JOURNAL OF INTERNATIONAL LOGISTICS AND TRADE

CONTENTS

Papers

- 3 Korea-ASEAN Free Trade Agreement: The Implications on Seaborne Trade Volume and Maritime Logistics Policy Development in Korea
Paul T-W Lee, Tsung-Chen Lee, Tzu-Han Yang
- 27 Third-party enterprises' perceptions of green logistics in China
Hyunggeun Kim, Jungseok Choi
- 43 Chinese Dragon venturing into GMS territory : Does it Makes Sense?
Nilanjan Banik, Khanindra Ch. Das
- 67 Scenario Based Global Supply Chain Planning Process Considering Demand Uncertainty
Hongjoo Lee, Hosang Jung
- 87 Assisting Trade Adjustment in Korea:Is it a Facilitating Device for FTA Implementation?
Yoon HEO
- 99 The Evaluation of East Asian Regionalism from APEC to RCEP
Inkyo Cheong, Jungran Cho

Korea-ASEAN Free Trade Agreement: The Implications on Seaborne Trade Volume and Maritime Logistics Policy Development in Korea

Paul T-W Lee*, Tsung-Chen Lee**, Tzu-Han Yang***

Abstract

This paper aims to explore the impacts of the recent development of Korean free trade agreements (FTAs) on its seaborne trade volumes. The paper firstly estimates the changes in cargo value flows caused by Korea-EU FTA, Korea-USA FTA and Korea-ASEAN FTA using a global computable general equilibrium model named Global Trade Analysis Project (GTAP) and its most recent database - version 7 with 2004 as the base year. Then a set of systematic conversion factors transferring trade value flows to volume flows of different types of commodities is calibrated according to the United Nations COMTRADE database and is used to convert the GTAP trade value flows into volume flows. Having indentified maritime cargo flows by different commodity types, this paper attempts to draw implications for maritime logistics policy in order to facilitate the trade of Korean merchandises and to propose key competitive strategy for the maritime container transport networking and logistics service providers in the Korean logistics industry.

Keywords : *Free trade agreements, Computable general equilibrium, Global Trade Analysis Project, Maritime transport and logistics*

JEL Classification: *F13, F14, F41*

* Department of Logistics and Shipping Management, Kainan University, Taiwan
(*Corresponding author: paultwlee@mail.knu.edu.tw)

** Department of Economics, National Taipei University, Taiwan

*** Department of Public Finance, National Taipei University, Taiwan

1. Introduction

Since late 20th century, trade liberalization has been a key driver of economic growth for many countries. Recognizing this point, after the 1997 Asian financial crisis, the Korean government has actively engaged in negotiating international agreements on freer trade. In the year of 2011, Korea becomes the first Asian country that concludes the free trade agreement (FTA) with both the European Union and the United States. Its further negotiation on the FTA with the Association of Southeast Asian Nations (ASEAN)¹⁾ is undergoing and draws considerable attention. In the current literature, there are several studies concluding that Korea will benefit from these FTAs (e.g., Lee and Park, 2005; Ariyasajakorn et al., 2009; Kwan and Qiu, 2010).

Trade liberalization is an important factor that affects trade geography (Lee and Lee, 2011), which further determines shipping demand at a global scale among regions. For a peninsula like Korea whose international trade of goods is mostly shipped by sea transportation, the shipping and port sectors serve an important role in accomplishing the mission of trading and realizing the benefits from trade liberalization. Hence it is essential to provide reliable forecasts of the associated cargo variations for the development policy for the Korean shipping and port industry in order to respond to the FTAs effectively. However, there has been little research on this subject.

Accordingly, this paper aims at offering a quantitative evaluation of the impact of recent development of Korean FTAs on seaborne cargo value and volume flows, and drawing the associated policy implications for the Korean maritime shipping and port industry. The variations in cargo volumes caused by trade liberalization crucially depend on the existing trade barriers and trade patterns, as well as the economy-wide adaptation. In general, the existing tariff levels vary across commodities and countries. Therefore, asymmetric impacts on commodity trade will ensue if the tariffs are removed. The adjustment of trade patterns caused by FTA is determined by economy-wide adaptation of industrial restructuring and factor reallocation. Such new trade patterns directly affect the derived demand for shipping service. An appropriate tool for shipping demand forecasting associated with trade liberalization should take account of the above features. Having considered the above and referring to the applications in maritime shipping studies

¹⁾ The ASEAN was established by Indonesia, Malaysia, Philippines, Singapore and Thailand in 1967. The main purpose is to accelerate the economic growth, social progress, cultural development of each member country, as well as to enhance the cooperation among member nations. Over the years its membership has broadened to include Brunei Darussalam (1984), Viet Nam (1995), Lao People's Democratic Republic (1997), Myanmar (1997) and Cambodia (1999). Tongzon (2005) attempted to analyze impacts of an ASEAN-China FTA and draw its economic implications but it has not addressed the estimation of maritime cargo volumes under our study.

concerning trade liberalization, such as Lee and Lee (2011) and Lee et al. (2011), we adopt a global computable general equilibrium (CGE) model named Global Trade Analysis Project (GTAP) to estimate the impacts of the recent development of Korean FTAs on trade value flows. Then a set of conversion factors based on the United Nations database of commodity trade (COMTRADE) is developed to estimate the impacts on cargo volumes.

The rest of the paper is organized as follows. Section 2 introduces the quantitative methodology adopted in this paper – the GTAP model and conversion approach. Section 3 reports the numerical results of trade value and volume flows caused by the recent development of Korean FTAs. Policy implications are drawn in Section 4. Finally, the conclusions are provided at the end of this paper.

2. Methodology: Global Trade Analysis Project (GTAP) and Conversion Approach

This paper adopts the GTAP model and a scientific conversion approach to estimate the impacts of the recent development of Korean FTAs on trade value flows. The standard GTAP model assumes perfect competition and constant returns to scale. Important features of the GTAP model include, among others, (1) the non-homothetic constant difference of elasticity (CDE) functional form characterizing private household preferences, (2) an explicit treatment of bilateral trade using the Armington assumption, trade barriers, and transport margins, and (3) a global bank modeling global saving and investment. The GTAP model is extensively used in the economic impact analysis regarding the trade liberalization under WTO, regional trade blocs and other FTAs. For more details on the GTAP model, readers may refer to Hertel (1997) and the GTAP technical papers.²⁾

The flowchart of our numerical analysis is provided in Figure 1. The analysis procedure is composed of four steps as below.

²⁾ <https://www.gtap.agecon.purdue.edu>

Figure 1.
Flowchart of the Numerical Analysis

2.1 Data Aggregation

First of all, we identify the countries and sectors (i.e., commodities) relevant to the maritime shipping in the recent development of Korean FTAs. The GTAP version 7 database (with 2004 as the base year) containing 113 regions and 57 sectors are aggregated into 13 regions and 8 sectors. The 13 aggregated regions are Korea, the ASEAN countries, China, Japan, Taiwan, India, Rest of Asia, the United States of America, Rest of America, the European Union, Rest of Europe, Oceania, and Rest of the World. The 8 aggregated sectors are containerizable general commodities, containerizable agriculture commodities, major bulk, break bulk and minor bulk, liquid, crude oil, automobile, and others. Tables 1 and 2 provide the detailed information of the regional and sectoral aggregation.

Table 1.

Regional Aggregation for IBSA Trade Liberalization Analysis

Regional description	Comprising the GTAP version 7 countries/regions
Korea	Korea
ASEAN	Cambodia; Indonesia; Lao People's Democratic Republic; Myanmar; Malaysia; Philippines; Singapore; Thailand; Vietnam; Rest of Southeast Asia [1]
China (including HongKong)	China; HongKong
Japan	Japan
Taiwan	Taiwan
India	India
Rest of Asia	Rest of East Asia; Bangladesh; Pakistan; SriLanka; Rest of SouthAsia
United States of America	United States of America
Rest of America	Canada; Mexico; Rest of North America; Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela; Rest of South America; Costa Rica; Guatemala; Nicaragua; Panama; Rest of Central America; Caribbean
European Union	Austria; Belgium; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Slovakia; Slovenia; Spain; Sweden; United Kingdom; Bulgaria; Romania
Rest of Europe	Switzerland; Norway; Rest of EFTA; Albania; Belarus; Croatia; Russian Federation; Ukraine; Rest of Eastern Europe; Rest of Europe; Kazakhstan; Kyrgyzstan; Rest of Former Soviet Union
Oceania	Australia; NewZealand;RestofOceania
Rest of the World	Armenia; Azerbaijan; Georgia; Iran, Islamic Republic of; Turkey; Rest of Western Asia; Egypt; Morocco; Tunisia; Rest of North Africa; Nigeria; Senegal; Rest of Western Africa; Rest of Central Africa; Rest of South Central Africa; Ethiopia; Madagascar; Malawi; Mauritius; Mozambique; Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; South Africa; Rest of South African Customs Union

Note : * Rest of Southeast Asia consists of Brunei Darussalam and Timor-Leste, and Brunei Darussalam is a member country of ASEAN.

Table 2.
Sectoral Aggregation and Existing Tariff Rates in the Three Simulation Scenarios

Sectoral descriptions	Comprising the GTAP version 7 sectors	Tariff rates (%)*							
		Scenario 1: ASEAN+1 FTA		Scenario 2: Korea-EU & Korea-USA FTAs		Scenario 3: KAFTA			
		ASEAN-China	China-ASEAN	Korea-EU	EU-Korea	Korea-USA	USA-Korea	Korea-ASEAN	ASEAN-Korea
Containerizable general commodities	Gas; Textiles; Wearing apparel; Leather products; Wood products; Paper products, publishing; Transport equipment nec; Electronic equipment; Machinery and equipment nec; Manufactures nec	2.72	6.28	1.91	5.34	1.79	2.81	5.51	1.93
	Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibers; Crops nec; Bovine cattle, sheep, goats, horses; Animal products nec; Raw milk; Wool, silk-worm cocoons; Fishings; Bovine meat products; Meat products nec; Vegetable oils and fats; Dairy products; Processed rice; Food products nec; Beverages and tobacco products	4.38	18.41	11.54	38.46	5.41	31.41	24.64	56.38
Major bulk	Paddy rice; Wheat; Cereal grains nec; Coal; Minerals nec	1.30	3.79	0.00	2.33	0.00	14.01	5.00	6.66
Break bulk and minor bulk	Forestry; Sugar; Mineral products nec; Ferrous metals; Metals nec; Metal products	4.05	6.40	2.12	5.35	1.25	3.87	7.21	4.40
Liquid	Petroleum, coal products; Chemical, rubber, plastic products	8.85	6.17	3.74	7.00	2.92	6.31	7.24	4.80
Crude oil	Oil	0.00	0.68	—	—	—	—	—	5.01
Automobile	Motor vehicles and parts	12.23	17.17	9.77	8.00	2.41	7.88	43.96	7.84
Others	Electricity; Gas manufacture, distribution; Water; Construction; Trade; Transport nec; Water transport; Air transport; Communication; Financial services nec; Insurance; Business services nec; Recreational and other services; Public Administration, Defense, Education, Health; Dwellings								

2.2 Design of the Simulation Scenarios

Step 2 is to design the simulation scenarios in order to appropriately capture the impacts of Korean trade liberalization. In this paper, we implement 3 simulations. The first simulation is the ASEAN+1 (China) FTA. The ASEAN+1 FTA became effective at the beginning of 2010. The simulation results provide the baseline data for our second simulation. The second simulation is the Korea-EU and Korea-USA FTAs, which have been concluded in the year of 2011. Finally, using the post-simulation database of the second simulation, we run the third simulation concerning the Korea-ASEAN FTA. The existing tariff rates in the three simulation scenarios are presented in Table 2.

2.3 Analysis on Trade Value and Volume Flows

Using the GTAP model to implement the above three simulations, we can obtain the (changes in) trade value flows. The associated results are summarized in Tables 3 and 4 for the second simulation and Tables 5 and 6 for the third simulation. As for the trade volume flows, this paper places a special focus on the containerizable commodities (i.e., containerizable general commodities, containerizable agriculture commodities, break bulk and minor bulk). Hence a set of conversion factors between trade value flows and volume flows of different types of containerizable commodities (see Table 7) is calibrated by linking the GTAP database and the UN COMTRADE database through the mapping concordance provided by the GTAP center. Using these conversion factors and the assumptions of “12 tons/TEU” for containerizable general commodities and break bulk and minor bulk (European Commission, 2001; Janic, 2007) and “9 tons/TEU” for containerizable agriculture commodities, the results of value flows of containerizable commodities in Tables 3-6 are converted into volume flows in terms of TEUs (twenty-foot equivalent units) (see Tables 8-11). Because the GTAP database accounts for only the “direct” trade flows (Gehlhar et al., 2010), our forecasts of volume flows correspond to (variations in) direct shipping full containers. The transshipment and empty containers are excluded. A detailed analysis on these trade flows is provided in Section 3.

Table 3.
Korea's Merchandise Export Values in Pre- and Post- Korea-EU and Korea-USA FTAs

Units: Million USD; (change)

	Containerizable general	Containerizable agriculture	Major bulk	Break bulk and minor bulk	Liquid	Crude Oil	Automobile	Sum
Pre-Liberalization								
ASEAN	15,131	182	14	2,497	3,868	0	1,108	22,800
China	45,021	258	45	7,478	14,860	0	1,866	69,528
Japan	10,559	1,534	20	2,594	4,321	0	405	19,433
Taiwan	8,763	76	3	1,056	1,751	0	166	11,815
India	2,468	6	6	446	436	0	248	3,610
Rest of Asia	1,112	39	1	170	340	0	92	1,754
USA	29,055	317	2	2,102	3,126	0	10,920	45,522
Rest of America	9,913	61	3	910	1,456	0	2,588	14,931
EU	29,317	145	2	1,416	2,486	0	7,324	40,690
Rest of Europe	2,318	156	1	271	742	0	1,407	4,895
Oceania	2,995	93	1	481	721	0	683	4,974
Rest of World	12,634	152	1	1,625	2,133	0	3,716	20,261
Post-Liberalization								
ASEAN	14,865 (-266)	193 (11)	14 (0)	2,444 (-53)	3,872 (4)	0 (0)	1,091 (-17)	22,479 (-321)
China	44,269 (-752)	274 (16)	46 (1)	7,329 (-149)	14,875 (15)	0 (0)	1,839 (-27)	68,632 (-896)
Japan	10,368 (-191)	1,622 (88)	21 (1)	2,540 (-54)	4,327 (6)	0 (0)	398 (-7)	19,276 (-157)
Taiwan	8,613 (-150)	80 (4)	3 (0)	1,034 (-22)	1,754 (3)	0 (0)	163 (-3)	11,647 (-168)
India	2,427 (-41)	7 (1)	6 (0)	437 (-9)	437 (1)	0 (0)	244 (-4)	3,558 (-52)
Rest of Asia	1,094 (-18)	42 (3)	1 (0)	166 (-4)	341 (1)	0 (0)	90 (-2)	1,734 (-20)
USA	33,260 (4,205)	435 (118)	2 (0)	2,251 (149)	3,734 (608)	0 (0)	12,261 (1,341)	51,943 (6,421)
Rest of America	9,767 (-146)	65 (4)	3 (0)	894 (-16)	1,461 (5)	0 (0)	2,552 (-36)	14,742 (-189)
EU	33,937 (4,620)	261 (116)	2 (0)	1,607 (191)	3,122 (636)	0 (0)	12,043 (4,719)	50,972 (10,282)
Rest of Europe	2,283 (-35)	167 (11)	1 (0)	266 (-5)	745 (3)	0 (0)	1,387 (-20)	4,849 (-46)
Oceania	2,942 (-53)	98 (5)	1 (0)	470 (-11)	722 (1)	0 (0)	671 (-12)	4,904 (-70)
Rest of World	12,438 (-196)	162 (10)	1 (0)	1,594 (-31)	2,138 (5)	0 (0)	3,662 (-54)	19,995 (-266)

Table 4. Korea's Merchandise Import Values in Pre- and Post- Korea-EU and Korea-USA FTAs

Units: Million USD; (change)								
	Containerizable general	Containerizable agriculture	Major bulk	Break bulk and minor bulk	Liquid	Crude Oil	Automobile	Sum
Pre-Liberalization								
ASEAN	12,445	967	808	1,171	2,499	1,884	53	19,827
China	16,791	1,761	1,470	5,863	2,039	196	462	28,582
Japan	25,524	415	71	7,621	8,164	0	1,184	42,979
Taiwan	6,002	80	2	526	812	0	14	7,436
India	362	148	156	254	384	0	31	1,335
Rest of Asia	245	54	3	53	39	4	1	399
USA	17,564	2,231	1,116	1,855	5,633	3	557	28,959
Rest of America	1,427	904	2,042	2,131	618	581	103	7,806
EU	12,841	1,239	36	2,342	3,793	3	1,804	22,058
Rest of Europe	1,435	364	196	2,611	677	595	16	5,894
Oceania	474	1,185	2,605	2,307	280	502	249	7,602
Rest of World	2,366	265	201	1,370	4,363	24,358	27	32,950
Post-Liberalization								
ASEAN	11,737 (-708)	613 (-354)	749 (-59)	1,156 (-15)	2,311 (-188)	1,903 (19)	50 (-3)	18,519 (-1,308)
China	15,850 (-941)	1,115 (-646)	1,361 (-109)	5,792 (-71)	1,887 (-152)	198 (2)	435 (-27)	26,638 (-1,944)
Japan	24,146 (-1,378)	262 (-153)	66 (-5)	7,532 (-89)	7,560 (-604)	0 (0)	1,117 (-67)	40,683 (-2,296)
Taiwan	5,664 (-338)	51 (-29)	2 (0)	519 (-7)	751 (-61)	0 (0)	13 (-1)	7,000 (-436)
India	341 (-21)	93 (-55)	144 (-12)	250 (-4)	355 (-29)	0 (0)	29 (-2)	1,212 (-123)
Rest of Asia	231 (-14)	34 (-20)	3 (0)	52 (-1)	36 (-3)	4 (0)	0 (-1)	360 (-39)
USA	20,922 (3,358)	5,188 (2,957)	1,657 (541)	2,368 (513)	7,536 (1,903)	3 (0)	800 (243)	38,474 (9,515)
Rest of America	1,344 (-83)	571 (-333)	1,888 (-154)	2,102 (-29)	571 (-47)	585 (4)	97 (-6)	7,158 (-648)
EU	18,958 (6,117)	3,710 (2,471)	36 (0)	3,310 (968)	5,293 (1,500)	3 (0)	2,613 (809)	33,923 (11,865)
Rest of Europe	1,351 (-84)	230 (-134)	181 (-15)	2,572 (-39)	625 (-52)	600 (5)	15 (-1)	5,574 (-320)
Oceania	449 (-25)	751 (-434)	2,416 (-189)	2,286 (-21)	259 (-21)	507 (5)	235 (-14)	6,903 (-699)
Rest of World	2,777 (-139)	167 (-98)	185 (-16)	1,350 (-20)	4,030 (-333)	24,569 (211)	25 (-2)	32,553 (-397)

Table 5.
Korea's Merchandise Export Values in Pre- and Post- Korea-ASEAN FTA

Units: Million USD; (change)								
	Containerizable general	Containerizable agriculture	Major bulk	Break bulk and minor bulk	Liquid	Crude Oil	Automobile	Sum
Pre-Liberalization								
ASEAN	14,865	193	14	2,444	3,872	0	1,091	22,479
China	44,269	274	46	7,329	14,875	0	1,839	68,632
Japan	10,368	1,622	21	2,540	4,327	0	398	19,276
Taiwan	8,613	80	3	1,034	1,754	0	163	11,647
India	2,427	7	6	437	437	0	244	3,558
Rest of Asia	1,094	42	1	166	341	0	90	1,734
USA	33,260	435	2	2,251	3,734	0	12,261	51,943
Rest of America	9,767	65	3	894	1,461	0	2,552	14,742
EU	33,937	261	2	1,607	3,122	0	12,043	50,972
Rest of Europe	2,283	167	1	266	745	0	1,387	4,849
Oceania	2,942	98	1	470	722	0	671	4,904
Rest of World	12,438	162	1	1,594	2,138	0	3,662	19,995
Post-Liberalization								
ASEAN	22,265 (7,400)	573 (380)	18 (4)	3,772 (1,328)	5,796 (1,924)	0 (0)	6,170 (5,079)	38,594 (16,115)
China	42,604 (-1,665)	278 (4)	46 (0)	7,112 (-217)	14,753 (-122)	0 (0)	1,783 (-56)	66,576 (-2,056)
Japan	9,952 (-416)	1,645 (23)	21 (0)	2,462 (-78)	4,284 (-43)	0 (0)	385 (-13)	18,749 (-527)
Taiwan	8,281 (-332)	82 (2)	3 (0)	1,002 (-32)	1,736 (-18)	0 (0)	157 (-6)	11,261 (-386)
India	2,337 (-90)	7 (0)	6 (0)	424 (-13)	433 (-4)	0 (0)	237 (-7)	3,444 (-114)
Rest of Asia	1,054 (-40)	42 (0)	1 (0)	161 (-5)	338 (-3)	0 (0)	87 (-3)	1,683 (-51)
USA	31,987 (-1,273)	442 (7)	2 (0)	2,183 (-68)	3,699 (-35)	0 (0)	11,910 (-351)	50,223 (-1,720)
Rest of America	9,400 (-367)	66 (1)	3 (0)	868 (-26)	1,448 (-13)	0 (0)	2,479 (-73)	14,264 (-478)
EU	32,645 (-1,292)	265 (4)	2 (0)	1,557 (-50)	3,091 (-31)	0 (0)	11,695 (-348)	49,255 (-1,717)
Rest of Europe	2,198 (-85)	169 (2)	1 (0)	258 (-8)	738 (-7)	0 (0)	1,348 (-39)	4,712 (-137)
Oceania	2,830 (-112)	99 (1)	1 (0)	456 (-14)	716 (-6)	0 (0)	649 (-22)	4,751 (-153)
Rest of World	11,985 (-453)	165 (3)	1 (0)	1,546 (-48)	2,119 (-19)	0 (0)	3,557 (-105)	19,373 (-622)

Table 6.
Korea's Merchandise Import Values in Pre- and Post- Korea-ASEAN FTA

Units: Million USD; (change)								
	Containerizable general	Containerizable agriculture	Major bulk	Break bulk and minor bulk	Liquid	Crude Oil	Automobile	Sum
Pre-Liberalization								
ASEAN	11,737	613	749	1,156	2,311	1,903	50	18,519
China	15,850	1,115	1,361	5,792	1,887	198	435	26,638
Japan	24,146	262	66	7,532	7,560	0	1,117	40,683
Taiwan	5,664	51	2	519	751	0	13	7,000
India	341	93	144	250	355	0	29	1,212
Rest of Asia	231	34	3	52	36	4	0	360
USA	20,922	5,188	1,657	2,368	7,536	3	800	38,474
Rest of America	1,344	571	1,888	2,102	571	585	97	7,158
EU	18,958	3,710	36	3,310	5,293	3	2,613	33,923
Rest of Europe	1,351	230	181	2,572	625	600	15	5,574
Oceania	449	751	2,416	2,286	259	507	235	6,903
Rest of World	2,227	167	185	1,350	4,030	24,569	25	32,553
Post-Liberalization								
ASEAN	13,995 (2,258)	4,106 (3,493)	915 (166)	1,579 (423)	3,067 (756)	2,947 (1,044)	86 (36)	26,695 (8,176)
China	15,877 (27)	901 (-214)	1,343 (-18)	5,873 (81)	1,886 (-1)	194 (-4)	461 (26)	26,535 (-103)
Japan	24,259 (113)	212 (-50)	65 (-1)	7,649 (117)	7,570 (10)	0 (0)	1,185 (68)	40,940 (257)
Taiwan	5,677 (13)	41 (-10)	2 (0)	526 (7)	751 (0)	0 (0)	14 (1)	7,011 (11)
India	341 (0)	75 (-18)	142 (-2)	253 (3)	355 (0)	0 (0)	30 (1)	1,196 (-16)
Rest of Asia	231 (0)	27 (-7)	3 (0)	53 (1)	36 (0)	4 (0)	1 (1)	355 (-5)
USA	20,952 (30)	4,187 (-1,001)	1,635 (-22)	2,400 (32)	7,534 (-2)	3 (0)	846 (46)	37,557 (-917)
Rest of America	1,345 (1)	461 (-110)	1,861 (-27)	2,128 (26)	570 (-1)	574 (-11)	103 (6)	7,042 (-116)
EU	18,970 (12)	2,993 (-717)	36 (0)	3,353 (43)	5,292 (-1)	3 (0)	2,765 (152)	33,412 (-511)
Rest of Europe	1,351 (0)	185 (-45)	178 (-3)	2,604 (32)	625 (0)	588 (-12)	16 (1)	5,547 (-27)
Oceania	449 (0)	606 (-145)	2,382 (-34)	2,316 (30)	258 (-1)	491 (-16)	249 (14)	6,751 (-152)
Rest of World	2,277 (0)	135 (-37)	183 (-2)	1,366 (16)	4,025 (-5)	24,077 (-497)	27 (2)	32,035 (-518)

Table 7.

Calibrated Conversion Factors for Containerizable Cargoes

Units: tons/ million USD

	Containerizable general	Containerizable agriculture	Break bulk and minor bulk
Exports	138	437	968
Imports	154	1,311	1,643

Table 8.
Korea's Containerizable Export Volumes in Pre- and Post- Korea-EU and Korea-USA FTAs

	Containerizable general	Containerizable agriculture	Break bulk and minor bulk	Sum	Units: TEUs; (change)
Pre-Liberalization					
ASEAN	174,007	8,837	201,425	384,269	
China	517,742	12,527	603,225	1,133,494	
Japan	121,429	74,484	209,249	405,162	
Taiwan	100,775	3,690	85,184	189,649	
India	28,382	291	35,977	64,650	
Rest of Asia	12,788	1,894	13,713	28,395	
USA	334,133	15,392	169,561	519,086	
Rest of America	114,000	2,962	73,407	190,369	
EU	337,146	7,041	114,224	458,411	
Rest of Europe	26,657	7,575	21,861	56,093	
Oceania	34,443	4,516	38,801	77,760	
Rest of World	145,291	7,380	131,083	283,754	
Post-Liberalization					
ASEAN	170,948 (-3,059)	9,371 (534)	197,149 (-4,275)	377,468 (-6,800)	
China	509,094 (-8,648)	13,304 (777)	591,206 (-12,019)	1,113,604 (-19,890)	
Japan	119,232 (-2,197)	78,757 (4,273)	204,893 (-4,356)	402,882 (-2,280)	
Taiwan	99,050 (-1,725)	3,884 (194)	83,409 (-1,775)	186,343 (-3,306)	
India	27,911 (-472)	340 (49)	35,251 (-726)	63,502 (-1,149)	
Rest of Asia	12,581 (-207)	2,039 (146)	13,391 (-323)	28,011 (-384)	
USA	382,490 (48,358)	21,122 (5,730)	181,581 (12,019)	585,193 (66,107)	
Rest of America	112,321 (-1,679)	3,156 (194)	72,116 (-1,291)	187,593 (-2,776)	
EU	390,276 (53,130)	12,673 (5,632)	129,631 (15,407)	532,580 (74,169)	
Rest of Europe	26,255 (-403)	8,109 (534)	21,457 (-403)	55,821 (-272)	
Oceania	33,833 (-610)	4,758 (243)	37,913 (-887)	76,504 (-1,254)	
Rest of World	143,037 (-2,254)	7,866 (486)	128,583 (-2,501)	279,486 (-4,269)	

Table 9.
Korea's Containerizable Import Volumes in Pre- and Post- Korea-EU and Korea-USA FTAs

	Containerizable general	Containerizable agriculture	Break bulk and minor bulk	Sum	Units: TEUs; (change)
		Pre-Liberalization			
ASEAN	159,711	140,860	160,329	460,900	
China	215,485	256,519	802,742	1,274,746	
Japan	327,558	60,452	1,043,442	1,431,452	
Taiwan	77,026	11,653	72,018	160,697	
India	4,646	21,559	34,777	60,982	
Rest of Asia	3,144	7,866	7,257	18,267	
USA	225,405	324,982	253,980	804,367	
Rest of America	18,313	131,683	291,769	441,765	
EU	164,793	180,481	320,659	665,933	
Rest of Europe	18,416	53,023	357,489	428,928	
Oceania	6,083	172,615	315,867	494,565	
Rest of World	30,364	38,602	187,576	256,542	
		Post-Liberalization			
ASEAN	150,625 (+9,086)	89,294 (-51,566)	158,276 (-2,054)	398,195 (-62,706)	
China	203,408 (-12,076)	162,418 (-94,101)	793,021 (-9,721)	1,158,847 (-115,898)	
Japan	309,874 (-17,684)	38,165 (-22,287)	1,031,256 (-12,186)	1,379,295 (-52,157)	
Taiwan	72,688 (-4,338)	7,429 (-4,224)	71,060 (-958)	151,177 (-9,520)	
India	4,376 (-270)	13,547 (-8,012)	34,229 (-548)	52,152 (-8,830)	
Rest of Asia	2,965 (-180)	4,953 (-2,913)	7,120 (-137)	15,038 (-3,230)	
USA	268,499 (43,094)	755,719 (430,736)	324,219 (70,238)	1,348,437 (544,068)	
Rest of America	17,248 (-1,065)	83,176 (-48,507)	287,799 (-3,971)	388,223 (-53,543)	
EU	243,294 (78,502)	540,423 (359,942)	453,194 (132,535)	1,236,911 (570,979)	
Rest of Europe	17,338 (-1,078)	33,503 (-19,519)	352,150 (-5,340)	402,991 (-25,937)	
Oceania	5,762 (-321)	109,396 (-63,219)	312,992 (-2,875)	428,150 (-66,415)	
Rest of World	28,580 (-1,784)	24,326 (-14,275)	184,838 (-2,738)	237,744 (-18,797)	

Table 10.

Korea's Containerizable Export Volumes in Pre- and Post- Korea-ASEAN FTA

	Containerizable general	Containerizable agriculture	Break bulk and minor bulk	Sum	Units: TEUs; (change)
Pre-Liberalization					
ASEAN	170,948	9,371	197,149	377,468	
China	509,094	13,304	591,206	1,113,604	
Japan	119,232	78,757	204,893	402,882	
Taiwan	99,050	3,884	83,409	186,343	
India	27,911	340	35,251	63,502	
Rest of Asia	12,581	2,039	13,391	28,011	
USA	382,490	21,122	181,581	585,193	
Rest of America	112,321	3,156	72,116	187,593	
EU	390,276	12,673	129,631	532,580	
Rest of Europe	26,255	8,109	21,457	55,821	
Oceania	33,833	4,758	37,913	76,504	
Rest of World	143,037	7,866	128,583	279,486	
Post-Liberalization					
ASEAN	256,048 (85,100)	27,822 (18,451)	304,275 (107,125)	588,145 (210,676)	
China	489,946 (-19,148)	13,498 (194)	573,701 (-17,505)	1,077,145 (-36,459)	
Japan	114,448 (-4,784)	79,874 (1,117)	198,601 (-6,292)	392,923 (-9,959)	
Taiwan	95,232 (-3,818)	3,982 (97)	80,828 (-2,581)	180,042 (-6,302)	
India	26,876 (-1,035)	340 (0)	34,203 (-1,049)	61,419 (-2,084)	
Rest of Asia	12,121 (-460)	2,039 (0)	12,987 (-403)	27,147 (-863)	
USA	367,851 (-14,640)	21,462 (340)	176,095 (-5,485)	565,408 (-19,785)	
Rest of America	108,100 (-4,221)	3,205 (49)	70,019 (-2,097)	181,324 (-6,269)	
EU	375,418 (-14,858)	12,867 (194)	125,598 (-4,033)	513,883 (-18,697)	
Rest of Europe	25,277 (-978)	8,206 (97)	20,812 (-645)	54,295 (-1,526)	
Oceania	32,545 (-1,288)	4,807 (49)	36,784 (-1,129)	74,136 (-2,368)	
Rest of World	137,828 (-5,210)	8,012 (146)	124,711 (-3,872)	270,551 (-8,936)	

Table 11.

Korea's Containerizable Import Volumes in Pre- and Post- Korea-ASEAN FTA

	Containerizable general	Containerizable agriculture	Break bulk and minor bulk	Sum	Units: TEUs; (change)
Pre-Liberalization					
ASEAN	150,625	89,294	158,276	398,195	
China	203,408	162,418	793,021	1,158,847	
Japan	309,874	38,165	1,031,256	1,379,295	
Taiwan	72,688	7,429	71,060	151,177	
India	4,376	13,547	34,229	52,152	
Rest of Asia	2,965	4,953	7,120	15,038	
USA	268,499	755,719	324,219	1,348,437	
Rest of America	17,248	83,176	287,799	388,223	
EU	243,294	540,423	453,194	1,236,911	
Rest of Europe	17,338	33,503	352,150	402,991	
Oceania	5,762	109,396	312,992	428,150	
Rest of World	28,580	24,326	184,838	237,744	
Post-Liberalization					
ASEAN	179,603 (28,978)	598,107 (508,814)	216,191 (57,916)	993,901 (595,708)	
China	203,755 (347)	131,246 (-31,173)	804,112 (11,090)	1,139,113 (-19,736)	
Japan	311,324 (1,450)	30,881 (-7,283)	1,047,276 (16,019)	1,389,481 (10,186)	
Taiwan	72,855 (167)	5,972 (-1,457)	72,018 (958)	150,845 (-332)	
India	4,376 (0)	10,925 (-2,622)	34,640 (411)	49,941 (-2,211)	
Rest of Asia	2,965 (0)	3,933 (-1,020)	7,257 (137)	14,155 (-883)	
USA	268,884 (385)	609,906 (-145,812)	328,600 (4,381)	1,207,390 (-141,046)	
Rest of America	17,261 (13)	67,152 (-16,023)	291,359 (3,560)	375,772 (-12,450)	
EU	243,448 (154)	435,980 (-104,443)	459,082 (5,887)	1,138,510 (-98,402)	
Rest of Europe	17,338 (0)	26,948 (-6,555)	356,531 (4,381)	400,817 (-2,174)	
Oceania	5,762 (0)	88,274 (-21,122)	317,099 (4,108)	411,135 (-17,014)	
Rest of World	28,580 (0)	19,665 (-4,661)	187,028 (2,191)	235,273 (-2,471)	

2.4 Policy Implications and Discussions

Based on the analysis in step 3, policy implications are drawn and discussed in Section 4.

3. Change in Trade Value and Volume Flows Caused by the Recent Development of FTAs

This section aims at analyzing the numerical results of the trade value and volume flows caused by the recent development of Korean FTAs. In the following two sub-sections, we will start with the trade value analysis, followed by trade volume analysis.

3.1 Analysis on Trade Value Flows

(1) Analysis on Trade Value Flows Associated with Korea-EU and Korea-USA FTAs

Table 3 reports the export value flows before and after the Korea-EU and Korea-USA FTAs. Prior to trade liberalization with the EU and the USA, the Korea's major exporting areas consist of China (US\$ 69,528 million), the USA (US\$ 45,522 million) and the EU (US\$ 40,690 million). The Korea-EU and Korea-USA FTAs will significantly increase Korea's exports to the EU (US\$ 10,282 million) and the USA (US\$ 6,421 million), and decrease Korea's exports to China (US\$ 896 million). Regarding individual commodities, the top two items exported to China are containerizable general commodities (US\$ 45,021 million) and liquid (US\$ 14,860 million), to the USA containerizable general commodities (US\$ 29,055 million) and automobile (US\$ 10,920 million), and to the EU containerizable general commodities (US\$ 29,317 million) and automobile (US\$ 7,324 million). Korea's FTAs with the EU and the USA will enhance the exports of containerizable general commodities and automobile to the EU (respectively US\$ 4,620 million and US\$ 4,719 million) and the USA (US\$ 4,205 million and 1,341 million).

The import value flows before and after the Korea-EU and Korea-USA FTAs are presented in Table 4. In the pre-FTA equilibrium, the Korea's imports mainly come from Japan (US\$ 42,979 million), the USA (US\$ 28,959 million) and China (US\$ 28,582 million). The FTAs with the EU and the USA will lead to a substantial increase in the Korea's imports from the EU (US\$ 11,865 million) and the USA (US\$ 9,515 million), and a moderate decrease in imports from Japan (US\$ 2,296 million) and China (US\$ 1,944 million). After the FTAs, the EU will replace China as the Korea's third largest importing

area. As for the commodity type, the top two items imported from Japan are containerizable general commodities (US\$ 25,524 million) and liquid (US\$ 8,164 million), from the USA containerizable general commodities (US\$ 17,564 million) and liquid (US\$ 5,633 million), and from China containerizable general commodities (US\$ 16,791 million) and break bulk and minor bulk (US\$ 5,863 million). After the FTAs with the EU and the USA, the imports from the EU increase most, particularly containerizable general commodities (US\$ 6,117 million) and containerizable agriculture commodities (US\$ 2,471 million).

(2) Analysis on Trade Value Flows Associated with Korea-ASEAN FTA

Table 5 reports the export value flows in the pre- and post- Korea-ASEAN FTA. Note that we use the updated value flows obtained from the simulation scenario of Korea-EU and Korea-USA FTAs as the baseline data for this simulation scenario. Hence the results in the post- Korea-ASEAN FTA reflect the changes compared to the post- Korea-EU and Korea-USA FTAs equilibrium. The trade liberalization with the ASEAN will significantly increase Korea's exports to the ASEAN (US\$ 16,115 million), and decrease the exports to the major exporting areas, including China (US\$ 2,065 million), the USA (US\$ 1,720 million), and the EU (US\$ 1,717 million). However, the decrease in exports to the USA and the EU is moderate, as compared with the increase in exports caused by Korea-EU and Korea-USA FTAs. As for the individual commodities, containerizable general commodities (US\$ 7,400 million) and automobile (US\$ 5,079 million) account for most of the increase in Korea's exports to the ASEAN.

Based on Table 6 concerning the import value flows before and after the Korea-ASEAN FTA, Korea's imports from the ASEAN will increase by US\$ 8,176 million after trade liberalization, which is much smaller than the increase in Korea's exports to the ASEAN (US\$ 16,115 million). Korea's imports from other regions (such as the USA and the EU) decrease, but the impacts are relatively minor. In terms of commodity type, the increase in imports from the ASEAN mainly comes from containerizable agriculture commodities (US\$ 3,493 million) and containerizable general commodities (US\$ 2,258 million).

3.2 Analysis on Trade Volume Flows

(1) Analysis on Trade Volume Flows Associated with Korea-EU and Korea-USA FTAs

Based on Table 8 concerning Korea's containerizable export volumes before and after the Korea-EU and Korea-USA FTAs, the amounts of Korea's exporting containerizable

commodities are 1,133,494 TEUs to China, 519,086 TEUs to the USA, and 458,411 TEUs to the EU. The FTAs with the EU and the USA will lead to a significant increase in the exports to the EU (74,169 TEUs) and the USA (66,107 TEUs), and a decrease in exports to China (19,890 TEUs). The increases in containerizable exports to the EU and the USA are mainly containerizable general commodities (the EU: 53,130 TEUs; the USA: 48,358 TEUs) and break bulk and minor bulk (the EU: 15,407 TEUs; the USA: 12,019 TEUs).

According to Table 9, Korea's major containerizable import volumes are mainly from Japan (1,431,452 TEUs), China (1,274,746 TEUs), the USA (804,367 TEUs) and the EU (665,993 TEUs). Trade liberalization with the EU and the USA will remarkably increase the containerizable import volumes from the two regions (the EU: 570,979 TEUs; the USA: 544,068 TEUs), and decrease those from China (115,898 TEUs). As for the commodity type, the top two containerizable imports from Japan are break bulk and minor bulk (1,043,442 TEUs) and containerizable general commodities (327,558 TEUs), from China break bulk and minor bulk (802,742 TEUs) and containerizable agriculture commodities (256,519 TEUs), from the USA containerizable agriculture commodities (324,982 TEUs) and break bulk and minor bulk (253,980 TEUs), and from the EU break bulk and minor bulk (320,659 TEUs) and containerizable agriculture commodities (180,481 TEUs). After the FTAs with the EU and the USA, the containerizable imports from the EU increase most (570,979 TEUs), particularly containerizable agriculture commodities (359,942 TEUs).

(2) Analysis on Trade Volume Flows Associated with Korea-ASEAN FTA

Table 10 shows the containerizable export volumes in the pre- and post-Korea-ASEAN FTA. Korea-ASEAN FTA will significantly increase Korea's containerizable exports to the ASEAN (210,676 TEUs). The exports to the other major exporting areas decrease (China: 36,459 TEUs; the USA: 19,785 TEUs; the EU: 18,697 TEUs), and the decrease is moderate, as compared with the increase in exports to the ASEAN. As for the individual commodities, break bulk and minor bulk (107,125 TEUs) and containerizable general commodities (85,100 TEUs) account for most of the increase in Korea's containerizable exports to the ASEAN.

According to Table 11, Korea's containerizable imports from the ASEAN will increase 595,708 TEUs after trade liberalization, which is much higher than the increase in Korea's containerizable exports to the ASEAN (210,676 TEUs). The Korea's containerizable imports from the USA and the EU respectively decrease 141,046 TEUs and 98,402 TEUs. In terms of commodity type, the increase in containerizable imports from the ASEAN mainly comes from containerizable agriculture commodities (508,814 TEUs).

4. Policy Implications and Discussions

The above simulation results suggest that the recent development of Korean FTAs promotes the intra-regional trade with the EU, the USA and the ASEAN, and consequently increases the derived demand for shipping service in these trade routes. As noted before, the estimates of the shipping volumes are on a direct trade basis; hence they can be interpreted as the maximum likely increase in demand for the direct shipping in these trade routes. Policy implications are drawn as follows.

First, Korea-EU, Korea-USA and Korea-ASEAN FTAs will lead to a significant trade creation effect. The FTAs have different implications on trade value flows: (i) Korea-EU and Korea-USA FTAs will mainly increase Korea's imports from the EU and the USA, but Korea-ASEAN FTA will increase Korea's exports to the ASEAN. These results are due to the comparatively lower tariffs of the EU and the USA toward Korea and higher tariffs of the ASEAN toward Korea before the FTAs. (ii) Korea-EU and Korea-USA FTAs will discourage Korea's trade with the Asian countries (i.e., reducing exports to China and imports from Japan) but Korea-ASEAN FTA will promote Korea's trade with the Asian countries. (iii) Korea-ASEAN FTA will offset the increase in Korea-EU and Korea-USA trade values arising from Korea-EU and Korea-USA FTAs, but the impacts are minor.

Second, based on the numerical results, the variations of cargo value flows caused by Korea-EU and Korea-USA FTAs are larger than those caused by Korea-ASEAN FTA. However, in terms of containerizable import volume flows, the impacts caused by the Korea-ASEAN FTA are more significant than those caused by Korea-EU and Korea-USA FTAs. These simulation results highlight the importance of estimating the cargo volume flows to provide a better reference for future port capacity planning, port policy development, and are informative for shipping operators and logistics providers.

Third, the recent development of the Korean FTAs will promote commodity trade with the EU, the USA, and the Asian countries, particularly Korea's containerizable imports from the EU, the USA and the ASEAN. These results imply an increase in the demand for long-distance and feeder shipping service. In terms of geography distance, Korea is far apart from the EU and the USA and is close to the ASEAN. Removing tariffs between Korea-EU and Korea-USA will promote distant trade. Accordingly, special attention should be paid to the imbalance trade of containerizable commodities, especially in Korea-ASEAN trade route.

Fourth, the recent development of Korean FTAs will enhance her interaction with the Western countries and Asian countries, and usher a new era for Korean shipping and logistic development. This fact, together with Korea's ideal geographical location in the

Northeast Asia, will give container operators a great opportunity to manage their fleet structure and calling ports more efficiently.

Finally, the fact that Korean FTAs will promote trade volume with the USA, the European countries and the ASEAN leads Korea to develop a commercial gateway to Asia and the Pacific Rim, accelerates hub port competition among major container ports in association with “sea motorway” in Northeast Asia (Lee et al., 2010), and changes location of hub ports (Notteboom, 2011). Consequently, it may serve to establish a more efficient global supply chain system with an integrated maritime logistics (Song and Lee, 2009) and transportation network.

5. Conclusions

This paper has estimated the impacts of the recent development of Korean FTAs on international cargo flows and draws the implications for Korea’s shipping and logistics system. The Korean FTAs provide an interesting case study because of its active role in international trade liberalization. Based on our numerical results, the increases in Korea’s containerizable export volumes caused by Korea-EU and Korea-USA FTAs are 74,169 TEUs to the EU and 66,107 TEUs to the USA respectively, and the increases in containerizable import volumes are respectively 570,979 TEUs and 544,068 TEUs. As for the Korea-ASEAN FTA, the increase in Korea’s containerizable export volumes to the ASEAN is 210,676 TEUs, and the increase in containerizable import volumes from the ASEAN is 595,708 TEUs. The results from the two simulation scenarios both indicate that the increase in the demand for inbound shipping service is larger.

The methodology adopted in this paper is a multi-regional CGE model, GTAP. The GTAP model provides the results of country-to-country cargo volumes. The distribution of these cargo volumes across the ports is an interesting topic that deserves future research attention. In addition to liberalization in commodity trade, liberalization in investment and service sector is also important dimension in the new age FTA. The future research can take this liberalization into consideration, and provide the impact analysis at a broader scope.

Acknowledgement

This work was supported by a National Research Foundation of Korea Grant which was funded by the Korean Government (MOEHRD) (NRF-2011-413-B00008) as well as by the Research Grant of the Inha University.

References

- Ariyasajjakorn, D., Gander, J., Ratanakomut, S. and Reynolds, S. (2009) "ASEAN FTA, Distribution of Income, and Globalization," *Journal of Asian Economics*, 20, 327-335.
- European Commission (2001) Real Cost Reduction of Door-to-Door Intermodal Transport, RECORDIT, European Commissions, Directorate General DG VII, RTD 5th 555 Framework Programme, Brussels, Belgium.
- Gehlhar, M., Wang, Z. and Yao, S. (2010) GTAP 7 Data Base Documentation –Chapter 9.A: Reconciling Merchandise Trade Data. Obtained through the Internet: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=3429.
- Hertel, T.W. (1997) *Global Trade Analysis: Modeling and Applications*. New York, US: Cambridge University Press.
- Janic, M. (2007) "Modelling the Full Costs of an Intermodal and Road Freight Transport Network," *Transportation Research Part D*, 12(1), 33-44.
- Kwan, Y., and Qui, L. (2010) "The ASEAN+3 Trading Bloc," *Journal of Economic Integration*, 25, 1-31.
- Lee, J., and Park, I. (2005) "Free Trade Areas in East Asia: Discriminatory or Non-discriminatory?" *The world Economy*, 28, 21-48.
- Lee, T.C. and Lee, P. T-W (2011) "South-South Trade Liberalization and Shipping Geography: A Case Study on India, Brazil and South Africa," *International Journal of Shipping and Transport Logistics*, forthcoming.
- Lee, T.-C., Wu, C.-H., Lee, P. T-W (2011) "Impacts of the ECFA on Seaborne Trade Volume and Policy Development for Shipping and Port Industry in Taiwan", *Maritime Policy & Management*, 38(2), 169-189.

- Lee, P. T-W, Hu, K. C., and Chen, T. (2010) "External Costs of Domestic Container Transportation: Short-Sea Shipping versus Trucking in Taiwan", *Transport Reviews*, 35(3), 315-335.
- Notteboom, T. (2011), "An Application of Multi-Criteria Analysis to the Location of a Container Hub Port in South Africa", *Maritime Policy and Management*, 38(1), 51-79.
- Song, D-W and Lee, P. T-W (2009) "Maritime Logistics in the Global Supply Chain," Editorial, *International Journal of Logistics: Research and Applications*, 12(2), 1-2.
- Tongzon, J. L. (2005) "ASEAN-China Free Trade Area: A Bane or Boon for ASEAN Countries?" *The World Economy*, 28(2), 191-210.