한국항해항만학회지 제39권 제5호
J. Navig. Port Res. Vol. 39, No. 5 : 423-429, October 2015 (ISSN:1598-5725(Print)/ISSN:2093-8470(Online))
DOI : http://dx.doi.org/10.5394/KINPR.2015.39.5.423

The Evaluation of Location Competitiveness for International Logistics Center: Case of Northeast Asia

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Abstract : *The expansion on the scale of international trade and rapid economic growth in Northeast Asia have caused intense competition among global companies for securing international logistics center in Northeast Asia. Analyzing location competitiveness for international logistics center in Northeast Asia, this paper aims to extract implications for enhancing locational competitiveness. Employing the relative importance among location selection factors extracted from AHP analysis in prior study, we evaluated the major five port-cities in Northeast Asia including Busan, Gwangyang, Shanghai, Qingdao and Tokyo. In the evaluations, Shanghai (3.926) ranked as the first, followed by Busan (3.859), Qingdao (3.555), Tokyo (3.013) and Gwangyang (2.915). Furthermore, the causal relationships between determinants for location choice decision (logistics factor, cost factor, market factor, service factor and environmental factor) and dependent variables (competitiveness of international logistics center, potentiality to growth, present intention to move into and future plan to move into) were analyzed to provide implications. Results provide useful insights for further improvements, and helps strategic agenda for future development of port-cities.*

Key words : *international logistics center, northeast asia, evaluation of location competitiveness, multiple regression analysis*

1. Introduction

Northeast Asia(NEA) has been the third biggest economic district in the world, with the fast growth of China economies. World maritime cargo volumes toward NEA have increased, rapidly. With the expansion of international trade and rapid economic growth in NEA, competition among global companies for securing international logistics centers(ILCs) in NEA has occurred. To demonstrate Global Supply Chain Management(GSCM) in international logistics activities, competition to preoccupy a competitive position among three countries in NEA including South Korea, China and Japan has been intensified(Shin, et al., 2005). Particularly, with the expansion of international trade and rapid economic growth, global companies would like to secure logistics center near port or airport, as a core strategy to develop efficient logistics networks(Kang and Kim, 2015).

The role and function of ILCs have expanded to the strategic node that can increase or decrease values added on GSCM(Jo et al., 2014; Choi et al., 2014). To maximize profits from value adding practices, the role of ILCs are highlighted.

Recognizing the importance of port hinterland as a strategic node for GSCM, South Korea, China and Japan focus on hinterland development, and are competing to attract global companies. Notwithstanding the importance of ILCs within the area, there is no ILCs in NEA. In this business environment, analyzing location competitiveness that can accommodate NEA market is very important as much as the construction of logistics infrastructure in port hinterland and establishment of political support to attract global companies.

Focusing on the three countries in NEA that are in real competition, the evaluation of location competitiveness would be significant to suggest useful insights, such as supplementing shortcomings and/or enhancing strong points. Nevertheless, on the evaluation of location competitiveness only few studies focused on port-cities in NEA. Moreover, most of prior studies on ILCs focused on development of progress algorithm and/or operational approach to analyse(Oh et al., 2011; Marc, et al., 2002; Ashayeri and Rongen, 1997). For example, with respect to costs, prior study on ILCs location evaluated total costs for moving in, by developing location selection model(Choi, 2010: Shin et al., 2005). Recently, in terms of determinants of location competitiveness in ILCs, Kang and Kim(2015) extracted determinants for ILCs location from literature reviews and experts' investigation. However, they just suggested five factors for location competitiveness of ILCs,

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through Analytic Hierarchy Process(AHP) identifying the relative importance among determinants.

In order to overcome the limitation of prior research and to provide unique implications of this study, this paper evaluated location competitiveness for ILCs focused on port-cities in NEA, considering diverse location selection factors, such as logistics factors, cost factors, market factors, service factors and environmental factors. To extract implications, we targeted the major five port-cities in NEA including Busan, Gwangyang, Shanghai, Qingdao and Tokyo. Further, the causal relationships between location selection factors and dependent variables (competitiveness of ILCs, potentiality to grow, present intention to move into and future plan to move into) were analyzed.

After the introduction of this study, research model and method to analyze are explained in section Ⅱ. section Ⅲ presents the results of the evaluation among the five port-cities in NEA, as well as the results of multi-regression analysis between the determinants and dependent variables. In section Ⅳ, research conclusion are presented.

2. Research Model and Methodology

To evaluate location competitiveness of ILCs in NEA, this study targeted the five major port-cities in three countries within NEA, considering the relative importance of determinants that extracted from prior study through AHP analysis by Kang and Kim(2015).

As presented in Figure 1, the five factors includes seventeen elements. The ratio of consistency for the five factors including seventeen elements was 0.002, indicating rational consistency (Kang and Kim, 2015).

Based on questionnaire survey conducted in 2014, we evaluated location competitiveness of ILCs, and analyzed a causal relationship between location selection factors (logistics factors, cost factors, market factors, service factors and environmental factors) and dependent variables (competitiveness of ILCs, potentiality to growth, present intention to move into and future plan to move into) through multiple regression analysis, individually. <Figure 1> describes the evaluation model for location competitiveness of ILCs.

The port-cities suggested for ILCs were composed of the three countries located in NEA including South Korea, China and Japan. Considering container cargo handling volume in 2014, we selected the target port-cities in each country. The target port-cities include; two Chinese port-cites (Shanghai, 35.29 Million TEU and Qingdao, 16.62 Million TEU), two Korean port-cities (Busan, 18.68 Million TEU and Gwangyang, 2.34 Million TEU), and one Japanese port-city (Tokyo). They are in real competition in terms of port and its hinterland operations, as well as ranked as the leading port of each country(BPA, 2015).

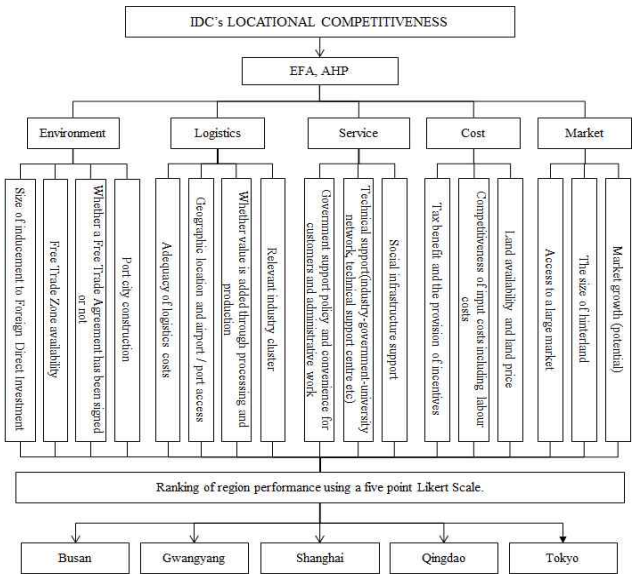


Fig. 1 The evaluation model for location competitiveness of ILCs

Questionnaire were distributed to expert groups including logistics companies, operators and institutional groups. to evaluate location competitiveness, we employed a five-point Likert Scale ranging from 1-strongly disagree to 5-strongly agree. The respondents are asked to tick one box to show their degree of agreement by checking one of five response categories in each statement. The five port-cities were evaluated, individually. In addition, measurement items for multiple regression analysis include dependent variables such as competitiveness of international logistics center, potentiality to grow, present intention to move into and future plan to move into.

Of the initial 240 questionnaires that were distributed a total 108 were collected by distributed-and-collect, email and Fax. Excluding 11 insincere responses, a total 97 responses were used for further analysis in this study. For data analysis, SPSS 18.0 was employed.

The general characteristics of the sample collected (see Table 1) classified into four group: logistics companies (63.9%), followed by institution (18.6%), university (10.3%), government body (7.2%). Respondents have been with their organizations an average of 17.5 years: Less than 5 years

(21.6%), 5-10 (36.1%), 10-15 (21.6%), 15-20 (15.5%) and over than 20 (5.2%).

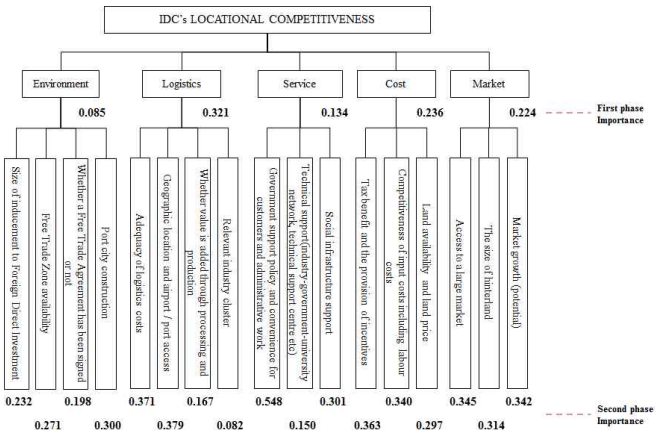
Table 1 General characteristics of the sample collected

		Frequency	Percentage	Accumulated
Type	Institution	18	18.6%	18.6%
	Government	7	7.2%	25.8%
	University	10	10.3%	36.1%
	Organizations	62	63.9%	100.0%
Work experience	Less than 5	21	21.6%	21.6%
	5~10	35	36.1%	57.7%
	10~15	21	21.6%	79.4%
	15~20	15	15.5%	94.8%
	Over 20 years	5	5.2%	100.0%
Total		97	100%	

3. Empirical Analysis

3.1 The results of Location competitiveness of ILCs

To evaluate location competitiveness of ILCs, we employed the relative importance extracted from AHP analysis by Kang and Kim(2015). Logistics factor (32.1%) ranked as the first significant factor in the relative importance among determinants, followed by cost factors (23.6%), market factors (22.4%), service factors (13.4%) and environmental factors (8.5%)(Kang and Kim(2015). <Figure 2> presents hierarchy of location selection factors for ILCs.



Source : A Study on the Location Determinants of International Logistics Center, Kang etc., 2015

Fig. 2 The relative importance of location selection factors for ILCs

3.1.1 Costs factor competitiveness

Costs factors of competitiveness for ILCs consist of administrative supports and incentives, competitiveness in input costs including labor costs, availability of the land and costs. Table 2 presents the results of the evaluation of the target port-cities in terms of costs factor. In a comparison among the targeted port-cities, Busan ranked as the first with 3.909 of relative importance. Shanghai (3.758), Qingdao (3.621), Gwangyang (3.318) and Tokyo (2.561) were ranked, sequentially. In a case of Japan, the results may imply that higher land and labor costs negatively influence cost factor of competitiveness in Tokyo. In addition, the difference from cargo volumes handled and lower activation level of Gwangyang(2.34 Million TEU, compared to Busan(18.68 Million TEU), may cause the difference in costs factors between Busan and Gwangyang.

Table 2 A comparison on costs factor of competitiveness

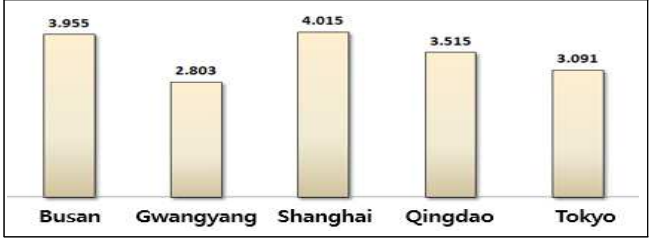
		Busan	Gwangyang	Shanghai	Qingdao	Tokyo
Logistics	Mean	3.909	3.318	3.758	3.621	2.561
	Rank	1	4	2	3	5

3.1.2 Logistics factor competitiveness

Adequacy level of logistics costs, geographical location and accessibility to port/airport, political support for creating value adding from processing and manufacturing and concentration of the related industries are included in competitiveness for ILCs in logistics factor. Shanghai showed the highest value in logistics factors of competitiveness, followed by Busan (3.955), Qingdao (3.515), Tokyo (3.091), and Gwangyang (2.803). In logistics factor, unexpectedly, Gwangyang recorded lower value than Tokyo, because of the higher accessibility of Tokyo to airport. It can be caused by connectivity in the region (Air & Sea).

Table 3 A comparison on logistics factor of competitiveness

		Busan	Gwangyang	Shanghai	Qingdao	Tokyo
Logistics	Mean	3.955	2.803	4.015	3.515	3.091
	Rank	2	5	1	3	4

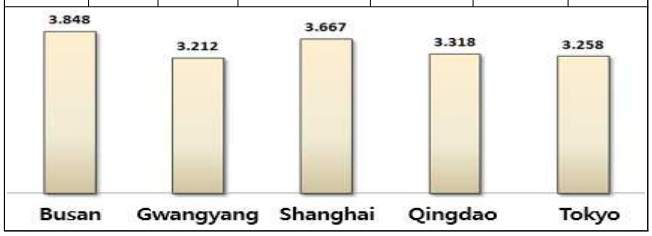


3.1.3 Service factor competitiveness

Service factors of competitiveness for ILCs incorporate political supports and convenience for customs clearance/administrations, technical supports, social infrastructure supports. Table 4 indicates the evaluation values of service factor competitiveness in the comparison among the target port-cities. Results revealed that Busan has the highest values in service factors, indicating 3.848. Shanghai (3.667), Qingdao (3.318) and Tokyo (3.258) followed Busan. In addition, Gwangyang (3.212) showed the lowest value in service factor.

Table 4 A comparison on service factor of competitiveness

		Busan	Gwangyang	Shanghai	Qingdao	Tokyo
Service	Mean	3.848	3.212	3.667	3.318	3.258
	Rank	1	5	2	3	4

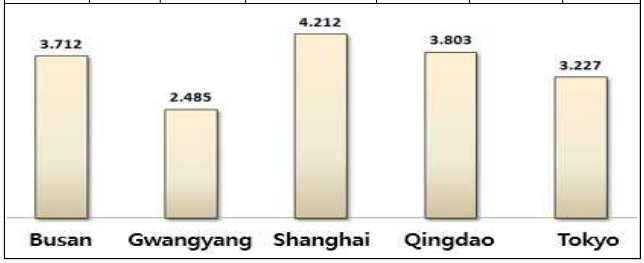


3.1.4 Market factor competitiveness

Market factors in competitiveness for ILCs are composed of accessibility to the market, the scale of the market, potentiality to growth. Table 5 illustrates the evaluation values of market factor for competitiveness of ILCs. In comparison on market factor, Shanghai (4.212) ranked as the first, followed by Qingdao (3.803), Busan (3.712), Tokyo (3.227) and Gwangyang (2.485). The reason for higher values of Chinese port-cities may imply potentiality of Chinese markets as global factory for manufacturing and/or the huge customers.

Table 5 A comparison on market factor of competitiveness

		Busan	Gwangyang	Shanghai	Qingdao	Tokyo
Market	Mean	3.712	2.485	4.212	3.803	3.227
	Rank	3	5	1	2	4



3.1.5 Environmental factor competitiveness

The scale of overseas investments, availability of free trade zone, existence and nonexistence of FTA, port-city relationships are included in environmental factor for ILCs competitiveness. The results indicated that Busan (3.758) is the most competitive, compared to Shanghai (3.712), Qingdao (3.242), Tokyo (3.030) and Gwangyang (2.879). Results imply that Busan and Shanghai have relatively a high value in environmental factor while Gwangyang showed the lowest value in the comparison among the target port-cities (see Table 6).

Table 6 A comparison on environmental factor of competitiveness

		Busan	Gwangyang	Shanghai	Qingdao	Tokyo
Enviro nment	Mean	3.758	2.879	3.712	3.242	3.030
	Rank	1	5	2	3	4

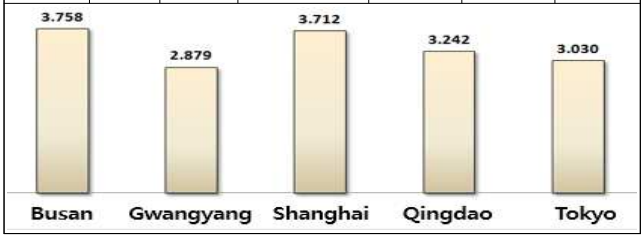
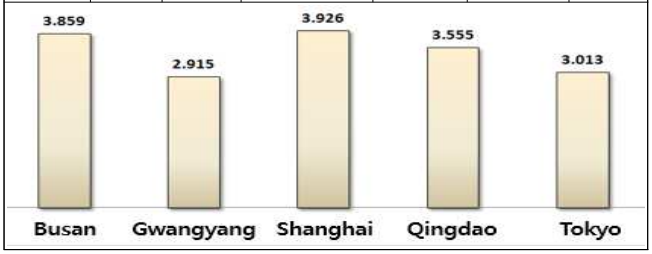


Table 7 presents a comparison of overall competitiveness, reflecting the relative importance of determinants. Among the five port-cities compared, Shanghai and Busan ranked as the highest group, indicating 3.926 and 3.859, respectively. The following cities were Qingdao (3.555) and Tokyo (3.012). On the other hand, Gwangyang in South Korea revealed the lowest value in overall competitiveness.

Table 7 A comparison on overall competitiveness

		Busan	Gwangyang	Shanghai	Qingdao	Tokyo
Overall	Mean	3.859	2.915	3.926	3.555	3.013
	Rank	2	5	1	3	4



3.2 The results of multiple regression analysis

After evaluating location competitiveness for the target port-cities, we conducted multiple regression analysis that identify the liner relationships between determinants for location competitiveness (logistics factor, cost factor, market factor, service factor and environmental factor) and dependent variables (1) competitiveness of international logistics center, (2) potentiality to growth, (3) present intention to move into and (4) future plan to move into. To

choose optimal regression model, we employed stepwise method that adds dependent variable step by step at a significant level of 0.05.

3.2.1 Competitiveness of ILCs

We analyzed the influence of location selection factors on competitiveness of ILCs. The analysis of variance assumed five regression model at a significant level of 0.01 (see Table 8). At first, Busan revealed environmental (0.5505), costs (0.2617) and logistics factor (0.1861) influence competitiveness of ILCs, sequentially. The results showed a similar pattern in the results of the competitiveness evaluation. In a case of Gwangyang, the results identify that logistics and costs factor that have a competitive position in a comparison influence competitiveness of ILCs, indicating 0.5517 and 0.2247, respectively. Shanghai revealed that logistics (0.3678), market (0.2715), environmental (0.1720) influence competitiveness. In a case of Qingdao, service (0.4281), market (0.2852), logistics (0.2663) factors were significant. On the other hand, Tokyo showed the influence of environmental (0.4868) and costs factor (0.4550).

Although the influential factor is slightly different from the target port-cities, the results of regression analysis indicate that logistics factor influence all of the cities excluding Tokyo. This result showed the same tendency on the results of the relative importance. Therefore, the results imply that logistics factor is the most important factor for location selection of ILCs, as well as competitiveness of ILCs.

Table 8 Results of regression analysis (Competitiveness)

	Dependent Variable	Standardized coefficients	S • E	t value	Pr > |t|
Busan	Costs	0.2617	0.0826	3.23	0.0017
	Logistics	0.1861	0.7443	2.64	0.0098
	Environment	0.5055	0.0711	6.30	<.0001
R^2 : 0.6264, F : 51.97, P : <.0001					
Gwangyang	Costs	0.2247	0.0857	2.71	0.0080
	Logistics	0.5517	0.0821	6.66	<.0001
R^2 : 0.4505, F : 38.54 P : <.0001					
Shanghai	Logistics	0.3678	0.1021	3.62	0.0005
	Market	0.2715	0.0940	2.73	0.0076
	Environment	0.1720	0.0975	2.07	0.0409
R^2 : 0.4153, F : 22.02, P : <.0001					
Qingdao	Logistics	0.2663	0.0907	3.12	0.0024
	Service	0.4281	0.0710	5.57	<.0001
	Market	0.2852	0.0763	3.23	0.0017
R^2 : 0.4923, F : 30.06, P : <.0001					
Tokyo	Costs	0.4550	0.0598	6.13	<.0001
	Environment	0.4868	0.0679	6.56	<.0001
R^2 : 0.4878, F : 44.75, P : <.0001					

3.2.2 Potentiality to growth

Table 9 presents the results of regression analysis that tests the influence of location selection factors on potentiality to growth. In a case of Busan, only costs factor significantly influenced potentiality to grow. As Busan showed strength in costs factor in the evaluation of competitiveness, the result implies that Busan have a potentiality to grow, if they can constantly hold a competitive position in costs factor. On the other hand, Gwangyang indicated that logistics (0.5595) and costs (0.2280) factors have a significant effect on potentiality of growth.

In a case of Chinese cities, Shanghai showed a significant influence in market (0.4440) and logistics (0.3952) factors, while logistics (0.3155), market (0.2508) and costs (0.2292) factors have a significant influence in Qingdao. In a case of Qingdao, logistics factor that shows the lowest value in the evaluation of competitiveness was the most significant factor that influences potentiality of growth. While in Tokyo, the logistics (0.3788) and market (0.3048) were the most significant in growth potentiality.

Table 9 Results of regression analysis (Potentiality)

	Dependent Variable	Standardized coefficients	S • E	t value	Pr > |t|
Busan	Costs	0.5231	0.0845	5.98	<.0001
R^2 : 0.2736, F : 35.79 P : <.0001					
Gwangyang	Costs	0.2280	0.0912	2.78	0.0065
	Logistics	0.5595	0.0873	6.83	<.0001
R^2 : 0.4635, F : 40.61, P : <.0001					
Shanghai	Logistics	0.3952	0.1013	4.63	<.0001
	Market	0.4440	0.0953	5.20	<.0001
R^2 : 0.5649, F : 61.03 P : <.0001					
Qingdao	Costs	0.2292	0.1122	2.49	0.0145
	Logistics	0.3155	0.1227	3.33	0.0012
	Market	0.2508	0.1028	2.57	0.0116
R^2 : 0.4021, F : 20.85, P : <.0001					
Tokyo	Logistics	0.3788	0.0790	3.96	0.0001
	Market	0.3048	0.0889	3.19	0.0019
R^2 : 0.3502, F : 25.33, P : <.0001					

3.2.3 Present intention to move into

With respect to present intention to move into, environmental factor (0.4222) indicated the highest value in Busan, followed by logistics (0.3195) and costs factor (0.2286), sequentially. Gwangyang reported a significant influence in logistics (0.4001) and market factor (0.2769). In the case of Chinese cities, both Shanghai and Qingdao showed a significant influence in market and logistics,

indicating 0.3337 and 0.2232, and 0.3669 and 0.2057, respectively. In addition, cost (0.4709) and environmental factor (0.2626) was significant in a case of Tokyo.

Table 10 Results of regression analysis (Present intention)

	Dependent Variable	Standardized coefficients	S • E	t value	Pr > |t|
Busan	Costs	0.2286	0.0791	2.75	0.0071
	Logistics	0.3195	0.0713	4.42	<.0001
	Environment	0.4222	0.0682	5.14	<.0001
R^2 : 0.6083, F : 48.15, P : <.0001					
Gwangyang	Logistics	0.4001	0.1067	3.74	0.0003
	Market	0.2769	0.1273	2.58	0.0114
R^2 : 0.3830 F : 29.17, P : <.0001					
Shanghai	Logistics	0.2232	0.1574	1.99	0.0490
	Market	0.3337	0.1481	2.98	0.0037
R^2 : 0.2510, F : 15.75, P : <.0001					
Qingdao	Logistics	0.2057	0.1358	2.00	0.0481
	Market	0.3669	0.1105	3.57	0.0006
R^2 : 0.2518, F : 15.82 P : <.0001					
Tokyo	Costs	0.4709	0.0745	5.49	<.0001
	Environment	0.2626	0.0846	3.06	0.0029
R^2 : 0.3152, F : 21.63, P : <.0001					

3.2.4 Future plan to move into

In terms of future plan to move into, costs (0.2937), logistics (0.2500) and environmental factor (0.2407) were significant in a case of Busan. Gwangyang reported the significant influence on future plan in service (0.2541), environmental (0.2245) and market factor (0.2240), sequentially. In a case of Chinese cities, logistic and market factor were significant in future plan to move into (see Table 11). In addition, costs (0.4184) and environmental factor (0.2481) were significant in a case of Japanese city.

Table 11 Results of regression analysis (Future intention)

	Dependent Variable	Standardized coefficients	S • E	t value	Pr > |t|
Busan	Costs	0.2937	0.1049	2.85	0.0054
	Logistics	0.2500	0.0946	2.78	0.0065
	Environment	0.2407	0.0904	2.36	0.0204
R^2 : 0.3955, F : 20.28, P : <.0001					
Gwangyang	Service	0.2541	0.1449	2.56	0.0121
	Market	0.2240	0.1362	2.16	0.0336
	Environment	0.2245	0.1250	2.10	0.0382
R^2 : 0.3196, F : 14.56, P : <.0001					
Shanghai	Logistics	0.2897	0.1575	2.58	0.0113
	Market	0.2664	0.1483	2.38	0.0196
R^2 : 0.2480, F : 15.50 P : <.0001					
Qingdao	Logistics	0.2881	0.1390	2.83	0.0058
	Market	0.3046	0.1131	2.99	0.0036
R^2 : 0.2629, F : 16.76, P : <.0001					
Tokyo	Costs	0.4184	0.0903	4.68	<.0001
	Environment	0.2481	0.1026	2.78	0.0066
R^2 : 0.2571, F : 16.27 P : <.0001					

In a comparison on both present intention and future plan to move into, the three factors were extracted in the case of Busan, indicating that costs, logistics and environmental factors significantly influence both the present and the future intentions to move into. In a case of Shanghai, the results revealed that logistics and market factors have a significant influence in the present intention to move into while environmental factor is significantly considered for future plan to move into. In a case of Gwangyang, logistics and market factors had an influence in the present intention to move into. However, the results identified that service, market and environmental factors significantly influence in the future plan to move into. Lastly, Qingdao and Tokyo reported that market and costs factors have a significant influence in both the present and the future intentions to move into.

4. Conclusion

This study aims to suggest implications for improving location competitiveness of ILCs, evaluating competitiveness of the target port-cities. To extract implications, we analyzed the causal relationships between determinants for location competitiveness of ILCs incorporating logistics, costs, market service and environmental factors, and dependent variables (competitiveness of international logistics center, potentiality to growth, present intention to move into and future plan to move into).

At first, the results identified that Shanghai (3.926) ranks as the first in NEA, followed by Busan (3.859), Qingdao (3.555) and Tokyo (3.012), sequentially. Results reported relatively higher ranking of Korean port-city (Busan), following Chinese port-city (Shanghai). On the other hand, another Korean port-city (Gwangyang) showed lower values in the competitiveness evaluation than Japanese port-city (Tokyo).

Although Shanghai ranked as the first in overall competitiveness, they ranked as the second in costs, service and environmental factors. When Consider the growth rate of Chinese market and the scale of Chinese economies, Shanghai can take a competitive position in competition, but they are required to improve service and environmental factors, such as social infrastructure and supports for IT management.

In case of Busan, they showed higher values in a

comparison, thoroughly. The results reported disadvantages in the market and logistics factors. At first, to maximize the advantages, Busan needs a strategic approach focused on costs and service factors for future improvement. In addition, in order to overcome its weak points, differentiation strategies and positive political supports, such as tax supports and incentives, investments in R&D, are required. Additionally, in a case of Busan, it is revealed that costs, logistics and environmental factors significantly influence present and future intentions to move in. Therefore, Busan needs to focus on the strategies that can overcome its weak points such as market and logistics factors, as well as future improvements in costs and environmental factors. Lastly, results are expected to provide useful insights for the strategic agenda for the future improvements in ILCs operations.

Further, it is revealed that the reasons for lower values of Gwangyang compared to Tokyo were because of the lowest maritime cargo volumes handled and low level of connectivity (e.g. Sea & Air). In a case of Qingdao, results identified that political supports such as incentives, SOC investment and hinterland development can be a strategic agenda to improve locational competitiveness.

In addition, the results of multiple regression analysis identified that potentiality of growth of ILCs are affected by costs factors (in a Busan case), and logistics and market factors (in a case of Shanghai), respectively. Therefore, results suggested different approach to the port-cities such as improvement in costs factors to Busan, and supports for logistics and market factors to Shanghai. The results also imply that improvement in the factors for competitiveness significantly influence potentiality of growth in ILCs operations.

Lastly, in analysis of the present and the future intentions to move into, results identified that costs, market, logistics, and environmental factors for competitiveness significantly influence the present and the future plans of companies to move into. Results imply that the success of ILCs operations significantly depends on further improvements in the factors for locational competitiveness of ILCs.

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Received 30 September 2015
Revised 27 October 2015
Accepted 27 October 2015