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Analysis of potential e-commerce transit demand to maritime transport among Korea, China and Japan

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ABSTRACT

The global e-commerce (B2C) market is expected to grow at an average annual rate of 10%, reaching 2.3 trillion US dollars by 2018. The e-commerce market has been growing dramatically since 2010 and its growth has been outstanding especially in the Asia-Pacific region including Korea. The e-commerce market among Korea, China and Japan has also been growing rapidly. The growth of the e-commerce market among the three countries is expected to rise even further. As the e-commerce market grows the ports have been seeking ways to take advantage of such growth. In particular, the benefits of being able to shift the existing air-shipping services to the sea-shipping services. So far, there has been no detailed analysis of specific demand of the sea delivery in terms of the e-commerce products. Korea is located at the center of Northeast Asia and has Busan Port, which is the 6th largest ports in the world. Based on this advantage, it is necessary to establish an e-commerce logistics base in Korea. This will enable Korea to serve as the hub for e-commerce to China and Japan. Therefore, this study will analyze the expected e-commerce throughput among Korea-China and Korea-Japan in order to find out if there is any possibility to shift the current air-shipping deliveries to the sea-shipping deliveries. If so, this study will see how much of portion can be shifted to the sea-shipping deliveries. In doing so, this study will look at the throughputs by 2030.

Keywords: e-commerce, B2C, Asia-pacific region, shipping service, Korea, Japan, China

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1. Introduction

The e-commerce became familiar with us back in 1994 when the World Wide Web (WWW) began to spread. The initial e-commerce started from B2C (Business to Consumer) markets targeting consumers in general and afterwards, it has widened to B2B (Business-to-Business) markets. The B2B online retail market is expected to generate revenues of $ 6.7 trillion by 2020 and this will be the double size of the B2C online sales (Frost official website, 2017).

The e-commerce market is rapidly growing in major countries around the world and its size is growing every year. The top four e-commerce sales recorded in 2015 were China, the United States, the United Kingdom, and Japan. In particular, the proportion of B2C e-commerce to the total retail market (amount) of the U.S. in the first quarter of 2017 reached 8.1% - this portion has been increasing from 3.5% since the first quarter of 2008. The most outstanding figure is that the overall retail market grew only by 5.1% while the e-commerce market grew by 15.4% from the period between the first quarters of 2016 and 2017(U.S. Department of Commerce official website, 2017).

The global e-commerce market in Korea, China and Japan is no exception. By region, the size of the e-commerce market in Asia-Pacific, including Korea, has surpassed North America in 2015. In particular, China's growth has been remarkable. During the period from 2012 to 2017, China's e-commerce market grew at an annual average of 56.5%. China has already surpassed the U.S. and became the world's largest e-commerce market. China has experienced a rapid growth of 35% while other countries has grown by 10%. Japan has also grown to become the fourth largest e-commerce market in the world. The B2C e-commerce market in Japan grew at an annual average of 13.2% between 2010 and 2014. It is expected that the e-commerce market in Japan will reach 25.6 trillion yen by 2021, doubling the size of 2014 (Lee, 2016). As of 2016, the size of e-commerce in Korea and China increased by 89.9% from the previous year and, the size of e-commerce markets in Korea and Japan increased by 27.1%. Especially, due to the expansion of e-commerce market in Japan, Korea's exports to Japan showed an annual average growth rate of 222.5% between 2013 and 2015. According to the Ministry of Economy, Trade and Industry of Japan, the e-commerce trade in China and Japan will triple the size of 2015. Considering that the Chinese consumers' preference for Korean products is high, China will become an important market to Korea.

In global e-commerce, the modes of transportation are inevitably necessary. There are two representative means of modes, which are air transport and maritime transport. Currently, the air transport is mostly used for the deliveries between Korea, China and Japan but there has been attempts to shift such mode of transportation to the sea service. Korea and China launched a ferry service for e-commerce in August 2015, and the POST Sea Express service is under operation for B2C e-commerce. Even though this shipping service adds on one extra delivery day, the delivery cost is 60% lower than the air delivery service. As a result, there has been an attempt to utilize global e-commerce in the port sector, but no concrete proposals until now.

Therefore, the purpose of this study is to estimate the possible conversion demand of global e- commerce in Northeast Asia (Korea - China, Korea – Japan) by analyzing the delivery type among the three countries. Based on the results, it aims to suggest any possible roles the ports can play as a mean of the e-commerce logistics base.

2. Status of e-commerce markets in Korea, China and Japan

2.1 Korea

Currently, Korea's global e-commerce market is growing at a double-digit rate. From 2014 to 2016, the size of the global e-commerce market (export and import) in Korea increased by 34.2% annually. In particular, the B2C transaction has grown rapidly since 2010.

The growth trend of global e-commerce in Korea shows that the overseas transaction (export) is leading the growth of the market in the country. In other words, foreign consumers' spending on Korean goods lead the e-commerce market in Korea. From 2014 to 2016, the export and import grew at an annual average rate of 83.3% and 7.6%, respectively. The export grew 11 times greater than the import.

Table 1. E-commerce market size in Korea

(100 Million Won)

Trade type	2014	2015	2016	CAGR
Total	23,262	29,558	41,904	34.2%
Export	6,792	12,544	22,825	83.3%
Import	16,471	17,014	19,079	7.6%

Source: Statistics Korea

As of 2016 China recorded as the top country which imports most of B2C goods (78.5%) from Korea. The B2C goods sold to China show a sharp increase every year. The U.S. and Japan were followed accounting 6.5% and 5.1%, respectively

Table 2. Destination countries for Korea's e-commerce goods (exports)

(Million Won)

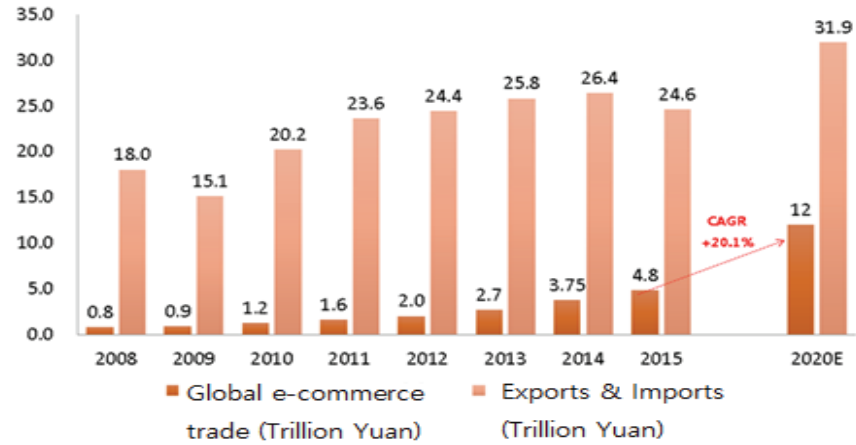
Rank	Country	2014	2015	2016	Ratio
1	China	318,752	861,989	1,790,512	78.45%
2	U.S.	96,363	128,899	147,747	6.47%
3	Japan	90,187	83,537	116,077	5.09%
4	Asean	45,311	58,757	73,903	3.24%
5	EU	24,682	20,438	31,376	1.38%
6	Oceania	18,326	14,635	19,037	0.83%
7	Latin America	9,703	8,973	11,400	0.50%
8	Middle East	8,904	8,918	7,841	0.34%
9	Rest	66,900	68,210	84,559	3.70%
Total		679,128	1,254,356	2,282,452	96.3%

Source: Statistics Korea

2.2 China

Global e-commerce has emerged as a new growth engine for China's imports and exports, and has been growing at a rapid rate of 20% since 2010. From 2015 to 2020, China's global e-commerce trade is expected to increase by an annual average of 20.1%, reaching RMB 12 trillion by 2020. In addition, the proportion of global e-commerce in China's total trade is expected to increase from 19.5% in 2015 to 37.6% in 2020.

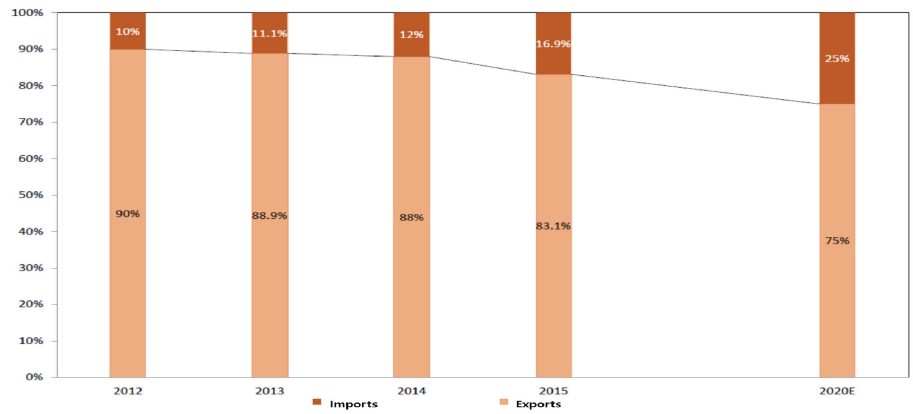
Figure 1. Volume of China's global e-commerce trade and import & export



Source: Ministry of Land, Infrastructure and Transport (Korea), 2016

In 2015, exports accounted for 83.1% of China's global e-commerce trade and this is about 4.9 times higher than of imports (16.9%). However, the size of imports will gradually increase in the coming years, and it will be expected to account for 25% of the total global e-commerce trade by 2020 (Ministry of Land, Infrastructure and Transport (Korea), 2016).

Figure 2. China's global e-commerce import & export



Source: Ministry of Land, Infrastructure and Transport (Korea), 2016

2.3 Japan

In 2015, the second largest global e-commerce (B2C) trading partners of Japan were the U.S. and China. The total volume of export to the U.S. and China was 6 times greater than the import. The export increased by 22% compared to the previous year – the export to the U.S. increased by 10.5% while it increased by 31.2% to China.

Table 3. Japan's B2C goods sold to the U.S. and China

(100 Million Yen)

Trading Country	Trading Type	2015	2016	2017	2018	2019	CAGR
U.S.	Import	5,381	6,081	6,822	7,614	8,451	11.9%
	Export	2,019	2,261	2,510	2,761	3,023	10.6%
	Total	7,400	8,342	9,332	10,375	11,474	11.6%
China	Import	7,956	10,788	14,305	18,568	23,359	30.9%
	Export	210	235	261	287	314	10.6%
	Total	8,166	11,023	14,566	18,855	23,673	30.5%

Source: Ministry of Economy, Trade and Industry (Japan), 2016

From 2015 to 2019, Japan's B2C goods sold to the U.S. is expected to grow at an annual average of 11.6%. In addition, Japan's B2C import and export to the U.S. is expected to grow at an annual average of 11.9% and 10.6%, respectively.

Moreover, its B2C goods sold to China is expected to grow at an annual average of 30.5%. Between 2015 and 2019, Japan's B2C import and export to China will grow at an average of 30.9% and 10.6%, respectively.

In 2015, Japan's major B2C import items were books/CDs/DVDs/video games (27%), cosmetics (21%), clothing and footwear (20%), and mobile phones (10%).

3. E-commerce delivery type in Korea, China and Japan

Currently, the air transportation is absolute means of international transportation mode for e-commerce goods between Korea, China and Japan. Because the express delivery service is used for the transportation of urgent goods, the air transportation has become to play the vital role. Moreover, the customs offices of each country operate a system for simple customs clearance for air express cargoes at a low tariff rate. However, in recent years, there have been attempts among these three countries to diversify the means of transportation mode for e-commerce goods – from the current air service to the sea service. Korea and China launched a ferry service for e-commerce goods in August 2015, and the POST Sea Express service is under operation for B2C e-commerce. Even though this shipping service adds on one extra delivery day, the delivery cost (i.e. logistics cost) is almost 60% lower than the air delivery service.

Furthermore, it turned out to be that there is demand to utilize Korean ports as transhipment hub for global e-commerce goods, mainly from China and Japan.

3.1.1 Korea-China

As a result of the efforts by both Korea and China's Customs Authority, the two countries currently provide maritime customs clearance and express sear shipping service for e-commerce goods (Korea Information Society Development Institute, 2016). This service is a sea shipping delivery method for global e-commerce goods using a ferry operating between Korea and China. In 1989, a direct route for container was established between Busan port and Shanghai port. In August 1990, Weihai port launched a direct ferry service between Incheon and China.

3.1.2 Korea-Japan

Japan has more than 70 airports nationwide, of which the main international airports are Narita, Haneda, Kansai, Fukuoka and Chubu International Airport. There are more than 100 ports and among them, the main ports are known as Tokyo, Yokohama, Osaka, Kobe, Fukuoka and, Moji ports. In addition, the ports of Komadomae, Hakodate, Aomori, Sendai, Niigata and Kitakyushu in Kyushu are used in connection with Busan port in Korea. It is common to use air delivery service for e-commerce goods between Korea and Japan. The general cargoes may be delivered by either air or sea shipping service.

4. Estimation of possible conversion demand of sea shipping service for e-commerce goods in Korea

In order to estimate the possible conversion demand of sea shipping service for e-commerce goods, this paper estimates the future size of global e-commerce in Korea, China, and Japan using existing statistical data. Once this is done, it estimates how much of current air shipping service can be shifted to the sea shipping service. This will be calculated based on the survey carried out.

4.1 Size of global e-commerce in Korea, China, and Japan between 2016 and 2030

4.1.1 Korea-China

In this study, the average annual growth rate derived from previous studies was applied to estimate the future size of e-commerce between Korea, China and Japan. Previous studies have estimated the international e-commerce market around 2020 and expect to grow at an average annual rate of around 25%. It is assumed

that the size of Korea-China, Kore -Japan e-commerce market will increase by 25% per year until 2020. After 2020, the market size of the e-commerce market to be decreased per year until 2030 considering the industrial life cycle.

Based on the data from the National Statistical Office, it is estimated that the market size will be 4.8 trillion won in 2020, 11.4 trillion won in 2025, and 19.5 trillion won in 2030.

It is estimated that the export transaction volume (B2C) will reach 17.7 trillion won in 2030, which will account for 91.1% of Korea-China e-commerce. The import transaction volume will be 1.7 trillion won (8.9%). It is expected that Korea-China e-commerce will occupy 2.8% of trade size, B2C exports will account for 4.4% of Korea's total exports, and B2C imports will account for 0.7% of imports.

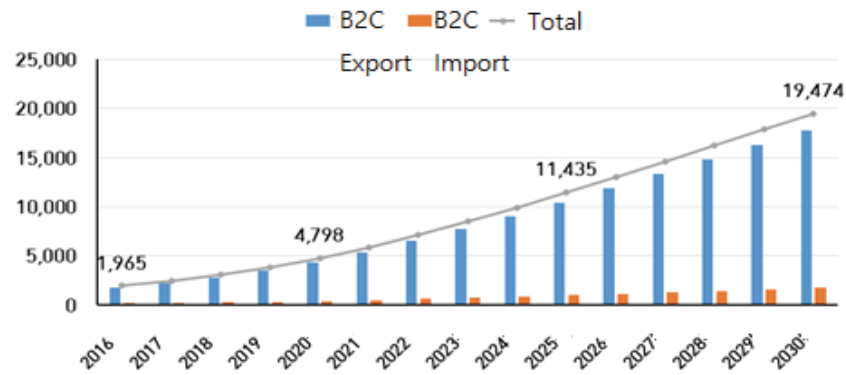
Table 4. Korea-China e-commerce market between 2016~2030

(Million Won)

Year	Trade		B2C Export		B2C Import		Total
	Export	Import	Total	Ratio	Total	Ratio	
2016	141,355,821	98,809,433	1,791,297	1.267%	174,162	0.176%	1,965,459
2017	149,824,764	108,706,863	2,239,121	1.521%	217,703	0.200%	2,456,824
2018	160,068,816	119,223,392	2,798,902	1.749%	272,128	0.228%	3,071,030
2019	172,349,361	130,984,219	3,498,627	2.030%	340,160	0.260%	3,838,787
2020	186,209,298	142,655,112	4,373,284	2.349%	425,200	0.298%	4,798,484
2021	199,455,611	154,205,635	5,379,139	2.697%	522,996	0.339%	5,902,135
2022	214,145,666	166,952,535	6,508,758	3.039%	632,825	0.379%	7,141,584
2023	231,291,732	180,047,196	7,745,422	3.349%	753,062	0.418%	8,498,484
2024	250,165,898	194,905,922	9,062,144	3.622%	881,083	0.452%	9,943,227
2025	271,751,090	209,130,664	10,421,466	3.835%	1,013,245	0.485%	11,434,711
2026	296,018,499	223,022,843	11,854,417	4.005%	1,152,567	0.517%	13,006,984
2027	323,714,535	237,810,820	13,336,219	4.120%	1,296,637	0.545%	14,632,857
2028	351,048,545	252,086,232	14,836,544	4.226%	1,442,509	0.572%	16,279,053
2029	379,339,395	268,408,845	16,320,198	4.302%	1,586,760	0.591%	17,906,958
2030	404,759,707	283,669,506	17,748,216	4.385%	1,725,601	0.608%	19,473,817
CAGR	7.80%	7.82%	17.80%	9.27%	17.80%	9.25%	17.80%

Source: Statistics Korea

Figure 4. Korea-China e-commerce market between 2016~2030



Source: Statistics Korea

4.1.2 Korea-Japan

In the case of Korea-Japan e-commerce, it is expected that the market size will be 0.6 trillion won in 2020, 1.3 trillion won in 2025, and 2.2 trillion won in 2030 when the size is estimated based on the data of the National Statistical Office. The sizes of the B2C export and import market by 2030 are estimated at 1.2 trillion won and 1.0 trillion won, respectively. This will account for 2.5% (B2C exports) and 0.9% (B2C imports) of Korea-Japan's total trade.

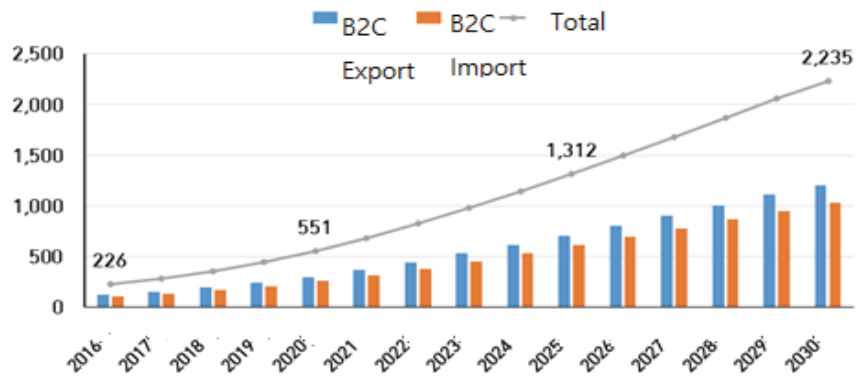
Table 5. Korea-Japan e-commerce market between 2016~2030

(Million Won)

Year	Trade		B2C Export		B2C Import		Total
	Export	Import	Total	Ratio	Total	Ratio	
2016	27,667,321	53,922,049	121,341	0.439%	104,196	0.193%	225,537
2017	29,070,300	57,823,362	151,676	0.522%	130,245	0.225%	281,921
2018	30,402,887	62,009,455	189,595	0.624%	162,806	0.263%	352,402
2019	33,062,737	66,987,436	236,994	0.717%	203,508	0.304%	440,502
2020	33,652,851	71,671,217	296,243	0.880%	254,385	0.355%	550,627
2021	35,120,084	76,504,521	364,378	1.038%	312,893	0.409%	677,272
2022	36,605,631	81,324,308	440,898	1.204%	378,601	0.466%	819,499
2023	37,919,260	85,599,197	524,669	1.384%	450,535	0.526%	975,204
2024	39,293,922	90,058,086	613,862	1.562%	527,126	0.585%	1,140,988
2025	40,630,124	94,421,350	705,942	1.737%	606,195	0.642%	1,312,136
2026	42,043,749	99,040,994	803,009	1.910%	689,547	0.696%	1,492,555
2027	43,519,540	103,738,611	903,385	2.076%	775,740	0.748%	1,679,125
2028	45,134,807	108,728,396	1,005,015	2.227%	863,011	0.794%	1,868,026
2029	46,818,410	113,487,411	1,105,517	2.361%	949,312	0.836%	2,054,829
2030	48,652,955	118,033,621	1,202,250	2.471%	1,032,377	0.875%	2,234,626
CAGR	4.11%	5.76%	17.80%	13.14%	17.80%	11.39%	17.80%

Source: Statistics Korea

Figure 5. Korea-Japan e-commerce market between 2016~2030



Source: Statistics Korea

This paper also examines the total trade volume (throughput) expected in the coming years. According to the National Statistical Office data, the total trade volume expected in 2020 for Korea-China e-commerce is 3,304 TEU while for Korea-Japan it is estimated to be 491 TEU in the same year. For 2030, 13,407 TEU (Korea - China) and 1,995 TEU are expected, according to the analysis.

4.2 Potential transit to sea shipping service for e-commerce goods

In order to estimate the possible conversion demand of sea shipping service for e-commerce goods, this study applies ratios drawn from the survey and previous studies. This study estimates the demand for transshipment of marine transportation in Korea-China, Korea-Japan for e-commerce goods and selects ferries as a means of transportation mode. Ferries are regularly operated, and the delivery time can take up to an average of extra 1 day than the current air service while the shipping costs can be reduced by up to 60%. However, as a result of interviews with experts, it was found that the cost of e-commerce delivery using a ferry is about 70% cheaper compared to the air service. Therefore, this research estimates the conversion rate by dividing the shipping cost of sea service by 40% level and 70% level compared to the air transportation.

From the questionnaire survey carried out by the e-commerce customers in Korea, it was found that 32% of the respondents are willing to accept the one day delay in delivery if the shipping cost was 10% cheaper. On the other hand, 78.5% of respondents are willing to accept one day delay in delivery if the cost was reduced by up to 50%. Because the shipping time of the ferry is one day longer than the existing air transportation, the conversion demand is estimated based on the discount rate required by the delay of one day delivery. Based on the results of the survey and the shipping price of sea service, the expected conversion demand from air to sea delivery service for Korea-China e-commerce goods is 68.8% when the shipping cost was 60% (40% of the air service cost) lower than the air service. Furthermore,

if the shipping cost was 30% (70% of the air service cost) lower than the air 39.6% of the e-commerce goods are expected to be shipped by the sea.

When the same scenario is applied to Korea-Japan e-commerce goods 57.3% of goods are expected to be shipped by the sea if the shipping cost was 60% (40% of the air service cost) lower than the air while 36% of goods are expected to be delivered by the sea if the cost was 30% (70% of the air service cost) lower than the air.

Table 6. Potential transit demand to marine transportation for Korea-China and Korea-Japan

Trading	Cost of shipping for sea service	
	40% of air service	70% air service
Korea-China	68.8%	39.6%
Korea-Japan	57.3%	36.0%

Source: Author's analysis

4.3 Demand forecasted based on the analysis

The trade volume of e-commerce for Korea- China is expected to be up to 13,407 TEU by 2030, and for Korea-Japan it is expected to be 1,995 TEU. If the ratio of 40% (60% lower than the air service) is applied to these volumes, the possible throughput for Korea-China e-commerce goods to be shipped by the sea service is approximately between 219 and 2,273 TEU in 2020 and between 891 and 9,224 TEU in 2030. For Korea-Japan e-commerce goods it is expected to be approximately between 183 and 281 TEU in 2020 and between 741 and 1,143 TEU in 2030.

On the other hand, if the ratio of 70% (30% lower than the air service) is applied to these volumes the possible throughput by the sear service delivery is expected to be between 126 and 1,308 TEU in 2020 and 513 and 5,309 TEU in 2030 for Korea-China e-commerce goods. For Korea-Japan, the sea service demand will be around 115 ~ 491 TEU in 2020 and 465 ~ 718 TEU in 2030.

5. Conclusion

The e-commerce market size for Korea-China and Korea-Japan is expected to grow steadily. However, since the e-commerce main items are relatively small in size and expensive in price, there is more preference on the air delivery service by the customers. This is why the air delivery is mainly used for the e-commerce items. In addition, according to the results of this study, it was found that the demand for e-commerce items will not be secured enough to be converted to the sea shipping service.

For these reasons, the roles of ports are believed to be limited yet. Because the expected throughput is maximum of 9,224 TEU for Korea-China while it will be around 1,143 TEU for Korea-Japan it seems almost impossible to launch a new

ferry route for the deliveries of e-commerce goods between these three countries.

Nonetheless, the global e-commerce market is growing rapidly, and Korea is located at the center of Northeast Asia meaning it has a geographical advantage. Ports such as Busan and Incheon are believed to play a vital role as the logistics hub for e-commerce markets. By utilizing this point, it is possible to increase the trade volume of the global e-commerce by establishing a logistics hub in the port complex and by improving the logistics system connected with it.

Furthermore, in order to take advantage of the rapid growth of global e-commerce, it is important that the roles of ports should be realized and priority should be given to the establishment of a logistics system to convert the current air delivery service to the sea service in the coming future. Korea should work towards to facilitate such port roles as the e-commerce trade volumes continues to grow rapid with China and Japan. Korea has an opportunity to secure enough throughput for marine transportation for e-commerce goods in the future.

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