An analysis of port demand
- The important factors for the port competitiveness

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1. Introduction

In recent years, severe competition among international ports has held all over the world. For example, among East Asian ports, Chinese ports have increased their power, and the market share of Japanese ports has decreased. To recover the position in Asia, Japanese Government plans some strategies to make their ports competitive. One of them is "super hub port projects" and Japanese government chose 3 ports. Now they concentrate their political resources on these ports, but the specific efforts of each port are left to individual "super hub port", so they will have to choose their service level or investment level etc. What is the key to be a hub port.

In this paper, we will examine the port competitiveness. And if we try this supply side analysis, we would be better to know the demand side view. So we will examine the important factors for the port choice and what is the "Best port" for the carrier or shipper.

2. Japanese ports in Asia

First we should grasp the present condition of port usage in the world. The transportation volume has increased every year and one of the most remarkable reasons is the rapid economic growth in China and India. So in Asia, aggressive investment in ports promotes the usage in Asian ports, especially in China. In table 1, we can find out over 25% of containers in the world is treated in China. Table 2 shows top 5 of container ports in the world, but all the ports are in Asia and three of them are Chinese ports.

On the contrary, the position of Japanese ports has lost their position in Asia. About 20 years ago, Kobe port in Japan was the one of the biggest ports in the world. But in recent years, freight related in and from China increased rapidly and Japanese ports are relatively weak in Asia. In some cases, even the freight from

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Japan is transshipped in Asian ports. In such situation, Japanese government plans "Super Hub Port" project to make the container port more competitive. The project's main targets are

Table 1　The number of containers by countries (2007)

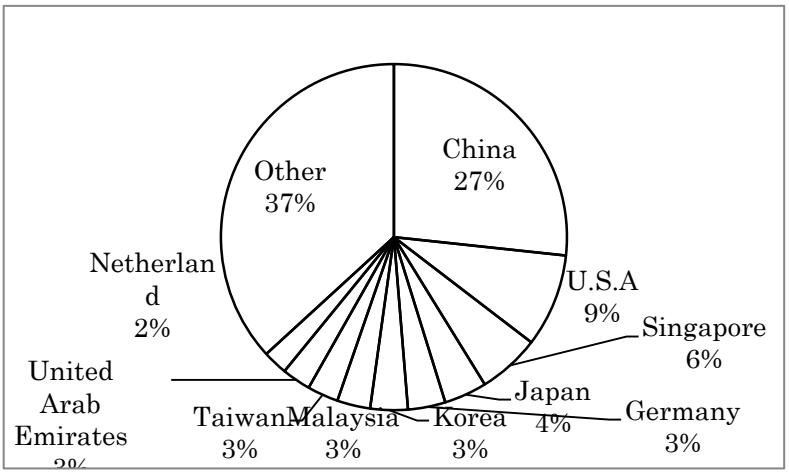

Table 2　The ranking of container port (2007)

1	Singapore
2	Shanghai
3	Hongkong
4	Shenzhen
5	Busan
24	Tokyo

- reducing port costs by 30%
- shortening the lead time approximately by one day

So the port should be able to more efficiently operate large-scale container terminals and surpass Asian other main ports. And then Japanese ports will be competitive.

3. What is the "competitive port"?

We often use the words "competitive port", but we have to reconsider about the term. This definition is not so easy. For example, depending on their ownership, their targets are different. If it is under the private ownership, the port pursues the profit maximization. On the other hand, under the public ownership, their main

target is volume maximization. If these ports mention their goal to be a “competitive port”, maybe, their vision is a little bit different from each other.

Someone will connect these words with hub port, especially the global hub port. Sometimes government of each country insists the necessity of global hub port in their country.

But when we think of the port competition, we should not only try to compete with the foreign ports, but also need to compete with local ports. Let’s think about there are two ports in the same region. Even if a ship brings containers to these both ports, it will choose one. If the ship will anchor both ports, they have to pay their fee for both ports and need extra time, so ordinal carrier doesn’t make such a choice. They will choose the “best port”. This “best port” means attractive port for carriers and shippers. But to be the “Best port”, what kind of factors will be needed?

3. How to think about shipper’s port choice – Port choice model

Traditional research on port choice uses questionnaire-based qualitative data; meanwhile in this research we will use available quantitative data. But in this paper, to know the competitive “best port”, we examine the demand of container port. The way of thinking is like this. For carrier or shipper, it is simple to choose the nearest port for their freight’s destination. But I’ve already mentioned above, they usually choose the “best port” among the neighborhood ports. And then the best port can gather more freight, not only their fundamental freight. On the other hand, a port next to the best port will reduce their freight. So the volume of the freight will be used for one of the indices of competitiveness.

The base case of port choice model (or Port demand model) suppose one period. The volume of freights which are originally destined from one port to another (“basic flow”) is calculated by gravity model. Gravity model have two main factors; distance of the ports and economy level of each port’s hinterland. And the sum of freights to a port mentioned as “basic demand”. But port demand will be changed by port choice of the carriers or shippers. They choose the “best port” by the port characteristics. If the port isn’t necessarily the nearest one for all the freight, some of them will be transported by road.

We examine at present time and the transport demand has a derived characteristic, so the sum of basic demands of each port is equal to the real demand of all ports.

4. Empirical framework

First, simple gravity equation is set

$$flow_{fj} = G \frac{Y_f Y_j}{D_{fj}} \qquad (1)$$

$flow_{fj}$ is "basic flow" between foreign port f and Japanese port j. Y_f and Y_j are GDP of origin (f) and destination (j) country or district, respectively. D_{fj} is a physical distance between foreign and Japanese ports.

"Basic flow" is affected from the port specific factors, i.e., level of infrastructure, services, and so on. Then, "real flow" is defined as follows

$$Q_{fj} = flow_{fj} \times \alpha_j \qquad (2)$$

α_j is a vector for port specific factors of each Japanese port.

Substitute eq. (1) to eq. (2), and transform to log-linear form

$$\ln Q_{fj} = C - \ln D_{fj} + \ln Y_f + \ln Y_j + \ln \alpha_f \qquad (3)$$

Empirical estimation is based on eq.(3).

5. Summary of empirical result and "Port Specific Factors α

Now I am going to make some efforts on this model, so I will present just one result[2]. The "real flow" between a foreign port and a Japanese port is estimated as below. The distance is longer the flow will decrease and GDP is increase the flow will increase. In this analysis number of terminals and port area are used for α. And all the expected signs are introduced.

$$\begin{aligned} \ln Q_{fj} = & -21.54 - 0.77 \ln D_{fj} + 0.26 \ln GDP_f + 2.00 \ln GDP_j \\ & (-2.31) \quad (-4.39) \quad (5.27) \quad (4.30) \\ & + 0.71 \ln TER + 1.44 \ln SEA \\ & (2.18) \quad (2.34) \\ & R^2 = 0.29 \quad \bar{R}^2 = 0.27 \\ & F = 10.79 \end{aligned} \qquad (4)$$

For carrier, if the number of terminals increase it is convenient to use, especially in

[2] Number of observations are 135.

the congested port. And also large port area will be convenient to navigate inside the port. But we have to take care there is a trade-off between these two factors. So the investment for port will face the limit to increase the port demand.

About the term α, there are lots of factors to illustrate the port services. For example, the port fee, time to get off the containers or access time to the highways and so on. But this time it is unavailable to use such kinds of data. Especially in Japan, each port is controlled by each region. So we should find out some alternative variables.

Reference

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