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

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## 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*

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## 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; Ariyasajjakorn 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 takes account of the above features. Having considered the above and referring to the applications in maritime shipping studies

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[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

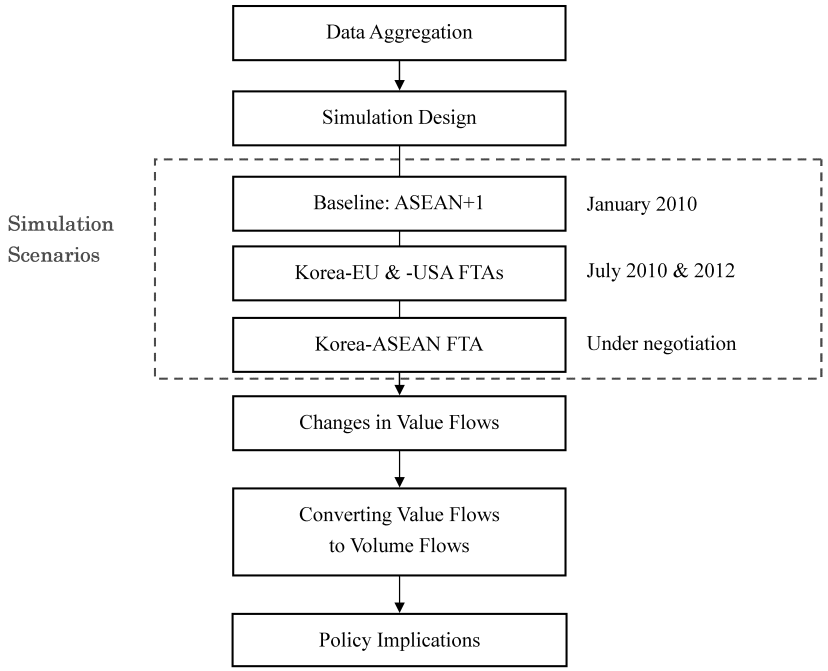


**Figure 1.**
Flowchart of the Numerical Analysis

### *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 |
| Containerizable agriculture commodities | 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; Fishing; 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 | 2,227 (-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 | 2,227 (0) | 135 (-32) | 183 (-2) | 1,366 (16) | 4,025 (-5) | 24,072 (-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

Units: TEUs; (change)

| | Containerizable general | Containerizable agriculture | Break bulk and minor bulk | Sum |
|---|---|---|---|---|
| **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

Units: TEUs; (change)

| | Containerizable general | Containerizable agriculture | Break bulk and minor bulk | Sum |
|---|---|---|---|---|
| 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

Units: TEUs; (change)

| | Containerizable general | Containerizable agriculture | Break bulk and minor bulk | Sum |
|---|---|---|---|---|
| **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

Units: TEUs; (change)

| | Containerizable general | Containerizable agriculture | Break bulk and minor bulk | Sum |
|---|---|---|---|---|
| **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.

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