HUB-AND-SPOKE NETWORKS IN AIR AND MARINE TRANSPORTATION BETWEEN KOREA AND JAPAN

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Abstract: This paper analyses the hub-and-spoke networks in international air and marine transportation between Korea and Japan, as a part of the research on "prospective hub sites in Asia ". Recently, some Japanese airports have been very eager to start direct air services to Seoul, partly because of the limited capacities of international airports in Tokyo and Osaka. Many Japanese ports have been, up to now, connected to Pusan, mainly because of the cost incentives. The main purpose of this study is to examine the hub-and-spoke networks of Korean airline companies focusing on the transferring of Japanese passengers in Seoul. The container liner networks of Korean shipping lines between Pusan and Japanese ports are contemplated in comparison with the air networks between Seoul and Japanese airports.

Key Words: Hub-and-spoke systems (HASS), Hub (air)ports, Seoul, Pusan, Internationalization of Japanese local (air)ports

1. INTRODUCTION

1.1 The Backgrounds and Literature Reviews

Hub-and-spoke systems (HASS) are the efficient and competitive route networks and often adopted in the industries such as transportation and telecommunication. These are the network configurations by which carriers can use larger vehicles and thus reduce costs per unit through bundling flows on a hub. It results in lower total network costs and therefore strong competitive edges. This is called "economies of scale" or "economies of density".

These network systems have been seen for a long time in international shipping markets. In international marine transportation, any shipping lines can freely form their route networks and select their ports of call, and they can basically transport the cargoes of any nationalities without any restrictions. This is called "Freedom of Shipping". On the contrary, airline companies are strictly regulated in international aviation markets. In international air transportation, the numbers of air carriers and flights, origin or destination cities, etc. are decided in bilateral air services agreements, and therefore air carriers are not allowed to freely create HASS beyond borders. In the current years, however, some examples are observed of HASS in international aviation.

With these different backgrounds, international air and marine transportation between Korea and Japan have a lot of similarities. Korean airline companies have direct air services between Seoul and many Japanese airports on a unilateral basis, and Korean shipping lines construct dense container liner networks between Pusan and many Japanese ports on a unilateral basis, too. These situations

are rarely seen in other countries except some cases like the air networks by KLM between Amsterdam and the airports in the U.K.

There are some analytical and empirical studies on HASS or hub location problems in international transportation. Daskin, M S. (1995) did the overall researches on these topics from the standpoint of network theories. As studies of air transportation, Berechman, J. & de Wit, J. (1996) did the research on hub airport choices in EU. Schwieterman, J P. (1993) investigated the hub sites for express air cargo in Asia. O'kelly, M E. (1986) & (1987) solved hub airport locations as cost-minimizing problems. O'kelly, M E. & Miller, H J. (1994) and O'kelly, M E. (1998) analyzed and evaluated the principles of forming HASS in international aviation. Bryan, D L. & O'kelly, M E. (1999) wrote the comprehensive literature reviews on these topics, which specially focused on analytical researches. As studies of marine transportation, there is a research by Wang, Z R. (1998) on comparison of competitive edges between Port of Kobe and Port of Pusan from the viewpoint of hub functions in North-east Asia.

1.2 The Purpose and Outline of this Paper

This paper is a part of the research on "prospective hub sites in Asia". The main purpose of this study is to grasp and analyze the HASS in international air and marine transportation between Korea and Japan. It is done mainly through examining the HASS of Korean airline companies, focusing on the international passengers originating from Japan and transferring in Seoul, and through contemplating the container liner networks of Korean shipping lines in comparison with the air networks between Seoul and Japanese airports.

Chapter 2 first picks up the regulatory aspects of international air transportation and classifies hub-buildings in international aviation into three types, and second treats the historical aspects of international marine transportation especially between Korea and Japan. Chapter 3 describes the structure and characteristics of the air networks between Seoul and Japanese airports, and the strategies of Korean airline companies toward the Japanese aviation market over the past decade. Some simple analyses are done about the development of hub-building by Korean airline companies, based on the results of investigations conducted by other institutions. In Chapter 4, the structure and characteristics of the container liner networks between Pusan and Japanese ports are depicted. Also, Port of Kobe and Port of Pusan are compared in some viewpoints like the ratio of transhipment. Finally, Chapter 5 summarizes this study and considers the possibilities of Japanese airports or ports to be selected as Asian hubs.

2. THE REGULATORY AND HISTORICAL ASPECTS OF NETWORK FORMATIONS IN INTERNATIONAL TRANSPORTATION

2.1 The Development of HASS in International Air Transportation

HASS in air transportation were first adopted in the U.S. domestic aviation market. Delta Airlines first set up a hub in Atlanta in the 60's. After the enactment of the Airline Deregulation Act (ADA) in 1978, free route setting by air carriers was allowed and American Airlines and United Airlines also placed a hub in Dallas and in Chicago respectively in the early 80's. They were very successful in dealing with many passengers efficiently, and other air carriers, too, adopted HASS positively one after another.

These network systems are now world-wide and are introduced, to some degree, into international aviation markets. The basic ideas about international air transportation were settled in multinational agreements in the Chicago Conference on International Civil Aviation of 1944. In this Convention,

commercial air rights in international air transportation were formally classified into the five freedoms of the air and now four more freedoms are often additionally mentioned in many cases. Considering these current frameworks of international air transportation, the cases about hub-building outside national territories will virtually be sorted out as (1) exercising the fifth freedom, (2) enjoying the sixth freedom, (3) forming global alliances. (1) is the case where air carriers set hubs outside their own countries by exercising beyond rights when they are admitted in bilateral agreements. It is practically the one and only means in the current frameworks of international air transportation for them to set hubs beyond their own boundaries. (2) is a combination of the third and forth freedoms, which enables air carriers to transport between two other countries via their own hubs. This is an important strategy for air carriers whose international air demands in their home countries aren't large. (3) is the method of having outside hubs by means of code-sharing with allied carriers. Air carriers in the world are now converging into four groups: Star Alliance (United Airlines, Lufthansa German Airlines etc.), One World (American Airlines, British Airways etc.), Wings Alliance (Northwest Airlines, KLM etc.) and Sky Team (Air France, Delta Airlines etc.).

Following the complete liberalization of the European aviation market in 1997, Iberia tried to develop a second hub at Schiphol. Finnair is reported to be actually developing a foreign hub at Stockholm based on the fifth freedom operations. SAS and KLM are also looking at non-home airports as potential hubs (Berechman, J. & de Wit, J.(1996)). In Asia, the case was reported where Qantas Airways formed a hub in Singapore (Taneja, N K.(1988)). It is often mentioned that Japan is lacking in international airport capacity, while large airports open one after another in other Asian countries. Korean airline companies are very positive about developing Seoul-Japan routes. As a result, some of the international passengers originating from Japan are going abroad by way of Seoul. This is the typical case of HASS in international air transportation using the sixth freedom.

2.2 The Basic Freedom of Forming Networks in International Marine Transportation

Since the nineteenth century, shipping lines have been free in route formation or selection of ports of call on their networks. Also, they have had the freedom to transport the cargoes of any shippers. This is enacted in the Convention on the High Seas which was adopted in 1958 and took effect in 1962, where Freedom on the High Seas and Freedom of Navigation are guaranteed.

Concerning the Korea-Japan trades, Korean government historically had driven Japanese shipping lines out of this market through the Article 16 of Korean Low for Fostering the Maritime Industries. By this article, Korean shipping lines had been given priority in transporting some kinds of cargoes. Reflecting the objections from the Japan side, this was revised in 1995 to remove the use of Korean shipping lines with priority. Japanese shipping lines can now practically enter this market.

On the other hand, NCTAD (United Nations Conference on Trade and Development) adopted the Convention on a Code of Conduct for Liner Conferences in 1974 and this Convention came into effect in 1983. It was concluded among most of the shipping lines around the world for raising the maritime industries in the developing countries. For Korean government, this used to be the cause of shutting Japanese shipping lines out of the Korea-Japan trades.

3. THE AIR NETWORKS BETWEEN SEOUL AND JAPANESE AIRPORTS

3.1 The Structure and Characteristics of the Air Networks between Seoul and Japanese Airports

Figure 1 shows the structure of the air networks between Seoul and Japanese airports. As of 2000, there were twenty airports in Japan which had international air services. Nineteen of them were

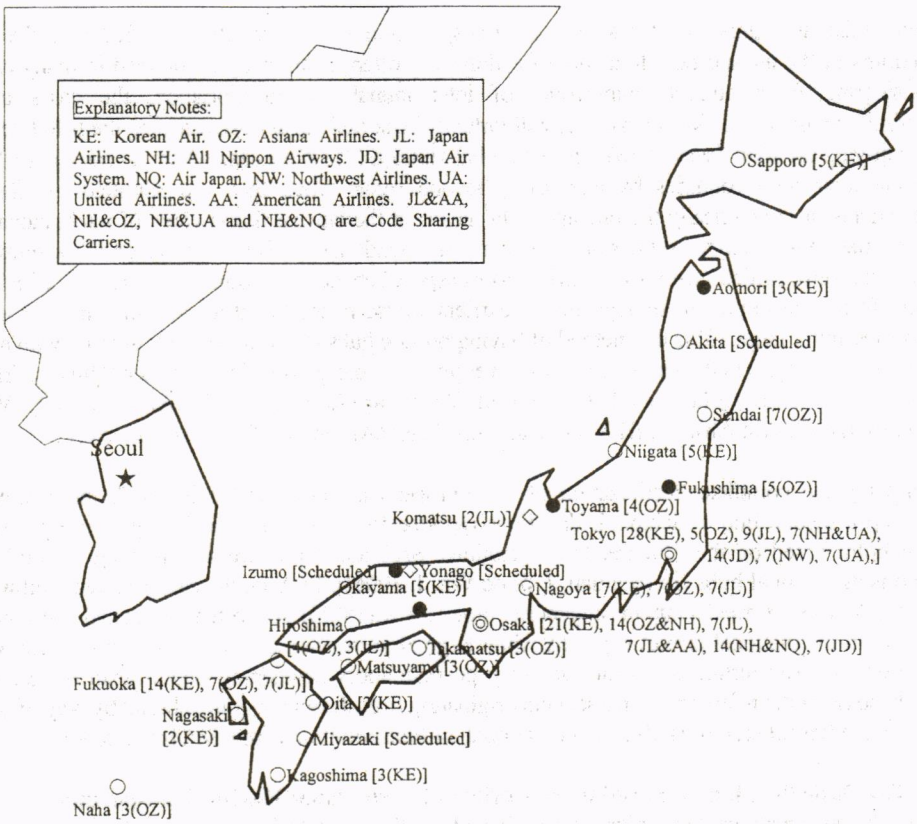


Figure 1. The Air Networks between Seoul and Japanese Airports in 2000

Note: The numbers in parentheses are total round-trip flights per week by each air carrier.
Airports connected to Seoul here are classified into four groups following the definition of the Japanese regulatory body for aviation: Class I (◎), Class II (○) and Class III (●). Airports marked with ◇ are the ones under both military and civil services.
Akita, Yonago, Izumo and Miyazaki are scheduled to be connected to Seoul in time.
Source: Compiled by author from OAG Pocket Flight Guide (Asia/Pacific), February 2001.

connected to Seoul, including the major four airports: Tokyo, Osaka, Nagoya and Fukuoka. As for the air carriers in service, both Korean Air and Asiana Airlines had flights to the above four airports. All other airports, excluding Komatsu, were connected to Seoul by either Korean Air or Asiana Airlines, and only Korean Air or Asiana Airlines was in service to these airports except Hiroshima which was also served by Japan Airlines.

Reflecting these situations, around 63% of all passengers between Seoul and those Japanese airports were carried by Korean airline companies in 1998 (Table 1). In 2000, the share of Japanese airline companies to total flights between Korea (Seoul, Pusan and Cheju) and Japan was only 28.5% (The Japanese Ministry of Transport (2000)). From this point, it can be said that Japanese airports are connected to a hub in Seoul mainly by Korean airline companies.

3.2 The Strategies of Korean Airline Companies toward Japanese Aviation Market over the Past Decade

Figure 2 describes the changes in the numbers of Japanese airports connected to Seoul and of flights per week over the past decade. In 1989, only the major four airports, plus Sapporo, Niigata and

Table 1. The Passengers Carried on Scheduled Services between Seoul and Japanese Airports in 1998

City	From Seoul	To Seoul	Total	Korean
Sapporo	42,897	42,911	85,808	100%
Aomori	13,818	13,797	27,615	100%
Sendai	50,112	49,302	99,414	100%
Tokyo	1,051,305	1,022,732	2,074,037	51%
Niigata	23,697	23,656	47,353	100%
Toyama	18,575	18,713	37,288	100%
Komatsu	16,507	16,683	33,190	0%
Nagoya	264,143	256,768	520,911	74%
Osaka	575,376	553,509	1,128,885	62%
Okayama	37,867	37,628	75,495	100%
Hiroshima	44,461	43,826	88,287	48%
Takamatsu	15,586	15,767	31,353	100%
Matsuyama	15,560	15,330	30,890	100%
Fukuoka	211,866	218,884	430,750	70%
Oita	8,631	8,393	17,024	100%
Kagoshima	23,946	24,221	48,167	100%
Naha	16,817	17,335	34,152	100%
Total	2,431,164	2,379,455	4,810,619	63%

Note: "Korean" means Korean Air and Asiana Airlines.
Source: Compiled by author from Traffic by Flight Stage, ICAO (1998).

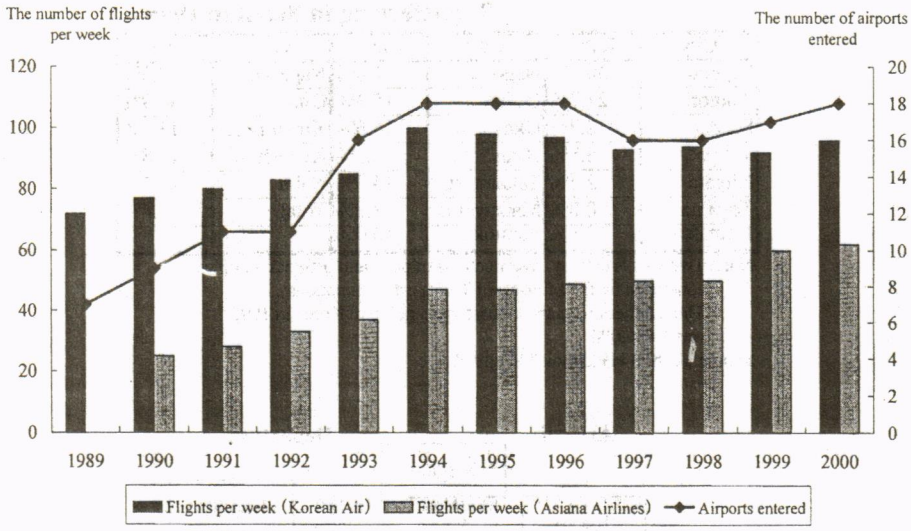


Figure 2. The Changes in the Numbers of Airports and Flights on Routes to Seoul by Korean Airline Companies (1989-2000)
Note: Annual schedules in winter time.
Source: Compiled by author from annual reports on aeronautic statistics (annual editions).

Nagasaki were served by Korean Air. This number increased to eighteen in 1994. In 1999, seventeen airports were connected to Seoul by Korean airline companies with the new route to Fukushima, after the cancellation of operations to Nagasaki and Kumamoto in 1997. The route to Nagasaki was opened again in 2000. In addition, Akita, Yonago, Izumo and Miyazaki are scheduled to start operations to Seoul in no time. As to the number of flights, both Korean Air and Asiana Airlines gradually increased their flights. It was, in total, more than doubled from 1989 (72 flights per week) to 2000 (158 flights per week).

The backgrounds of these changes are as followed: First, the entries from Japanese local airports to the international airports in Tokyo and Osaka are limited because of the lack of their capacities, and

even if they are admitted, it is very inconvenient to transfer from domestic flights to international ones. Second, the linkages between Japanese local economy and Korean economy become stronger and stronger these days. Third, Korean airline companies are putting more stress on the Japanese aviation market. The Japanese Ministry of Transport, which is the regulatory body for aviation, temporarily has allowed Korean airline companies to extend their routes to Japan on a unilateral basis. It is also necessary to point out that the direct flights from local airports to Seoul can save a lot of time and costs on the user's side.

3.3 The Spill-over of International Air Passengers Originating from Japan to Seoul

As mentioned above, many Japanese airports are connected to Seoul mainly by Korean airline companies. The report of investigations, conducted by the Japanese Ministry of Transport in 1995, on the fraction of Japanese passengers transferring in Seoul is shown in Table 2. This ratio means how many Japanese passengers on the Seoul routes passed Seoul. According to Table 2, it can be said that quite a few passengers including those from Tokyo and Osaka went on to other countries via Seoul. These passengers used the HASS of Korean airline companies like that shown in Figure 3. That is, Korean Air takes full advantages of the sixth freedom and captures some of the international passengers in Japan.

Table 2. The Ratio of Japanese Passengers Transferring in Seoul in 1995

City	Ratio	City	Ratio	City	Ratio
Sapporo	30.1%	Nagoya	6.6%	Nagasaki	4.5%
Aomori	21.7%	Osaka	15.3%	Oita	47.9%
Sendai	2.7%	Okayama	15.6%	Kumamoto	13.7%
Tokyo	6.8%	Hiroshima	4.9%	Kagoshima	17.8%
Niigata	2.5%	Takamatsu	13.3%	Naha	41.1%
Toyama	0.0%	Matsuyama	3.1%	Total	10.4%
Komatsu	2.9%	Fukuoka	13.0%		

Note: Two weeks data by investigations of peak and off-peak samples, conducted by the Ministry of Transport (Estimations).
The number of Japanese passengers going to Korea in 1995 was 1,630,000.
Source: Airport Handbook '98, pp 508.

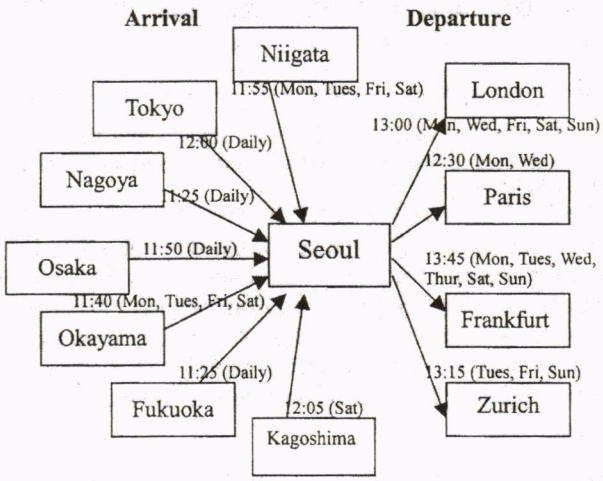


Figure 3. The HASS of Korean Air in Seoul (Winter, 2000)
Source: Compiled by author from OAG Pocket Flight Guide (Asia/Pacific), February 2001.

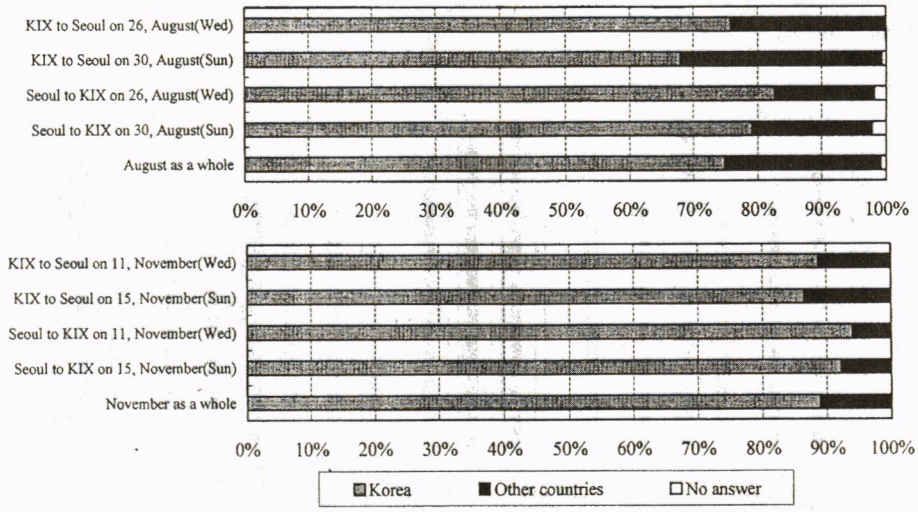


Figure 4. The Result of Investigations on Transferring of Passengers in Seoul Originating from or Arriving at KIX in 1998

Note: Interview days:
First time: 26 August (Wed), 1998-weekday in peak season-
Second time: 30 August (Sun), 1998-weekend in peak season-
Third time: 11 November (Wed), 1998-weekday in off-peak season-
Fourth time: 15 November (Sun), 1998-weekend in off-peak season-
Method of investigations:
Interviews of departing passengers and 2,721 of them answered.
Questionnaires to arriving passengers and around 12%of them (877) sent it back.
Source: New Airport Review, No.250, p80, Figure4.

There is another report of investigations on the transferring of passengers on the Seoul routes departing from or arriving at Kansai International Airport (KIX). This was conducted by KIX over the four days in 1998: a weekday and a weekend in peak season, a weekday and a weekend in off-peak season. Figure 4 indicates that about 24% of total passengers, on average, transferred in Seoul to another international flight on a weekday in peak season, about 31% on a weekend in peak season. In off-peak season, the percentage declined to 11~13%. When all passengers departing from or arriving at KIX were considered, that was about 24% in peak season and about 11% in off-peak season. As for the destinations or origins of the passengers transferring in Seoul, Honolulu was No.1 in both peak and off-peak seasons, followed by Paris, Los Angeles, London, Sydney, San Francisco, New York and Tashkent.

3.4 The Analyses for the Performances of Korean Airline Companies on the Routes to Japan

Here, some simple analyses are done in terms of load factors to judge the performances of Korean airline companies. Figure 5 describes the load factors for each route between Seoul and Japanese airports and for each air carrier in 1998. In general, Korean Air and Asiana Airlines enjoyed high load factors especially on the routes to/from the major four airports except Fukuoka, where they had severe competitions with Japanese airline companies. Those on the routes to/from other local airports were also rather high. On the contrary, low load factors were observed as for the routes of Japanese airline companies to/from the airports except Tokyo and Osaka. The load factors of Korean Air, Asiana Airlines and Japanese airline companies were, on average, 79%, 72% and 76% respectively.

HASS are the network configurations by which air carriers can use larger aircrafts and thus reduce passenger-kilometer costs through bundling flows on a hub. It results in lower total network costs and therefore strong competitive edges. For example, when Korean Air bundles some of the flows

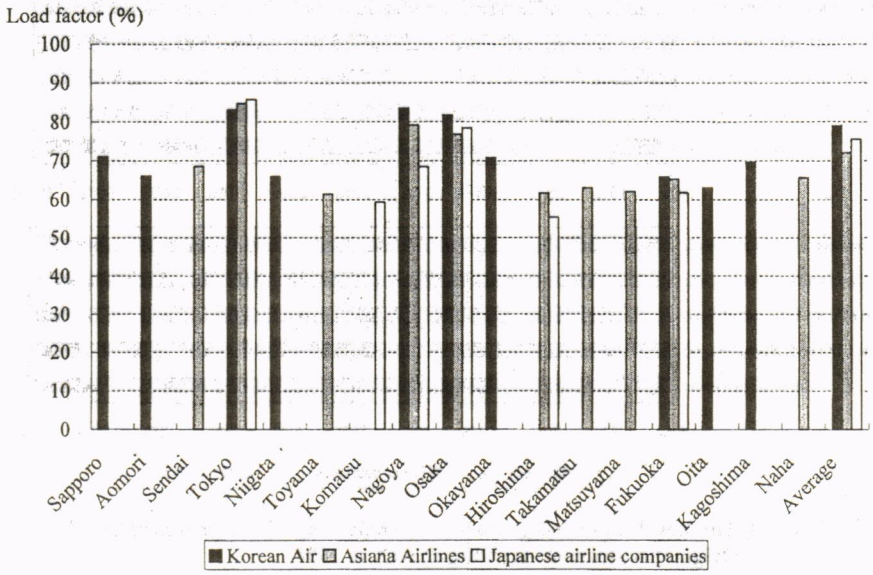


Figure 5.The Load Factors for Each Route between Seoul and Japanese Airports and for Each Air Carrier in 1998

Note: Load factor is a rate of occupied seats to offered seats.
Japanese airline companies are Japan Airlines, All Nippon Airways and Japan Air System.
Source: Compiled by author from Traffic by Flight Stage, ICAO (1998).

between Japan and the U.S. or between Japan and Europe in Seoul, it can benefit from its U.S. or European routes thanks to "economies of scale (or density)", even if the routes between Seoul and Japanese airports are at no commercial profits. In fact, the indexes of Korean Air on Seoul-European city routes are higher than those of its competitors because of the influx of passengers from its Japan flights. Korean Air has more flights and passengers carried than its competing air carriers. The case is also same with their load factors. It can be said that the development of HASS by Korean Air toward the Japanese aviation market contributes to these good performances.

4. THE CONTAINER LINER NETWORKS BETWEEN PUSAN AND JAPANESE PORTS

4.1 The Structure and Characteristics of Container Liner Networks between Pusan and Japanese Ports

Figure 6 describes the structure of the container liner networks between Pusan and Japanese ports. As of 2000, there were fifty-five ports dealing with international containers in Japan, among which fifty-three ports were connected to Pusan with regular containership services. They consisted of eight major ports (Tokyo, Yokohama, Shimizu, Nagoya, Yokkaichi, Osaka, Kobe and Moji), which is generally defined as ports treating more than around three hundred thousand TEU per year, and forty-five local ports.

As for the shipping lines in service, almost all of them were Korean except two Japanese shipping lines and some third-country shipping lines: Kampu Ferry (Japan), Camellia Line (Japan), APL (Singapore/U.S.A.), Maersk Sealand (Denmark) etc. As shown in Table 3, Korea-Japan regular containership routes are now formed mainly by Korean shipping lines.

On the Korea-Japan trades, Korea Nearseas Freight Conference (KNFC) started in 1991 to avoid

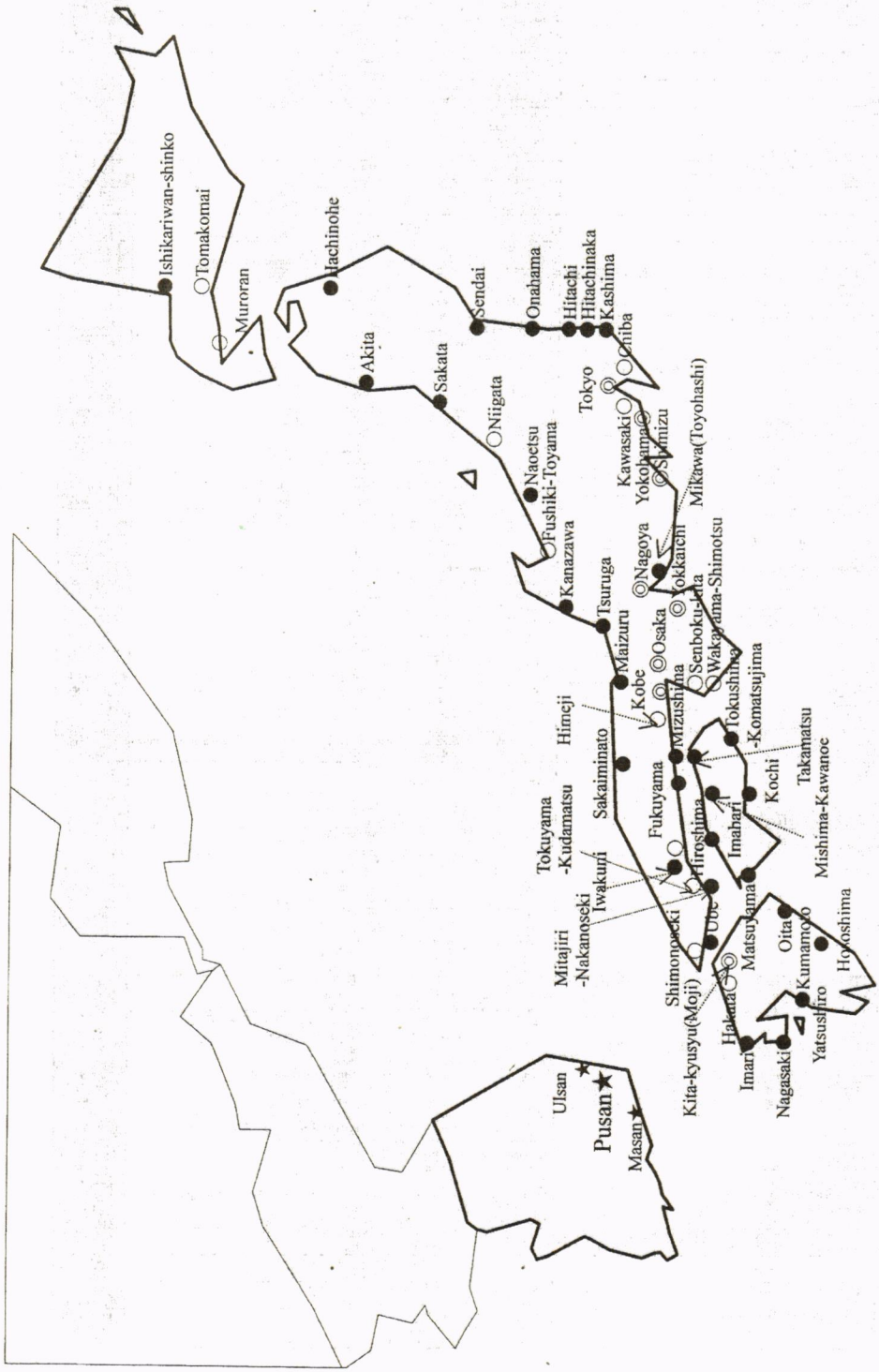


Figure 6. The Container Liner Networks between Pusan and Japanese Ports in 2000

Note: Ports marked with ◎ are Eight Major Ports, and with ○ and ● are Special Important Ports and Important Ports respectively.
Source: Compiled by author from International Transportation Handbook 2001 etc.

Table 3. The Details of Container Liner Networks between Pusan and Japanese Ports in 2000

Port	Shipping Line	Ports of Call	Frequency
Ishikariwan-shinko	**Heung-A**/Nam Sung	Pusan－Ishikariwan-shinko－Tomakomai－Pusan	1 per week
	Pan Ocean/KMTC	Pusan－Ishikariwan-shinko－Sakata－Pusan	1 per week
Tomakomai	**Heung-A**/Nam Sung	Pusan－Ishikariwan-shinko－Tomakomai－Pusan	1 per week
	KMTC	Pusan－Tomakomai－Muroran－Ulsan－Pusan	1 per week
	KMTC/CK Line/Nam Sung/Pan Ocean	Pusan－Tomakomai－Muroran－Ulsan－Pusan	1 per week
	Nam Sung/CK Line/Heung-A/KMTC/Pan Ocean	Pusan－Tomakomai－Hachinohe－Pusan	1 per week
	Pan Ocean/Sinokor	Pusan－Tomakomai－Akita－Pusan	1 per week
Muroran	KMTC	Pusan－Tomakomai－Muroran－Ulsan－Pusan	1 per week
	KMTC/CK Line/Nam Sung/Pan Ocean	Pusan－Tomakomai－Muroran－Ulsan－Pusan	1 per week
Hachinohe	**Nam Sung**/CK Line/Heung-A/KMTC/Pan Ocean	Pusan－Tomakomai－Hachinohe－Pusan	1 per week
	Nam Sung	Pusan－Hachinohe－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
Sendai	Nam Sung	Pusan－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
	Nam Sung	Pusan－Hachinohe－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
Akita	Heung-A	Pusan－Toyama－Niigata－Akita－Pusan	1 per week
	Heung-A	Pusan－Niigata－Akita－Pusan	1 per week
	Pan Ocean/Sinokor	Pusan－Tomakomai－Akita－Pusan	1 per week
	Pan Ocean/CK Line/KMTC/Nam Sung/Sinokor	Pusan－Niigata－Akita－Naoetsu－Pusan	1 per week
Sakata	**KMTC**/CK Line/Nam Sung/Pan Ocean	Pusan－Ulsan－Niigata－Naoetsu－Sakata－Pusan	1 per week
	Pan Ocean/KMTC	Pusan－Ishikariwan-shinko－Sakata－Pusan	1 per week
Onahama	Nam Sung	Pusan－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
	Nam Sung	Pusan－Hachinohe－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
Hitachinaka	Nam Sung	Pusan－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
	Nam Sung	Pusan－Hachinohe－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
Kashima	Nam Sung	Pusan－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
	Nam Sung	Pusan－Hachinohe－Sendai－Onahama－Kashima－Hitachinaka－Pusan	1 per week
Tokyo	**Cho Yang**/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Continental	Pusan－Chiba－Tokyo－Yokohama－Nagoya－Ulsan－Pusan	1 per week
	CK Line/KMTC	Pusan－Tokyo－Yokohama－Nagoya－Pusan	1 per week
	Dong Jin/Cho Yang/Dongnama/Dong Young/Heung-A/Pan Continental	Pusan－Tokyo－Yokohama－Ulsan－Pusan	1 per week
	Dong Young/Cho Yang/Dong Jin/Dongnama/Heung-A/Pan Continental	Pusan－Tokyo－Yokohama－Nagoya－Pusan	1 per week
	Dongnama	Tokyo－Yokohama－Osaka－Pusan (Southeast Asia)	1 per week
	Hanjin	Tokyo－Osaka－Pusan (North America)	1 per month
	Hanjin	Tokyo－Yokohama－Osaka－Pusan (Southeast Asia)	1 per month
	Heung-A/Cho Yang/Dongnama/Dong Jin/Dong Young/Hanjin/Pan Contin	Pusan－Shimizu－Tokyo－Nagoya－Yokkaichi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	Maersk Sealand	Tokyo－Osaka－Nagoya－Pusan (East Australia Service)	1 per month
	Nam Sung/Pan Ocean/Sinokor	Pusan－Tokyo－Yokohama－Kawasaki－Nagoya－Masan－Pusan	1 per week
	Pan Continental/Cho Yang/Dong Jin/Dongnama/Dong Young/Heung-A	Pusan－Tokyo－Nagoya－Yokkaichi－Pusan	1 per week
	Pan Ocean/Hanjin/Nam Sung/Sinokor	Pusan－Tokyo－Yokohama－Shimizu－Nagoya－Pusan－Masan－Kwangyang－Pusan	1 per week
	Sinokor/Nam Sung/Pan Ocean	Pusan－Tokyo－Yokohama－Nagoya－Kwangyang－Pusan	1 per week
Chiba	**Cho Yang**/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Continental	Pusan－Chiba－Tokyo－Yokohama－Nagoya－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
Kawasaki	**Nam Sung**/Pan Ocean/Sinokor	Pusan－Tokyo－Yokohama－Kawasaki－Nagoya－Masan－Pusan	1 per week
Yokohama	APL	Yokohama－Pusan (North America)	1 per week
	Cho Yang/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Continental	Pusan－Chiba－Tokyo－Yokohama－Nagoya－Ulsan－Pusan	1 per week
	CK Line/KMTC	Pusan－Tokyo－Yokohama－Nagoya－Pusan	1 per week
	CK Line/Dong Jin/Cho Yang/Heung-A/Nam Sung	Pusan－Yokohama－Pusan－Nagoya－Pusan－Yokohama－Pusan	1 per week
	Cosco	Yokohama－Osaka－Pusan (Australia)	1 per week
	Cosco	Yokohama－Kobe－Pusan (New Zealand)	1 per week
	Dong Jin/Cho Yang/Dongnama/Dong Young/Heung-A/Pan Continental	Pusan－Tokyo－Yokohama－Ulsan－Pusan	1 per week
	Dong Young/Cho Yang/Dongjin/Dongnama/Heung-A/Pan Continental	Pusan－Tokyo－Yokohama－Nagoya－Pusan	1 per week
	Dongnama	Tokyo－Yokohama－Osaka－Pusan (Southeast Asia)	1 per week
	Hanjin	Tokyo－Yokohama－Osaka－Pusan (Southeast Asia)	1 per month
	Hyundai	Yokohama－Pusan (North America)	1 per month
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	Maersk Sealand	Yokohama－Nagoya－Pusan (TP-2)	1 per month
	Nam Sung/Pan Ocean/Sinokor	Pusan－Tokyo－Yokohama－Kawasaki－Nagoya－Masan－Pusan	1 per week
	Nam Sung/CK Line/Cho Yang/Dong Jin/Heung-A	Pusan－Yokohama－Pusan	1 per week
	Pan Ocean/Hanjin/Nam Sung/Sinokor	Pusan－Tokyo－Yokohama－Shimizu－Nagoya－Pusan－Masan－Kwangyang－Pusan	1 per week
	Sinokor/Nam Sung/Pan Ocean	Pusan－Tokyo－Yokohama－Nagoya－Kwangyang－Pusan	1 per week
Niigata	Heung-A	Pusan－Toyama－Niigata－Akita－Pusan	1 per week
	Heung-A	Pusan－Niigata－Akita－Pusan	1 per week
	KMTC	Pusan－Kanazawa－Niigata－Toyama－Sakaiminato－Pusan	1 per week
	KMTC/CK Line/Nam Sung/Pan Ocean	Pusan－Ulsan－Niigata－Naoetsu－Sakata－Pusan	1 per week
	Pan Ocean/CK Line/KMTC/Nam Sung/Sinokor	Pusan－Niigata－Akita－Naoetsu－Pusan	1 per week
Naoetsu	**KMTC**/CK Line/Nam Sung/Pan Ocean	Pusan－Ulsan－Niigata－Naoetsu－Sakata－Pusan	1 per week
	Pan Ocean/CK Line/KMTC/Nam Sung/Sinokor	Pusan－Niigata－Akita－Naoetsu－Pusan	1 per week
Fushiki-Toyama	Heung-A	Pusan－Toyama－Niigata－Akita－Pusan	1 per week
	Heung-A	Pusan－Toyama－Kanazawa－Tsuruga－Maizuru－Pusan	1 per week
	KMTC	Pusan－Kanazawa－Niigata－Toyama－Sakaiminato－Pusan	1 per week
	KMTC	Pusan－Maizuru－Tsuruga－Kanazawa－Toyama－Sakaiminato－Pusan	1 per week
Kanazawa	Heung-A	Pusan－Toyama－Kanazawa－Tsuruga－Maizuru－Pusan	1 per week
	KMTC	Pusan－Kanazawa－Niigata－Toyama－Sakaiminato－Pusan	1 per week
	KMTC	Pusan－Maizuru－Tsuruga－Kanazawa－Toyama－Sakaiminato－Pusan	1 per week
Tsuruga	Heung-A	Pusan－Toyama－Kanazawa－Tsuruga－Maizuru－Pusan	1 per week
	KMTC	Pusan－Maizuru－Tsuruga－Kanazawa－Toyama－Sakaiminato－Pusan	1 per week
Shimizu	**Heung-A**/Cho Yang/Dongnama/Dong Jin/Dong Young/Hanjin/Pan Contin	Pusan－Shimizu－Tokyo－Nagoya－Yokkaichi－Ulsan－Pusan	1 per week
	Heung-A/Cho Yang/Dongnama/Dongjin/Dong Young/Pan Continental	Pusan－Osaka－Kobe－Shimizu－Ulsan－Pusan	1 per week
	Pan Ocean/Hanjin/Nam Sung/Sinokor	Pusan－Tokyo－Yokohama－Shimizu－Nagoya－Pusan－Masan－Kwangyang－Pusan	1 per week
Toyohashi	**KMTC**/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
Nagoya	**Cho Yang**/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Continental	Pusan－Chiba－Tokyo－Yokohama－Nagoya－Ulsan－Pusan	1 per week
	CK Line/KMTC	Pusan－Tokyo－Yokohama－Nagoya－Pusan	1 per week
	CK Line/Dong Jin/Cho Yang/Heung-A/Nam Sung	Pusan－Yokohama－Pusan－Nagoya－Pusan－Yokohama－Pusan	1 per week
	Dong Young/Cho Yang/Dong Jin/Dongnama/Heung-A/Pan Continental	Pusan－Tokyo－Yokohama－Nagoya－Pusan	1 per week
	Heung-A/Cho Yang/Dongnama/Dong Jin/Dong Young/Hanjin/Pan Contin	Pusan－Shimizu－Tokyo－Nagoya－Yokkaichi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	KMTC/CK Line	Pusan－Tokyo－Chiba－Yokohama－Nagoya－Toyohashi－Ulsan－Pusan	1 per week
	Maersk Sealand	Tokyo－Osaka－Nagoya－Pusan (East Australia Service)	1 per month
	Maersk Sealand	Yokohama－Nagoya－Pusan (TP-2)	1 per month
	Nam Sung/Pan Ocean/Sinokor	Pusan－Tokyo－Yokohama－Kawasaki－Nagoya－Masan－Pusan	1 per week
	Nam Sung/CK Line/Cho Yang/Dong Jin/Heung-A	Pusan－Nagoya－Pusan	1 per week
	Pan Ocean/Hanjin/Nam Sung/Sinokor	Pusan－Tokyo－Yokohama－Shimizu－Nagoya－Pusan－Masan－Kwangyang－Pusan	1 per week
	Pan Continental/Cho Yang/Dong Jin/Dongnama/Dong Young/Heung-A	Pusan－Tokyo－Nagoya－Yokkaichi－Pusan	1 per week
	Sinokor/Nam Sung/Pan Ocean	Pusan－Tokyo－Yokohama－Nagoya－Kwangyang－Pusan	1 per week
Yokkaichi	**Heung-A**/Cho Yang/Dongnama/Dong Jin/Dong Young/Hanjin/Pan Contin	Pusan－Shimizu－Tokyo－Nagoya－Yokkaichi－Ulsan－Pusan	1 per week
	Pan Continental/Cho Yang/Dong Jin/Dongnama/Dong Young/Heung-A	Pusan－Tokyo－Nagoya－Yokkaichi－Pusan	1 per week
Maizuru	Heung-A	Pusan－Toyama－Kanazawa－Tsuruga－Maizuru－Pusan	1 per week
	KMTC	Pusan－Maizuru－Tsuruga－Kanazawa－Toyama－Sakaiminato－Pusan	1 per week
Osaka	**Cho Yang**/CK Line/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Cont	Pusan－Osaka－Kobe－Wakayama－Oita－Pusan	1 per week
	CK Line/KMTC	Pusan－Kobe－Osaka－Mizushima－Pusan	6 per month
	CK Line/Cho Yang/Dong Jin/Nam Sung	Pusan－Kobe－Osaka－Pusan	1 per week
	CK Line/Cho Yang/Dong Jin/Nam Sung	Pusan－Kobe－Osaka－Pusan	1 per week
	Cosco	Yokohama－Osaka－Pusan (Australia)	1 per week

Osaka	**Dong Jin**/CK Line/Cho Yang/Heung-A	Pusan—Osaka—Kobe—Pusan	1 per week
	Dong Jin/CK Line/Cho Yang/Heung-A/Nam Sung	Pusan—Osaka—Kobe—Pusan	1 per week
	Dongnama	Tokyo—Yokohama—Osaka—Pusan (Southeast Asia)	1 per week
	Dongnama/Cho Yang/Dong Jin/Dong Young/Heung-A/Pan Continental	Pusan—Osaka—Kobe—Ulsan—Pusan	1 per week
	Hanjin	Tokyo—Yokohama—Osaka—Pusan (North America)	1 per month
	Hanjin	Tokyo—Yokohama—Osaka—Pusan (Southeast Asia)	1 per month
	Heung-A/Cho Yang/Dongnama/Dong Jin/Dong Young/Pan Continental	Pusan—Osaka—Kobe—Shimizu—Ulsan—Pusan	1 per week
	Hyundai	Osaka—Kobe—Hakata—Pusan (Southeast Asia)	1 per month
	KMTC/CK Line	Pusan—Kobe—Osaka—Mizushima—Ulsan—Pusan	6 per month
	Maersk Sealand	Tokyo—Osaka—Nagoya—Pusan (East Australia Service)	1 per month
	Nam Sung/Cho Yang	Pusan—Osaka—Kobe—Ube—Pusan	1 per week
	Nam Sung/Pan Ocean/Sinokor	Pusan—Osaka—Kobe—Masan—Kwangyang—Pusan	6 per month
	Pan Ocean/Nam Sung/Sinokor	Pusan—Osaka—Kobe—Masan—Kwangyang—Pusan	6 per month
Kobe	**Cho Yang**/CK Line/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Cont	Pusan—Osaka—Kobe—Wakayama—Oita—Pusan	1 per week
	CK Line/KMTC	Pusan—Kobe—Osaka—Mizushima—Pusan	6 per month
	CK Line/Cho Yang/Dong Jin/Nam Sung	Pusan—Kobe—Osaka—Pusan	1 per week
	CK Line/Cho Yang/Dong Jin/Nam Sung	Pusan—Kobe—Osaka—Pusan	1 per week
	Cosco	Yokohama—Kobe—Pusan (New Zealand)	1 per week
	Dong Jin/CK Line/Cho Yang/Heung-A	Pusan—Osaka—Kobe—Pusan	1 per week
	Dong Jin/CK Line/Cho Yang/Heung-A/Nam Sung	Pusan—Osaka—Kobe—Pusan	1 per week
	Dongnama/Cho Yang/Dong Jin/Dong Young/Heung-A/Pan Continental	Pusan—Osaka—Kobe—Ulsan—Pusan	1 per week
	Heung-A/Cho Yang/Dongnama/Dong Jin/Dong Young/Pan Continental	Pusan—Osaka—Kobe—Shimizu—Ulsan—Pusan	1 per week
	Hyundai	Osaka—Kobe—Hakata—Pusan (Southeast Asia)	1 per month
	KMTC/CK Line	Pusan—Kobe—Osaka—Mizushima—Ulsan—Pusan	6 per month
	Nam Sung/Cho Yang	Pusan—Osaka—Kobe—Ube—Pusan	1 per week
	Nam Sung/Pan Ocean/Sinokor	Pusan—Osaka—Kobe—Masan—Kwangyang—Pusan	6 per month
	Pan Ocean/Nam Sung/Sinokor	Pusan—Osaka—Kobe—Masan—Kwangyang—Pusan	6 per month
Wakayama-Shimoda	**Cho Yang**/CK Line/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Cont	Pusan—Osaka—Kobe—Wakayama—Oita—Pusan	1 per week
Himeji	Pan Ocean	Pusan—Himeji—Kwangyang—Pusan	1 per week
Mizushima	**CK Line**/KMTC	Pusan—Kobe—Osaka—Mizushima—Pusan	6 per month
	Heung-A	Pusan—Mizushima—Takamatsu—Tokushima—Pusan—Mizushima—Takamatsu—Pusan	1 per week
	KMTC/CK Line	Pusan—Kobe—Osaka—Mizushima—Ulsan—Pusan	6 per month
Fukuyama	KMTC	Pusan—Tokushima—Takamatsu—Fukuyama—Hiroshima—Pusan	1 per week
	KMTC	Pusan—Fukuyama—Takamatsu—Tokushima—Hiroshima—Ulsan—Pusan	1 per week
Hiroshima	Camellia Line	Pusan—Tokuyama—Nakanoseki—Hiroshima—Pusan—Tokuyama—Hiroshima—Pusan	1 per week
	Cho Yang	Pusan—Matsuyama—Imabari—Nakanoseki—Hiroshima—Tokuyama—Pusan	1 per week
	Cho Yang	Pusan—Matsuyama—Imabari—Iyomishima—Hiroshima—Pusan	1 per week
	Heung-A	Pusan—Imari—Hiroshima—Pusan—Imari—Hiroshima—Pusan	1 per week
	KMTC	Pusan—Tokushima—Takamatsu—Fukuyama—Hiroshima—Pusan	1 per week
	KMTC	Pusan—Fukuyama—Takamatsu—Tokushima—Hiroshima—Ulsan—Pusan	1 per week
Iwakuni	Nam Sung	Pusan—Nakanoseki—Iwakuni—Oita—Pusan—Iwakuni—Oita—Pusan	1 per week
Tokuyama-Kudamatsu	Camellia Line	Pusan—Tokuyama—Nakanoseki—Hiroshima—Pusan—Tokuyama—Hiroshima—Pusan	1 per week
	Cho Yang	Pusan—Matsuyama—Imabari—Nakanoseki—Hiroshima—Tokuyama—Pusan	1 per week
	Dong Jin/CK Line/Heung-A/Nam Sung	Pusan—Tokuyama—Pusan—Moji—Tokuyama—Pusan—Moji—Tokuyama—Pusan	1 per week
Mitajiri-Nakanoseki	Camellia Line	Pusan—Tokuyama—Nakanoseki—Hiroshima—Pusan—Tokuyama—Hiroshima—Pusan	1 per week
	Cho Yang	Pusan—Matsuyama—Imabari—Nakanoseki—Hiroshima—Tokuyama—Pusan	1 per week
	Nam Sung	Pusan—Shimonoseki—Pusan—Shimonoseki—Nakanoseki—Hososhima—Pusan	1 per week
	Nam Sung	Pusan—Nakanoseki—Iwakuni—Oita—Pusan—Iwakuni—Oita—Pusan	1 per week
Ube	**Nam Sung**/Cho Yang	Pusan—Osaka—Kobe—Ube—Pusan	1 per week
Shimonoseki	Kampu Ferry	Pusan—Shimonoseki—Pusan	7 per week
	Nam Sung	Pusan—Shimonoseki—Hakata—Pusan	1 per week
	Nam Sung	Pusan—Shimonoseki—Pusan—Shimonoseki—Nakanoseki—Hososhima—Pusan	1 per week
Sakaiminato	KMTC	Pusan—Kanazawa—Niigata—Toyama—Sakaiminato—Pusan	1 per week
	KMTC	Pusan—Maizuru—Tsuruga—Kanazawa—Toyama—Sakaiminato—Pusan	1 per week
Takamatsu	Heung-A	Pusan—Mizushima—Takamatsu—Tokushima—Pusan—Mizushima—Takamatsu—Pusan	1 per week
	KMTC	Pusan—Tokushima—Takamatsu—Fukuyama—Hiroshima—Pusan	1 per week
	KMTC	Pusan—Fukuyama—Takamatsu—Tokushima—Hiroshima—Ulsan—Pusan	1 per week
Tokushima-Komatsujima	Heung-A	Pusan—Mizushima—Takamatsu—Tokushima—Pusan—Mizushima—Takamatsu—Pusan	1 per week
	Heung-A	Pusan—Matsuyama—Imabari—Kochi—Pusan—Matsuyama—Imabari—Tokushima—Pusan	1 per week
	KMTC	Pusan—Fukuyama—Takamatsu—Tokushima—Hiroshima—Ulsan—Pusan	1 per week
	KMTC	Pusan—Tokushima—Takamatsu—Fukuyama—Hiroshima—Pusan	1 per week
Iyomishima-Kawano	Cho Yang	Pusan—Matsuyama—Imabari—Iyomishima—Hiroshima—Pusan	1 per week
Imabari	Cho Yang	Pusan—Matsuyama—Imabari—Nakanoseki—Hiroshima—Tokuyama—Pusan	1 per week
	Cho Yang	Pusan—Matsuyama—Imabari—Iyomishima—Hiroshima—Pusan	1 per week
	Heung-A	Pusan—Matsuyama—Imabari—Kochi—Pusan—Matsuyama—Imabari—Tokushima—Pusan	1 per week
Matsuyama	Cho Yang	Pusan—Matsuyama—Imabari—Nakanoseki—Hiroshima—Tokuyama—Pusan	1 per week
	Cho Yang	Pusan—Matsuyama—Imabari—Iyomishima—Hiroshima—Pusan	1 per week
	Heung-A	Pusan—Matsuyama—Imabari—Kochi—Pusan—Matsuyama—Imabari—Tokushima—Pusan	1 per week
Kochi	Heung-A	Pusan—Matsuyama—Imabari—Kochi—Pusan—Matsuyama—Imabari—Tokushima—Pusan	1 per week
Moji	**CK Line**/Dong Jin/KMTC/Nam Sung	Pusan—Moji—Pusan	3 per week
	Dong Jin/CK Line/Heung-A/Nam Sung	Pusan—Tokuyama—Pusan—Moji—Tokuyama—Pusan—Moji—Tokuyama—Pusan	1 per week
	Heung-A/Dong Jin	Pusan—Moji—Hakata—Pusan—Moji—Hakata—Pusan—Moji—Hakata—Yatsushiro—P	1 per week
	Jang Yung/Nam Sung/Pan Ocean	Moji—Pusan—Moji	2 per week
	Jang Yung/Nam Sung/Pan Ocean	Moji—Pusan—Moji—Pusan—Moji—Hososhima—Pusan—Moji	1 per week
Hakata	Camellia Line	Pusan—Hakata—Pusan	3 per week
	Deng Jin/Heung-A	Pusan—Hakata—Pusan	1 per week
	Heung-A/Dongjin	Pusan—Moji—Hakata—Pusan—Moji—Hakata—Pusan—Moji—Hakata—Yatsushiro—P	1 per week
	Hyundai	Osaka—Kobe—Hakata—Pusan (Southeast Asia)	1 per month
	Nam Sung	Pusan—Shimonoseki—Hakata—Pusan	3 per week
Imari	Heung-A	Pusan—Imari—Hiroshima—Pusan—Imari—Hiroshima—Pusan	1 per week
Nagasaki	KMTC	Pusan—Yatsushiro—Kumamoto—Nagasaki—Pusan	2 per week
Oita	**Cho Yang**/CK Line/Dongnama/Dong Jin/Dong Young/Heung-A/Pan Cont	Pusan—Osaka—Kobe—Wakayama—Oita—Pusan	1 per week
	Nam Sung	Pusan—Nakanoseki—Iwakuni—Oita—Pusan—Iwakuni—Oita—Pusan	1 per week
Kumamoto	KMTC	Pusan—Yatsushiro—Kumamoto—Nagasaki—Pusan	2 per week
Yatsushiro	**Heung-A**/Dongjin	Pusan—Moji—Hakata—Pusan—Moji—Hakata—Pusan—Moji—Hakata—Yatsushiro—P	1 per week
	KMTC	Pusan—Yatsushiro—Kumamoto—Nagasaki—Pusan	2 per week
Hososhima	**Jang Yung**/Nam Sung/Pan Ocean	Moji—Pusan—Moji—Pusan—Moji—Hososhima—Pusan—Moji	1 per week
	Nam Sung	Pusan—Shimonoseki—Pusan—Shimonoseki—Nakanoseki—Hososhima—Pusan	1 per week

Note: The shipping line among plural ones in bold-faced types is the main line.
Source: Compiled by author from International Transportation Handbook 2001.

excessive competitions and it was composed of seventeen Korean shipping lines as of 1999. These members are now chartering space of vessels with each other. Before 1992, Korean shipping lines allocated solely the containerships on the routes between Pusan and Japanese ports. But they started the joint allocation of containerships (space sharing) in 1993 because of Korean economy recession owing to high labor coats and therefore low international competitive edges. Its advantages are to be able to avert economic risks by enlarging the size of containerships and cutting down service frequencies compared to the sole allocation of containerships. The typical joint allocation of containerships on the Korea-Japan trades are as described in Table 3. There are basically three groups: (1) Heung-A Shipping, Cho Yang Shipping, Dong Young Shipping, Dong Jin Shipping and Pan Continental Shipping, (2) Pan Ocean Shipping, Nam Sung Shipping and Sinokor Merchant Marine and (3) Korea Marine Transport Co. (KMTC) and CK Line.

Reflecting these situations, total annual liftings of KNFC in 1999 were 471,056 TEU (Korea to Japan: 307,982 TEU, Japan to Korea: 163,074 TEU), while those of non-Korean shipping lines, on both ways, were only 51,000 TEU with the share of 9.6% to the total liftings.

4.2 The Increase of Japanese Local Ports open to International Containership Routes

Figure 7 describes the changes over the past decade in the numbers of Japanese ports connected to Pusan and of regular containership routes between them. Before 1989, six out of eight major ports (excluding Shimizu and Yokkaichi) and two local ports (Tokuyama-Kudamatsu and Hakata) had regular containership services to Pusan. This number has been increasing especially around mid 1990's. In the peak year of 1995, when the Great Hanshin-Awaji Earthquake occurred, ten local ports newly started the regular containership services to Pusan. This trend will be expected to continue especially in the Pacific rim of Tohoku region in the future.

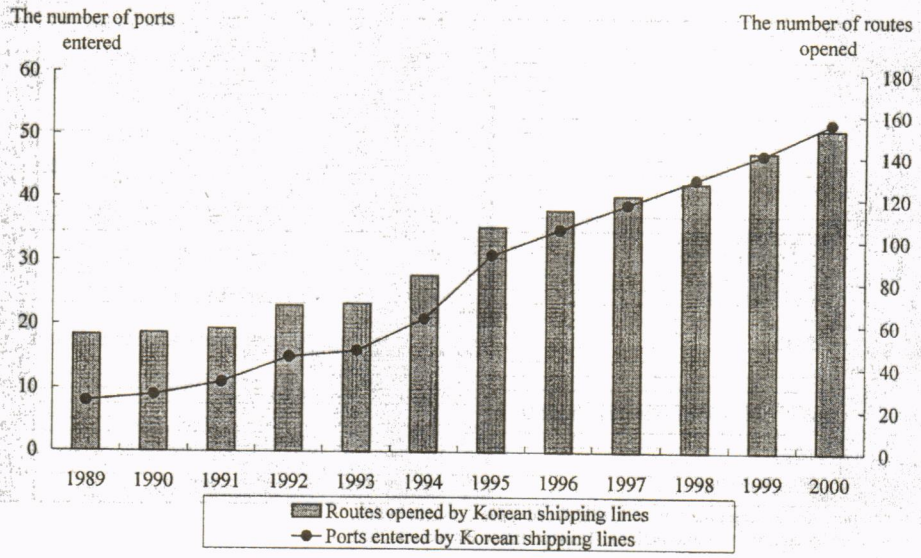


Figure7. The Changes in the Numbers of Ports and Routes on Routes to Pusan by Korean Shipping Lines (1989-2000)

Source: Compiled by author from the Japan Maritime Daily (January 5th, 2001).

Table 4. The Number of Calls per week in Local Ports and that of Pusan Route in 2000

Port	Total	Pusan	Port	Total	Pusan	Port	Total	Pusan	Port	Total	Pusan
Ishikariwan	2.00	2.00	Kawasaki	4.00	1.00	Mizushima	13.00	4.00	Imabari	3.00	3.00
Tomakomai	7.50	5.00	Niigata	7.50	5.00	Fukuyama	6.00	2.00	Matsuyama	8.00	3.00
Muroran	2.00	2.00	Naoetsu	3.00	2.00	Hiroshima	11.00	6.00	Kochi	2.00	1.00
Hachinohe	3.00	2.00	Toyama	6.25	4.00	Iwakuni	5.00	1.00	Imari	3.00	1.00
Sendai	4.00	2.00	Kanazawa	3.00	3.00	Tokuyama	9.00	3.00	Nagasaki	2.00	2.00
Akita	4.75	4.00	Tsuruga	3.00	2.00	Nakanoseki	5.00	4.00	Oita	6.00	2.00
Sakata	2.00	2.00	Toyohashi	2.00	2.00	Ube	2.50	1.00	Kumamoto	2.00	2.00
Onahama	2.00	2.00	Yokkaichi	10.50	2.00	Shimonoseki	14.00	11.00	Yatsushiro	3.00	3.00
Hitachi	1.00	0.00	Maizuru	3.25	2.00	Sakaiminato	3.00	2.00	Hososhima	5.00	2.00
Hitachinaka	2.50	2.00	Senboku-kita	0.00	0.00	Takamatsu	3.00	3.00	Shibushi	5.00	0.00
Kashima	2.00	2.00	Wakayama	1.00	1.00	Tokushima	4.00	4.00	Naha	6.50	0.00
Chiba	7.00	3.00	Himeji	1.00	1.00	Iyomishima	2.00	1.00	Total	207.25	114.00

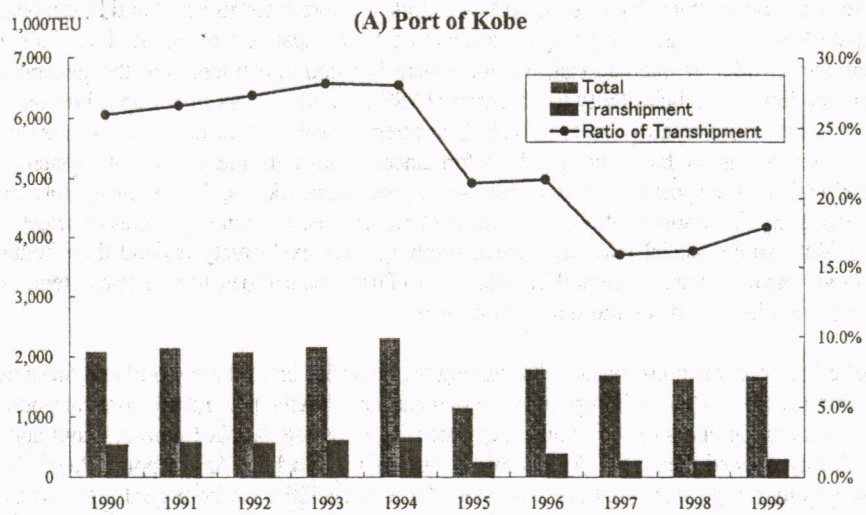
Note: Senboku-kita is now out of service.

Source: Compiled by author from International Transportation Handbook 2001

As mentioned in section 1, forty-seven local ports were opened to international containership services and forty-five of them were connected to Pusan with regular containership routes in 2000. Table 4 shows the number of calls per week of all international containerships and that of containerships on Pusan routes in the local ports in 2000. Fifteen local ports were connected only to Pusan and more than half of all international containership calls per week in the local ports were those of Pusan routes.

4.3 The Comparison between Port of Kobe and Port of Pusan as Connecting Hub Functions

After the Great Hanshin-Awaji Earthquake, Port of Pusan is replacing Port of Kobe as the connecting hub in North-east Asia. Korean shipping lines are now positively expanding Korea-Japan routes and, as a result, many Japanese local ports are, at present, connected to Pusan. The volumes of containers carried between Pusan and Japanese local ports are rapidly increasing especially after 1995. For example, the route between Pusan and Niigata was set up with the joint allocation of containerships by KMTC and Nam Sung in 1991. In this year, the treated container volumes were 3,984 TEU (export: 1,118 TEU, import: 2,866 TEU). In 1994 when Heung-A entered in this route, the container volumes rose up to 9,826 TEU (export: 2,572 TEU, import: 7,254 TEU), in 1995 when KMTC, Nam Sung and Pan Continental started the services with space sharing, they became 15,985 TEU (export: 3,740 TEU, import: 12,245 TEU) and they hit 19,790 TEU (export: 4,619 TEU, import: 15,171 TEU) in 1996.



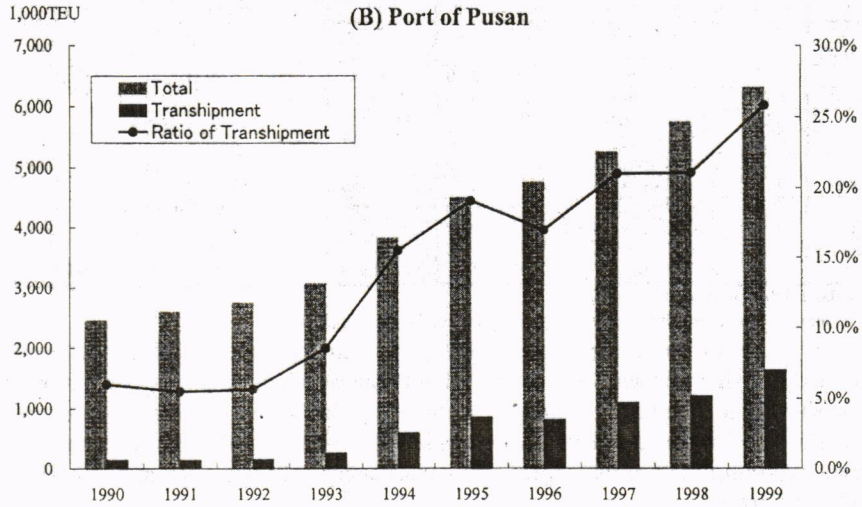


Figure 8. The Changes in the Total Volumes, the Transhipment Volumes and the Ratio of Transhipment at Port of Kobe and Port of Pusan (1990-1999)

Source: Compiled by author from Outlook of Kobe Port (1999), International Transportation Handbook 2001.

Figure 8 shows the total volumes, the transhipment volumes and the ratio of transhipment at both Port of Kobe and Port of Pusan. Port of Pusan goes on increasing especially in the ratio of transhipment year after year. On the contrary, those of Port of Kobe fall drastically just after 1995. This is, to a great extent, because shipping cargoes directly to Pusan, that means passing Japanese hub ports like Kobe, saves the costs of land transportation for shippers in the local regions in Japan.

5. SUMMARY AND CONCLUSIONS

The primary objective of this study is to examine the hub-and-spoke networks in international transportation, with the special considerations of air and marine networks between Korea and Japan. As discussed above, many Japanese airports and ports are connected to Seoul and Pusan respectively, and quite a few passengers and cargoes originating from Japan are transported via Korea. In the current frameworks of international aviation where bilateral agreements are the general case, air carriers are limited in their ability to construct HASS beyond borders or set up a hub outside their own countries. But some examples of HASS in international air transportation are now observed. Korean Air seems to have the good performances thanks to these network systems. Unlike international air transportation, the formation of route networks is, in principle, unrestrained in international marine transportation, and shipping lines are free to open any routes or select any ports of call. With some special reasons, Korean shipping lines exclusively expand their containership routes over Japan and are successful in collecting to Pusan the cargoes, to a certain extent, especially from Japanese local ports on the side of Japan Sea.

There're keen competitions for hub sites among the countries around the world and these trends are very strong especially in the European and Asian regions. In Asia, new international airports are now under construction and some are under expansion. Hong Kong, Kuala Lumpur, Seoul and so forth have already opened their new airports for air carriers to set a hub. As for ports, Pusan, Singapore and some other main ports in Asia are expanding their facilities on both hard and soft sides. It is

often pointed out that the major factors for hub locations are the size of terminal demands, and the numbers of routes and of flights/calls are important parameters for hub competitions. If so, Japan has a great possibility to become a hub in Asia because it has the largest terminal demands in this region. It also has geographical advantages in terms of the transferring of passengers or the transhipping of cargoes from the U.S. to Asia and vice versa. In addition to these advantages, the more important determinants for carriers to set a hub are how many and what kind of incentive packages airport or port authorities can give to carriers. Incentive packages are fascinating and advantageous conditions aimed to bring hubs, which include reduction or discount of charges etc. For example, Tokyo-Narita and KIX don't have enough capacities and their landing fees are the highest in the world. Besides, KIX and Chubu international airport (now under construction) take the form of joint-stock corporations because of the tight national budgets. If the amount of contributions from national or local governments is small and the need for borrowing increases, it will be difficult for an airport authority to offer fascinating incentive packages to air carriers. Taking these things into consideration, the chances may be small for Japanese airports to become a hub in Asia once international aviation markets in this region become completely liberalized in the future. Looking back to the port cases, Japanese major ports such as Kobe and Yokohama used to function as connecting hub ports in this region. But they are now far away behind other Asian major ports in their facilities and managements. The same kind of things may happen to Japanese airports. It is indispensable for Japan to make clear promptly its policies regarding international airports and aviation not to follow the same path as Japanese ports.

Looking from another standpoint, it is also important to examine whether Korea and Japan should compete or cooperate with each other in terms of global transportation networks. As mentioned above, the relationships between Korea and Japan in international transportation fields are rarely seen in other countries. It may be realistic for Japan to concentrate only on the management of its terminal demands for international air services because it is outrageously expensive in Japan to construct new airports or to expand the airports in operation compared with other countries.

Because only simple analyses have been done in this study which depicts and grasps the current situations of HASS in international air and marine transportation between Korea and Japan, more analyses will have to be done with quantitative methods about the effects of spill-over of international passengers or cargoes originating from Japan to Korea. This will be the first and vital step for Japan to decide on constructing its own hub or cooperating with the neighboring country.

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