model

$$Eq3: \Gamma_E^r = \phi^r \frac{I^r}{K^r} \left[\hat{I}^r - \hat{K}^r \right] + \phi^r d\Omega^r$$

where

I^r : Investment in region r

\hat{I}^r : Proportionate change in the investment in region r

K^r : Quantity of capital stock in region r

ϕ^r : Elasticity of the rate of return with respect to capital stock in region r

$d\Omega^r$: Proportionate change in the normal growth rate of capital in region r

Dynamic CGE Model

$$Eq4: \omega^r = \Pi^r \left[\hat{K}^r + \frac{\hat{R}_A^r}{\phi^r} - \Omega^r dY \right]$$

$$Eq5: \hat{K}^r = I^r dY$$

where

ω^r : Change in the normal rate of capital in region r

Π^r : Coefficient of adjustment for the normal growth rate of capital (Ω^r) in region r

4. Scenarios

- Baseline scenario (BS)
- Policy scenarios (PS)

Baseline Scenario

- Forecasts of key macroeconomic variables and any anticipated policy changes are needed, e.g. forecasts of the growth rates of GDP, skilled and unskilled labor and population for each region.
- The Korea-EU FTA that became effective on 1 July 2011 and the Korea-U.S. FTA that came into effect on 15 March 2015 are considered in the baseline scenarios.

Policy Scenarios

- It is assumed that the Korea-China FTA is implemented for the first time in 2015 and completed in 2034.
- According to the Ministry of Trade, Industry and Energy (2014), it is assumed that the reduction of tariffs between Korea and China occurs in three steps,
 - a) in 2015, when the Korea-China FTA is implemented for the first time,
 - b) in equal installments over the period of 9 years from 2016 to 2024, and
 - c) in equal installments over the period of 10 years from 2025 to 2034.

Tariff Reduction Schedules by Sector of Korea and China

Korea				China			
Sector	2015	2016-2024	2025-2034	Sector	2015	2016-2024	2025-2034
Agriculture	18	29	35	Agriculture	50	75	91
Fisheries	23	37	45	Fisheries	55	80	99
Manufacturing sectors	54	80	95	Manufacturing sectors	44	66	80
- Petroleum and chemicals	4	6	10	- Petroleum and chemicals	2	3	5
- Metal products	4	6	10	- Metal products	2	3	5
- Automobile and parts	2	3	5	- Automobile and parts	2	3	5
All sectors	52	77	91	All sectors	44	66	85

Ministry of Trade, Industry and Energy (2014)

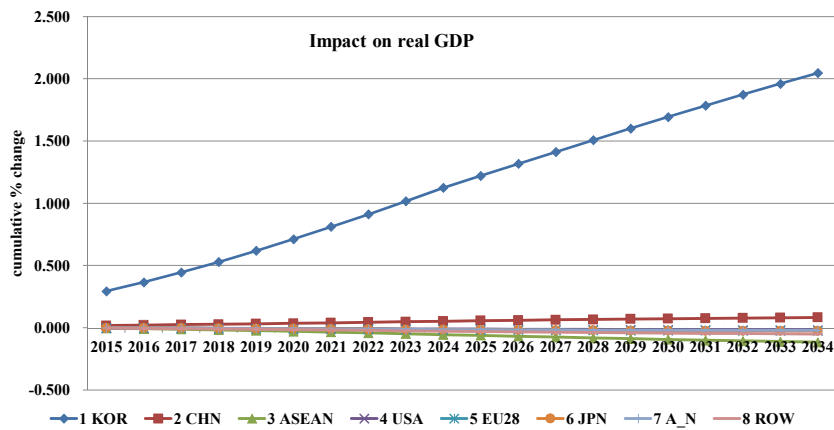
Sectors in the Model

Sector	Description
1 Rice	Rice
2 OthCrops	Other crops
3 VgtFrt	Vegetable and fruit
4 LvstkDairy	Livestock and dairy products
5 Fisheries	Fisheries
6 Mining	Mining
7 PrcFood	Processed food
8 TextWapp	Textiles and wearing apparel
9 PaperPblsh	Paper and publishing
10 Chemicals	Petroleum and chemicals
11 Metals	Metal products
12 Autos	Automobiles and parts
13 OthTrnspEq	Other transport equipment
14 Electronic	Electronics
15 Machinery	Machinery
16 OthManf	Other manufactures
17 Services	Services

Source: GTAP database pre-release version 9.2 (October 2014)

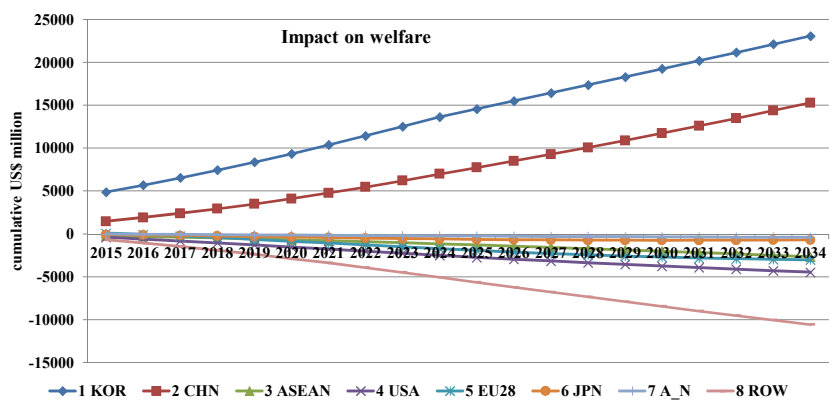
5. Simulation Results

Impact of Korea-China FTA on real GDP (cumulative % change)



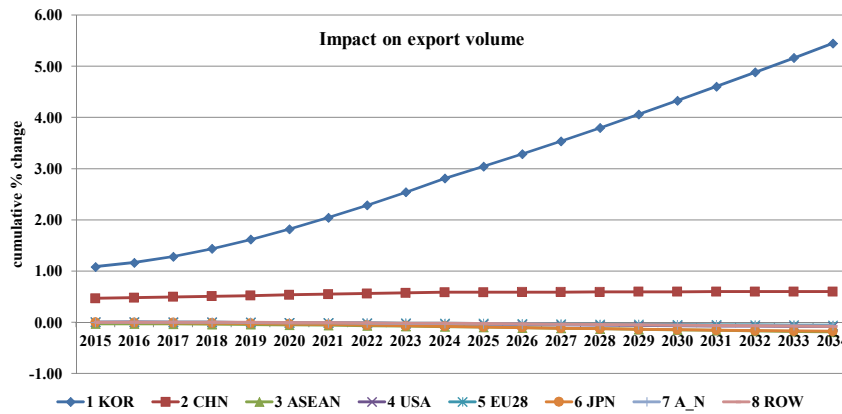
Source: author's calculation

Impact of Korea-China FTA on Welfare (cumulative US\$ million)



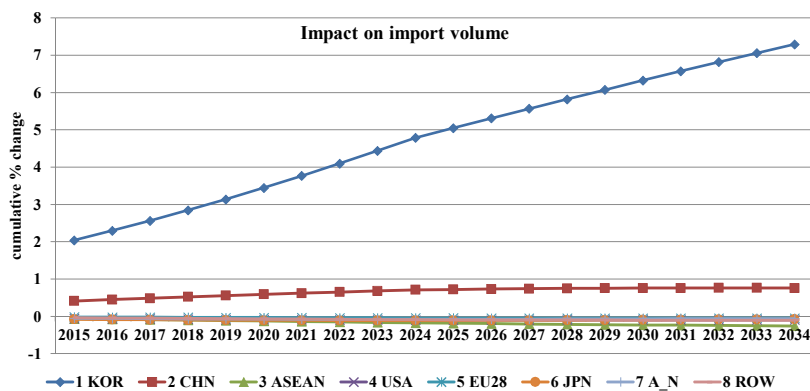
Source: author's calculation

Impact of Korea-China FTA on Export Volumes (cumulative % change)



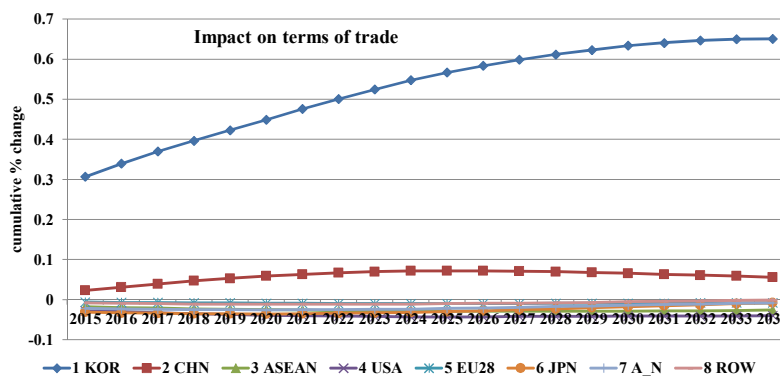
Source: author's calculation

Impact of Korea-China FTA on Import Volumes (cumulative % change)



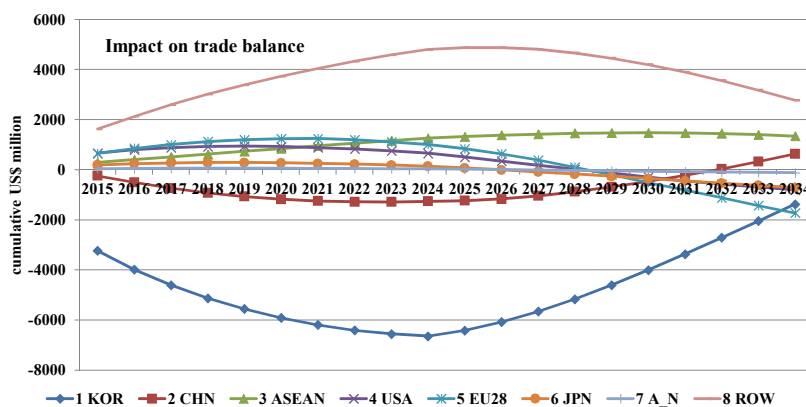
Source: author's calculation

Impact of Korea-China FTA on Terms of Trade (cumulative % change)



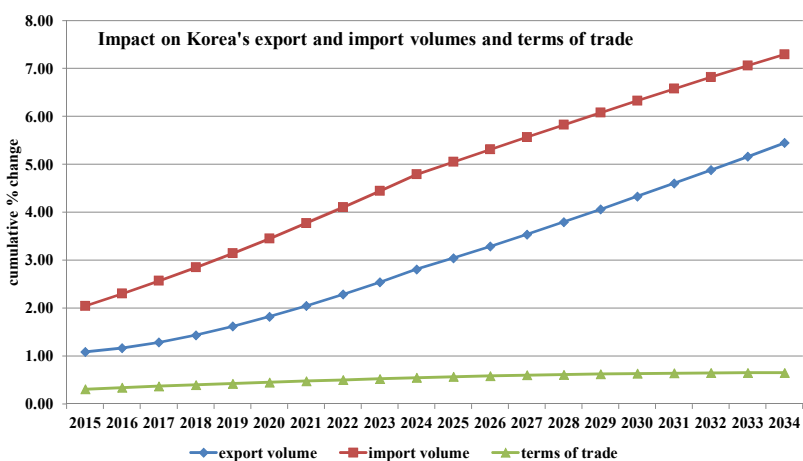
Source: author's calculation

Impact of Korea-China FTA on Trade Balance (cumulative US\$ million)



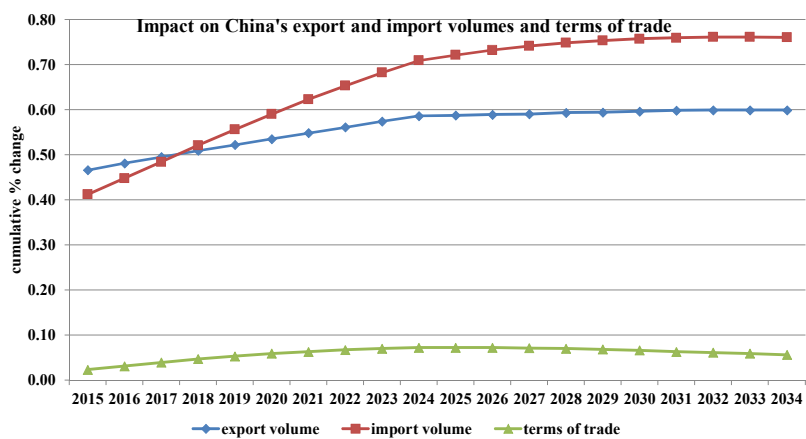
Source: author's calculation

Impact of Korea-China FTA on Korea's Export and Import Volumes and Terms of Trade (cumulative % change)



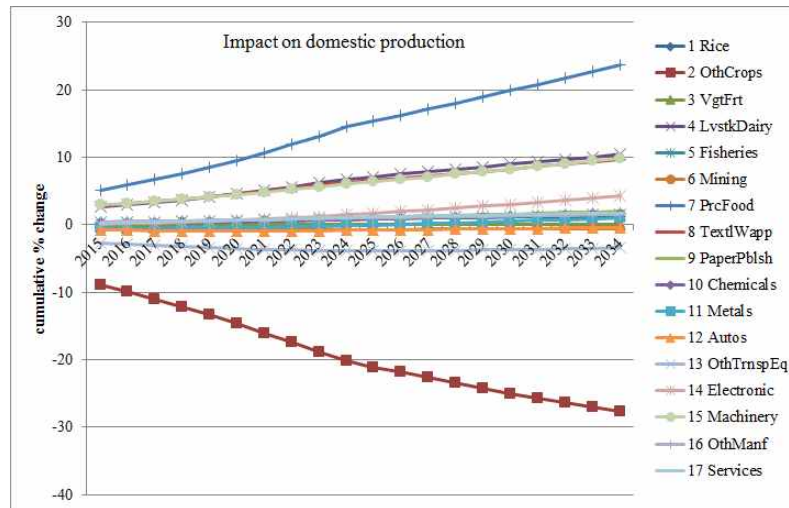
Source: author's calculation

Impact of Korea-China FTA on China's Export and Import Volumes and Terms of Trade (cumulative % change)



Source: author's calculation

Korea's Domestic Production by Sector (cumulative % change)



Conclusions

- Korea and China are expected to gain in terms of real GDP and welfare from the Korea-China FTA, while all non-members of the Korea-China FTA including Japan are to suffer a loss of economic growth and welfare.
- Korea's real GDP is expected to rise by 0.3% in 2015, 1.23% by 2024, and 2.05% by 2034.
- By contrast, China's real GDP is to rise by 0.02% in 2015, 0.05% by 2024 and 0.08% by 2034.





Conclusions

- Korea is to get an additional gain in welfare of US\$4.9 billion in 2015, \$13.7 billion by 2024 and \$23.1 billion by 2034, while China is to achieve an additional increase in welfare of \$1.5 billion in 2015, \$7 billion by 2024 and \$15.3 billion by 2034.
- It is because some domestic production of most industries in Korea and China is replaced by lower-cost imports from each other, i.e. **trade creation** occurs and it leads to their higher economic growth and increased welfare.
 - Trade creation results in greater specialization in production based on comparative advantage of Korea and China.

Conclusions

- All non-members of the Korea-China FTA including Japan are to be negatively affected in terms of economic growth and welfare by the Korea-China FTA, which is due to its **trading diverting effects** on them.
 - Trade diverting effects occur when lower-cost commodities that Korea and China have imported from non-members of the Korea-China FTA before the Korea-China FTA is in place are replaced by higher-cost imports from each other, which is made possible by tariff reductions by Korea and China.
 - Trade diversion reduces welfare of non-members of the Korea-China FTA because it shifts production from more efficient producers outside the Korea-China FTA to less efficient producers inside the Korea-China FTA.

Conclusions

- Korea is expected to run a trade deficit of \$3.2 billion in 2015 and its trade deficit increases continuously up to \$6.6 billion in 2024 and decreases afterwards, ending up with \$1.4 billion in 2034, because Korea's imports rise at a higher rate than its exports do.
- Although Korea's terms of trade improve as a result of the Korea-China FTA, they are not strong enough to compensate for Korea's insufficiently increased exports compared to its increased imports.

Conclusions

- Processed food, livestock and dairy products, textile and wearing apparel, and machinery are Korea's major beneficiaries of the Korea-China FTA, while other crops and other transport equipment are its major losers in terms of domestic production.
- It should be noted that domestic production of metal products and automobile and parts in which Korea has a comparative advantage with respect to China is to decrease as a result of trade liberalization measures agreed in the Korea-China FTA.



Thank you for your attention!