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A Study on the Comparative Analysis of Port Competitiveness Using AHP

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Abstract

Addressing change in the global sea transportation system in 21st century such as the introduction of “Hub and Spoke” systems, ports across the world have been respectively making various efforts to take the lead in playing their roles as regional hub ports. Considering this change, this research is attempting to find newly rising factors impacting on port competitiveness, especially focusing on the factors that reflect strategic investments in terms of port policy—through comparing major container ports throughout five continents including North America, Indian Sub-continent, and Greater Asia. To indentify key factors, the research uses the Analytic Hierarchy Process (AHP) as the major analytical tool, while identifying priorities from the perspective of consumer-facing competitiveness and policy-facing competitiveness by using a survey result. The research provides relevant entities such as local port authorities, local governments, and national governments with policy implications and future tasks.

Key words: port competitiveness, AHP, port selection

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1. Introduction

Since the beginning of 21st century, global trade volume has been persistently increasing, accompanied by a huge change of international transportation system, and, as a consequence, triggering sea change of global logistics. Global maritime transportation system has been developed with the aim to realize lower costs and efficient movements of cargoes and passengers. Along with the improvement of transportation vehicles, there have been developments of ports and their improvements continuously in regional and local levels.

One of the most representative examples can be said to be the introduction of "Hub and Spoke" system. With this introduction, ports across the world have been respectively making various efforts to take the lead in playing their roles as regional hub port. These phenomena are found not only in the Northeast Asian region, but in global level including North America, Northern and Southern Europe. Against this backdrop, there have been rapid emergences of new port development projects and their operation plans.

Regional major ports tend to, in general, implement development of cutting-edge facilities and operation plans in order to, on the one hand, maintain the existing customers, and, on the other hand, to attract new customers. This sort of competition can be seen in small and medium size ports as well. Small and medium size ports invest various efforts and attempts in order to become regional hub port, in particular, by providing customers with extraordinarily favorable incentives and by conducting port facility expansion and improvement of their operation systems, while struggling to catch further growth opportunities. In this circumstance, lack of rational port competitiveness evaluation in some region causes various adverse effects such as excessive competition among ports, and over-investment into port development.

In the past, there have already been research findings over various port competitiveness evaluations for port development and freight attraction policy. However, it is not ease to say that such evaluations have perfect effectiveness, mainly because most of the evaluations focused on ports in Northeast Asian region, and had difficulty to apply their research findings to other port's competitiveness in other regions including North America, Greater Asia, Europe, and the Middle East. Other common weakness of the existing evaluation methodology is that, by restricting the research objective into comparison of port size (and cargo volume)—in other words, by using the customer-facing competitiveness, the research findings have a limitation to reflect competitiveness changes led by strategic investments—in other words, lack of owner-facing competitiveness. Making up for such a weakness needs two other key additional works: geographical research area expansion, and inclusion of strategic investment factor in assessment of port competitiveness into the research.

In line with this observation, this research sets up a research scheme consisting of such elements as follows: 1) expansion of geographical range into five continents including South Korea, Northeast Asia, North America, Indian Subcontinent, and Greater Asia; 2) proposal of a new port competitiveness evaluation model particularly characterized by the reinforcement of introduction of "policy decision" factor. The main purpose of the research is to provide shipping companies and cargo owners with practical criteria for their rational sea port selections. The other purpose of this research is to prevent port policy makers from over-investment and/or over-competition, mainly by providing them with opportunities of using reasonable models and indicators based on more improved evaluation model.

To indentify key factors, the study uses the Analytic Hierarchy Process (AHP) as the major analytical tool, while identifying priorities from the perspective of consumer-facing factors and policy-facing factors, and provides relevant decision makers such as local port authorities, local governments, and national governments with policy implications and future tasks.

In Chapter 2, this paper identifies key factors impacting on port competitiveness by reviewing the existing theoretical trends and researches. Based on the efforts of the Chapter 2, Chapter 3 in this research paper attempts to establish a model for a more effective port evaluation. Chapter 4 focuses on identification of priorities by using of the model established in the Chapter 3. The research conclusion is provided in Chapter 5.

2. Theories and the Existing Studies on Port Competitiveness

2.1 Concept of Port Competition

The concept "port competitiveness" refers to the state that ports in relation of rivalry develop and conduct strategic options in order to obtain the status of comparative advantage. In this situation, a port needs to have certain amount of ability to initiate such a competition game and eventually become a winner against the other (or others). If a port has such ability, one can say that the port has the "port competitiveness."[1] In the sense that it shows the criteria of port selection to ship-owners and cargo owners, and can be used to port operators as indicators that enable them to lay out reaction strategies while grasping opportunities and threats of their own ports, the port competitiveness can be treated as by far the most important concept.[2]

1) Deaver, T. D., (1995) "The Implications of Increased Competition among Ports for Port Policy and Management," 22(2), pp.125-133.

2) Kim Jin-gu (2002) "An Application of Hierarchical Fuzzy Process: A Study on the Evaluation of Port Competitiveness in International Shipping & Port Logistics," Korean Journal of Logistics, Vol. 10, No. 2, p.43.

2.2 The Elements of the Port Competitiveness

As mentioned in its definition, the port competitiveness is so important for numerous players associated with the port industry, not only in the public sector but also in the private sector, and involving various areas ranging from maritime economic policy at national level to long-term business strategy at an individual company level.

Port competitiveness is formulated and decided by the interaction of numerous elements. As shown in the table 1, the elements include economic aspect and technological aspect, but sometimes or frequently internal politics.

Table1. List of the elements of port competitiveness

property classification	specific factors
Port Location	-Capacity of transportation connectivity -Economy scale of hinterland -Existence of port hinterland road -Nearness to main trunk
Port Facility	-A dedicated berth, EDI system -Ability to provide computer system for cargo handling -Allows for large volume shipments -Average time in transit -Cargo care and handling -Complete preparation of multimodal transport -Extent of port EDI -Existence of terminal operating system -Has loading and unloading facilities for large and /or odd-sized freight -Length of berth -Number of liners calling at ports -Operating system -Port operation time -Port productivity -Port scale -Road network to be fully equipped -Securing deep draft -Sufficiency of berth
Cargo Volume	-Cargo volume local to the port -Cargo volume of handling transshipment -Concentration of volume by export/import -Handling volume of export/import cargo
Service Level	-Ability of sales representative to handle problems -Ability to provide consolidation service -Ability to provide a just-in-time service -Ability to provide custom clearance service -Ability to provide custom clearance service -Ability to provide non-standard equipment -Ability to service outbound and inbound -Loading time -Offers convenient pickup and delivery times -Offers flexibility in meeting special handling requirements

property classification	specific factors
Service Level	-Port due + tug, pilot, line handling, etc. -Port extensiveness of services -Port's ability to accommodate special requirements -Presence of auxiliary services -Prompt response -Punctuality -Rate of lashing and tally, etc. -Schedule reliability
Cost	-Cargo expense (cargo handling charges) -Freight rates, Rates and charge, cost of service, low tariff -Guaranteeing of delivered price -Handling charge per TEU -Has low freight handling shipments -Price competitiveness -Pricing flexibility in meeting competitors' rates
others	-Accurate documentation -Balancing inbound and outbound cargo -Building Port MIS -Cargo safety -Changes of social environments -Courtesy of inquiry -Courtesy of sales representative -Customs regulation -Directness of sailing -Ease of communication with port's staff -Easiness of slot exchange agreement with other lines -Effectiveness of terminal operation -Electronic computation network -Entering niche market -Existence of cargo tracing system operation -Financial factors of port -Flexibility-ability -Good condition of containers -Good financial condition -Information Technology (IT) connectivity -Internal politics -IT and Management/worker relationship -Knowledgeability of sales personnel -Number of sailing -Oceanic distance -Port feeder connectivity to other ports -Port safety -Port's management-worker relationship -Port's operator reputation worldwide -Profitability of handling cargo at the port -Prompt of issue documentation -Regularity, reliability -Reputation -Securing exclusive use of equipment -Securing fairway -Securing navigation facilities/equipment -Securing railroad connection -Strength of legal/financial system of the port's

2.3 Literature Review

Most of the existing research outcomes relating port competitiveness evaluation tend to approach the issue with the limited geographic space—namely, specific regional space, and with narrower perspective—in other words, from the perspective of port service customers. The most frequently cited elements regarding port competitiveness, which are found and treated in the numerous existing research papers and works, can be boiled down to: port location, cargo volumes, level of services provided by port, port facilities, and port costs. The cargo flows or cargo throughput is said to be the major target of port competition analyses.

Most of the existing research outcomes tend to treat cargo volume—including export & import cargo volume, transshipment cargo volume, especially created by containers—as the most important factor. On the other hand, in terms of port facility capacity, main elements able to be compared with are maximum/minimum handling capacity, operation system, labor productivity and etc. Regarding port location issue, the analyses on the comparative strength and weakness in the existing research outcomes mostly focus on the geographical location, which consists of such elements as the accessibility to manufacturers, trunk lines, port expandability. In terms of port service, more frequently visited elements are average time of cargo handling in port and operation time including waiting time. Finally, in terms of cost competitiveness, major objectives of comparison tend to be loading & unloading cost per TEU and port service charges.

The factors used in the existing literature on the port competitiveness evaluation are summarized as shown in the table 2.

Table 2. Comparison of major port competitiveness factors by authors

Author	UNCTAD (1992)	Murphy (1992)	Starr (1994)
Factors of port selection	Geographic location, Port service, Port cost, Port socialism and economic, Port safety, Port system level	Port facility, Cargo damage claim, Cargo operation charge, Water depth, Cargo discharge ability	Geographic location, Railway transport on land, Port facility, Labor force sufficiency
Author	Suthiwartnarueput (1988)	McCalla (1994)	Collison (1984)
Factors of port selection	Port cost, Vessel schedule liability, Cargo operation speed, Vessel call frequency, Damage claim	Port facility, Railway transport on land	Vessel schedule liability, Documents dealing time, Port service level
Author	Tongzon (2001)	UNCTAD (2004)	Lirn (2003, 2004)
Factors of port selection	Geographic location, Transport speed, Restriction to cargo, Information system, Port service	Port service, Port cost, Information system, Space of Storage, Port safety	Port cost, Vessel schedule liability, Cargo operation speed, Vessel call frequency, Damage claim
Author	Song (2004)	Chang (2006)	Shou Jian Min (2007)
Factors of port selection	Port facility, Cargo damage claim, Cargo operation charge, Water depth, Cargo discharge ability	Port safety, Cargo safety operation, Vessel schedule liability, Service level	Port cost, Port safety, Port service, Information system, Port facility

Source: summarized by authors based on major references

3. AHP Method and a Hierarchic Structure Model

3.1 The Concept of Analytic Hierarchy Process (AHP)

The AHP is a structured technique for dealing with complex decisions. Rather than prescribing a "correct" decision, the AHP helps decision makers find one that best suits their goal and their understanding of the problem—it is a process of organizing decisions that people are already dealing with, but trying to do in their heads.

Based on mathematics and psychology, the AHP was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

It has particular application in group decision making, and is used around the world in a wide variety of decision situations, in fields such as government, business, industry, healthcare, and education.

Users of the AHP first decompose their decision problems into a hierarchy of more easily comprehended sub-problems, each of which can be analyzed independently. The elements of the hierarchy can relate to any aspect of the decision problem—tangible or intangible, carefully measured or roughly estimated, well- or poorly-understood—anything at all that applies to the decision at hand.

Once the hierarchy is built, the decision makers systematically evaluate its various elements by comparing them to one another two at a time, with respect to their impact on an element above them in the hierarchy. In making the comparisons, the decision makers can use concrete data about the elements, or they can use their judgments about the elements' relative meaning and importance. It is the essence of the AHP that human judgments, and not just the underlying information, can be used in performing the evaluations.

The AHP helps to convert these evaluations to numerical values that can be processed and compared over the entire range of the problem. A numerical weight or priority is derived for each element of the hierarchy, allowing diverse and often incommensurable elements to be compared to one another in a rational and consistent way. This capability distinguishes the AHP from other decision making techniques.

In the final step of the process, numerical priorities are calculated for each of the decision alternatives. These numbers represent the alternatives' relative ability to achieve the decision goal, so they allow a straightforward consideration of the various courses of action.

3.2 Restructuring Port Competitiveness Evaluation Model

3.2.1 Extraction of Detailed Assessment Properties

Before a properties test for drawing out port competitiveness factors in five continents, this study sets up the overall structure of analytic hierarchy for drawing out properties.

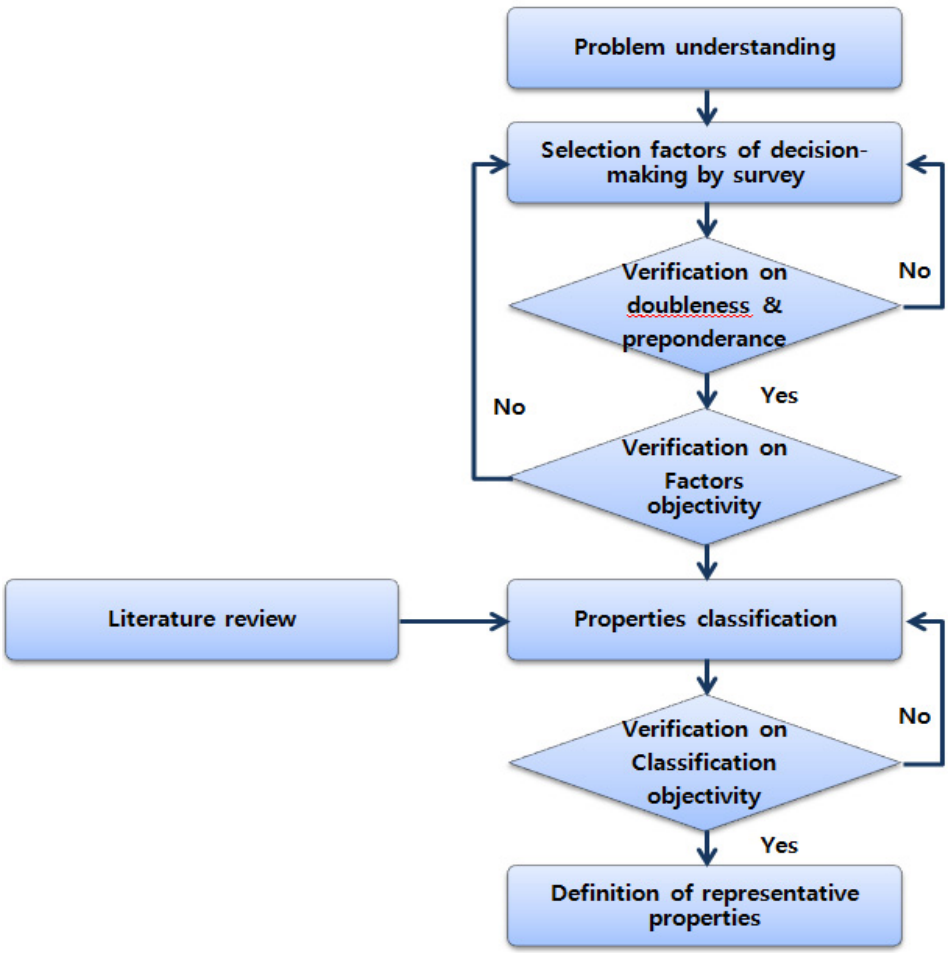

Figure 1. Research flow for the analysis on properties test

Consulting the secondary literature by analyzing the existing researches and reflecting experts' opinion, this research collected major evaluation elements of port competitiveness. And then, the research removed overlapping elements by reflecting experts'

opinion based on the results from Delphi analyses and pilot surveys, selecting 10 factors most valuable for port competitiveness evaluation. The research restructures the factors impacting port competitiveness into two hierarchical levels: The upper level and lower level.

The upper level brings the factors into two lines of properties for categorization: volume competitiveness (or customer-facing competitiveness) and investment competitiveness (or owner-facing competitiveness). Each of two categories has respectively five other lower factors totalizing ten. These ten factors consist of the lower level of port competitiveness in this research.

Table 3. Major Factors Comparison

Property Classification	Specific factors	Reference
Volume Competitiveness (Customer-facing)	Port Location	Brooks(1983,1984,1985), Chang(2006), McCalla(1994), Pearson (1980), Song(2004), UNCTAD(1992, 2004), Machow and Kanafani(2001), French(1979), McCalla(1994), Peters(1990), Starr(1994), Tongzon(2001), Wilingale(1981), Jun Il-soo(1993), Lee Seoktae · Lee Chul-young(1998), Ha Dong-woo · Kim Su-yup(1998), Yeo Ki-tae(1999), Lee Hong-Girl(2006), Jung Tae-won · Kwak Kyu-seok(2001), Busan New Port Co.(2002), Yeo Ki-tae(2004), Kwen Jae-yeon(2011)
	Port Facility	Chang(2006), Song (2004), Slack(1985), Wilingale(1981), Jun Il-soo (1993), Lee Chul-young(1998), Ha Dong-woo(1996), Ha Dong-woo · Kim Su-yup(1998), Jung Tae-won · Kwak Kyu-seok(2001), Lee Hong-Girl(2006), Busan New Port Co.(2002), Yeo Ki-tae(2004), Chang(2006), Lirn(2003, 2004), Murphy(1992), Yeo Ki-tae(1996), No Yu-jin(2007)
	Cargo Volume	Song(2004), Lu(2000), Slack(1985), UNCTAD(1992), Lee Seoktae · Lee Chul-young(1998), Yeo Ki-tae(1999), Jung Tae-won · Kwak Kyu-seok(2001) · Lee Hong-Girl(2006)
	Service Level	Tongzon(2001), Lee JiaBing (2009), UNCTAD(1992), French(1979), Peters(1990), Young Gull Kim (2009), No Yo Jin(2007), Shou JianMin (2007)
	Cost	French(1979), UNCTAD(1992), Yeo Ki-tae 외(1996) · Lee Seoktae · Lee Chul-young(1998), Yeo Ki-tae(1999), Lee Hong-Girl(2006), No Yu-jin(2007), Busan New Port Co.(2002), Brooks(1983,1984,1985), Murphy(1992), McGinnis(1979), UNCTAD(1992)
Investment Competitiveness (Owner-facing/Public Policy)	Price	Lu(2000), Tengku(1995), Starr(1994), UNCTAD(1992), Collison(1984), Suthiwartnarueput(1988), No Yu-jin(2007), Busan New Port Co.(2002), Jun Il-soo(1993), Lee Seoktae · Lee Chul-young(1998)
	Institutional Structure	French(1979), World Bank Report(2007), Wilingale(1981), Jun Il-soo(1993),
	Legal Framework	Collison(1984) · Suthiwartnarueput(1988) · Tengku(1995) · Starr(1994), Hur Yun-su(2006) · Jun Il-soo(1993) · Lee Seoktae · Lee Chul-young(1998)
	Financial Resources	Lu(2000), World Bank Report(2007), UNCTAD(1992),
	Port Reputation	Brooks(1983,1984,1985), Lu(2000), World Bank Report(2007),

3.2.2 Modeling of AHP

The successful solution of multi-criteria decision making problem by application of AHP depends on two important tasks: the task of selection of essential factors to evaluate option assessment, and, the task of systematically acceptable setting up of hierarchical structure.

Based on the existing research, and consulting AHP experts' and port experts' opinion, this research provides a list of factors finally selected (Table 4), and presents a diagram to show the overall hierarchical structure (Figure 1).

Table 4. Finally Selected Factors for Evaluation

Main items	Specific factors	Contents
Volume Competitiveness (Customer-focused)	Port Location	- Port accessibility, Deviation from main trunk routes - Land distance and connectivity to major shippers - Inter-modal link
	Port Facility	- Yard and terminal area - The size of berths - Support system-level departures and unloading of ship
	Cargo Volume	- Volume of total container cargoes - Cargo proportion of transshipment cargo
	Service Level	- Loading/discharging/cargo turn around speed of different cargo - Including port congestion(take berth speed), Night navigation available or not - PSC inspection/ Cooperation attitude/ Informatization level
	Cost	- Inland transportation cost - Cost related vessel and cargo entering - Cost for cargo handling, transfer and storage
Investment Competitiveness (Owner/Public Policy focused)	Price	- Incentives and price discounts according to the cargo
	Institutional Structure	- Government, local autonomous entity, private sectors
	Legal Framework	- Stability of port's labor
	Financial Resources	- Effective financing of port development
	Port Reputation	- Recognition and reputation of port

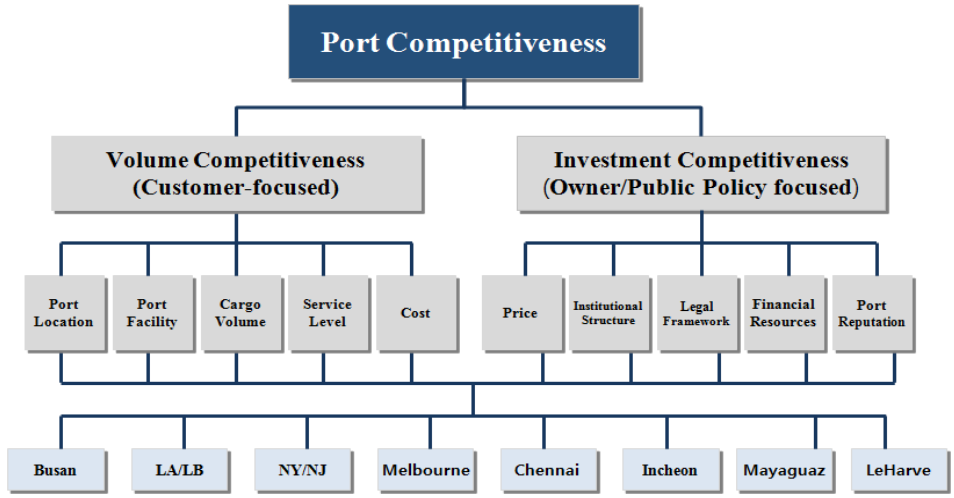

Figure 2. Restructured AHP Scheme for Port Competitiveness Evaluation

4. Result of AHP Analysis

4.1 Survey Target

The survey was conducted by using authors' human networks and literature collection. As a result, the survey selects eight ports across the five continents. Among them, Busan is the largest hub port aiming to be the hub port in the Northeast Asian region. Incheon is the largest South Korean commercial port in the Yellow Sea basin. LA/LB represents North America's west coast, as does NY/NJ in the east coast. Melbourne is well-known for Australian representative sea port. The survey's port list includes Chennai,[3] India's most modernized port, Port of Mayaguaz in Puerto Rico, and Port of LeHarve,[4] one of the most largest sea ports in France. The survey was conducted by the network of eight universities in the five continents, all of which are linked with University of Rhode Island.

The questions were given to port managers, researchers, and relevant officials representing 8 ports through the networks. A total of 28 responses were collected.

3) The Chennai (formerly called "Madras") is the capital city of the Indian state of Tamil Nadu, located on the Coromandel Coast off the Bay of Bengal.

4) The second largest sea port in trade volume in France, and the 54th largest port in total cargo volume (2011). See to "World Port Ranking 2011." (http://aapa.fies.cms-plus.com).

Table 5. Port Affiliation & Position

	Port Director	Elected Official	Port Senior Manager	Researcher	Shipper	Carrier
Busan	2	2	1	3		1
LA/LB	1	1	1		2	1
NY/NJ	1				1	
Melbourne				1		
Chennai					1	
Incheon	1		1			
Mayaguez	1			2		
LeHarve				2		
Others				2		

Based on the survey result, this research identified priority of each factors classified into the two categories: volume competitiveness (or customers' viewpoint) and investment competitiveness (or policy viewpoint), and then, evaluated competitiveness among ports.

4.2 Volume Competitiveness Aspect

As shown in the table 6, port location rises as the most important factor in terms of volume competitiveness of ports (0.282)—in other words, from the perspective of customers including cargo owners and logistics companies. The service level (0.276) and port cost (0.184) followed the next. High scores given to port location and service level in this research is similar with the result of other previous research findings.

Table 6. Volume Competitiveness: Pair-wise Comparison Matrix, Weight & Priority

	Cargo Volume	Port Facility	Port Location	Service Level	Port Cost	Weight	Ranking
Cargo Volume	1	3.33	0.445	0.95	0.885	0.087	5
Port Facility		1	0.848	2.544	2.14	0.171	4
Port Location			1	3.269	2.889	0.282	1
Service Level				1	3.056	0.276	2
Port Cost					1	0.184	3

4.3 Investment Competitiveness Aspect

In terms of investment competitiveness (or policy viewpoint), the priority of institutional structure was shown as the highest (0.246). However, it is shown that the

factor “financial resources” plays so much significant role in respondents’ determination over the port competitiveness. The score given to financial resources was 0.243—similar one given to the institutional structure (Table 7). These results make it possible to reach an interpretation that institutional structure and financial resources are equally important to the decision making of port investors.

Table 7. Investment Competitiveness: Pair-wise Comparison Matrix, weights & Priority

	Price	Institutional Structure	Legal Structure	Financial Resources	Port Reputation	Weight	Ranking
Price	1	1.245	1.49	1.43	1.434	0.163	4
Institutional Structure		1	2.158	2.178	2.184	0.246	1
Legal Structure			1	1.768	1.595	0.153	5
Financial Resources				1	2.10	0.243	2
Port Reputation					1	0.195	3

4.4 Comparison of Port Competitiveness: Volume or Customer

With the survey results, this research conducted a comparison of eight ports’ volume competitiveness by converting the results into quantitative values. Among the targeted eights, Busan ranked the top, LA/LB the second, and Incheon the third. The Busan Port obtained higher score than others in port location, service level, and port cost. However, mainly due to relative lack of detailed analysis on the comparison results in terms of port size, cargo specialization, characteristics, and competition (or dependence) relations, there seems to be some limitation in the findings’ applications.

Table 8. Overall Values of Volume Competitiveness

	Cargo Volume	Port Facility	Port Location	Service Level	Port Cost	Overall Values	Ranking
all	0.087	0.171	0.282	0.276	0.184	-	-
Busan	0.5011	0.3750	0.3099	0.2062	0.1773	0.1570	1
LA/LB	0.1415	0.1610	0.2856	0.2014	0.1930	0.0983	2
LeHarve	0.1313	0.1240	0.1112	0.1488	0.0743	0.0610	5
Incheon	0.0900	0.1508	0.0937	0.1921	0.2075	0.0834	3
NY/NJ	0.0332	0.1467	0.0520	0.1781	0.2130	0.0735	4
Chennai	0.0272	0.0202	0.0307	0.0500	0.1123	0.0281	6
Melbourne	0.0321	0.0104	0.0455	0.0103	0.0125	0.0133	8
Mayaguez	0.0435	0.0120	0.0714	0.0138	0.0104	0.0160	7

4.5 Comparison of Port Competitiveness: Investment or Policy

As the case of volume competitiveness, this research converted the survey results into quantitative values for gaining easiness of comparison in terms of "investment competitiveness." The result shows that Incheon is the top, LA/Long Beach , the second, and Busan, the third. Higher scores given to Incheon in institutional structure, financial resources, and port reputation help the Incheon Port to ascend toward the top in investment competitiveness—in other word, the competitiveness from the policy viewpoint. The port competitiveness from the policy viewpoint is likely to be realized in the future, rather than at present. In this regard, it can be said that Incheon has a relatively higher investment potential. However, as in the case of Busan in the earlier comparison of the volume competitiveness, mainly due to relative lack of detailed analysis on the comparison results in terms of port size, cargo specialization, characteristics, and competition (or dependence) relations, there seems to be similar limitation in the findings' applications.

Table 9. Overall Values of Investment Competitiveness

	Price	Institutional Structure	Legal Structure	Financial Resources	Port Reputation	Overall Values	Ranking
all	0.163	0.246	0.153	0.243	0.195	-	-
Busan	0.2002	0.2229	0.1776	0.2430	0.2271	0.1070	3
LA/LB	0.1670	0.1994	0.1742	0.2740	0.2602	0.1075	2
LeHarve	0.1114	0.0542	0.0976	0.0912	0.1017	0.0456	5
Incheon	0.1779	0.2311	0.2710	0.2610	0.1451	0.1089	1
NY/NJ	0.1776	0.1517	0.1235	0.0703	0.0909	0.0614	4
Chennai	0.0622	0.0135	0.0321	0.0122	0.0843	0.0206	8
Melbourne	0.0557	0.0271	0.0638	0.0383	0.0800	0.0269	6
Mayaguez	0.0479	0.1006	0.0604	0.0100	0.0100	0.0228	7

5. Conclusion

Hub & spoke port system is globally spreading, and in this stream, numerous sea ports make their various efforts to become a hub port in their respective regions. As the first step for realizing their goal, many ports have conducted port competitiveness researches for finding their own unique strengths and advantages. In order to overcome the limitation of data, these researches have focused on global container ports mainly due to their relative easiness to access data, or concentrated their efforts on comparisons of peer ports in neighboring countries or in the same region.

In order to make a differentiation from the existing studies, this research attempted to find common indicators of port competitiveness by conducting a comparative evaluation over the competitiveness of eight ports spread across the five continents, utilizing a bifurcated indicators—the volume competitiveness from the customers' viewpoint, and investment competitiveness from the policy viewpoint.

Through the survey targeted to port experts including researchers and port managers, the research found that, at least in terms of customer-facing competitiveness, some factors including port location, service level, and port cost—traditionally perceived as the most important—still have explanative power for port competitiveness. Meanwhile, from the perspective of policy competitiveness, institutional structure, financial resources, and port reputation play more major role in making port competitiveness.

Regarding the volume competitiveness among the targeted eight ports, Busan ranks the top, which shows that Busan has a global competitiveness—especially supported by the factors such as port location, service level, and port cost. On the other hand, in terms of the port competitiveness from policy viewpoint, Incheon ranks as the top followed by LA/LB, which implicates that the both ports have the comparative advantage in terms of growth potential in the future, and investment easiness.

When comprehensively considered, each competitiveness factors proved to have relatively equal importance, which can be interpreted in a way that, in global market's term, individual factor has similar weight of importance, and that the research result reflects particularity of the region where each port is located. Despite that, one important lesson able to be drawn from this research is that possible effective way to increase the port competitiveness is to pursue balanced approach for improvement of respective factors impacting the port competitiveness－so to speak, combination of approaches of volume-competitiveness and investment-competitiveness. In the past, most governments and port authorities have considered the tasks of port competitiveness improvements typically in terms of volume competitiveness. In the future, however, decision makers in governments need to reflect factors such as institutional structure, financial resources, and port reputation in their sea port policy in order to enhance port competitiveness more effectively.

Meanwhile, this research has a certain level flaws and limitations in the some critical points. First, the research lacks classification of targeted ports' types—for example, container-specific type and bulk-specific type. Second, more serious consideration over the representativeness of targeted ports should have been done in designing the research model. Third, there existed little discussion over competition/non-competition relations between the continents. In further researches, these points need to be considered more seriously. The expansion of targeted experts such as port operators and port users including shipping companies, cargo owners, and logistics companies armed with more specialized expertise will contribute to the improvement of objectivity of port competitiveness evaluation.

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