Chapter 1

Introduction

1.1 Background

The high-speed development of international trade is one of the most important sign of economic globalization. We can find that the growth rate of world international trade is more than the growth rate of world economy. As a major way of global logistic and an important factor of economic globalization, ocean transport becomes more and more important. Modern seaports have become critical nodes in complex logistics chains. Seaports that fail to establish themselves as key players in the optimization process unfolding within such logistics chains are in danger of ˇmissing the boat、 and being disregarded as ports of call on international freight routes.

In an era of economic globalization ports are evolving rapidly from being traditional land/sea interface to providers of complete logistics networks. This means ports have to face many challenges due to unpredictable environmental changes and trends in the shipping, port and logistics industries. It is estimated that 90% of the world internationally traded goods are imported or exported by sea. And the container transportation has become the most important way to global trade.

As the rapid development of Asia-Pacific region、s economy, the world economic center has been transferred into this area step by step. In terms of annual container throughputs, 9 Asian ports are ranked among the top10 container orts in the world and 6 of them are Chinese ports which rank second, third, forth, seventh, eighth and tenth respectively. Amongst Asian economies, the Chinese economy is regarded as the world、s most fascinating one in the modern era. The proportion of container transport is getting higher and higher and it is the future trend of ocean shipping development. So container transport is an important aspect in port competitiveness research.

In March 2001, the Fourth Session of the Ninth National People、s Congress of the People、s Republic of China approved ˇthe Tenth Five-year Plan Outline of the Economic and Social Development in the People、s Republic of China、. It has been included in the newly published plan (2001-2005) ˇto build Shanghai international shipping center、.

The Central Committee of the Party indicated in 1994: the building of Shanghai

into an international shipping center is the key for the development of Pudong into an economic center in the Fareast and that of the whole Yangtze River Delta. The Shanghai international shipping center should take full advantage of the favorable situations in the economic, financial and trade center of Shanghai, the Beilun deepwater port in Ningbo province, and the enormous container traffic in Shanghai and Jiangsu province to weave a system of ports with Shanghai as the center and with those in Zhejiang and Jiangsu provinces to coordinate.

However, there is also competition in this system of ports. Ningbo-Zhoushan port has developed rapidly recent years. It has continued to expand at a very high average annual growth rate of approximately 31% over the period 1997-2007 and it has become the eighth largest container port in the world in 2007. As a nearby port with Shanghai port, the competition can.t be avoided during the high-speed development. This paper will aim to the co-opetition between Shanghai port and Ningbo-Zhoushan port, using different method to analysis the relationship between the two ports and puts forward the relative suggestions concerning their competition and cooperation.

1.2 Research Objective

With the integration of Ningbo-Zhoushan Port and the construction of Shanghai Yangshan Port and Shanghai International Shipping Center, more and more concern has been attached to the development of Ningbo-Zhoushan Port and Shanghai Port. Based on the analysis of the relative competitiveness and the port behavior of export and import˙the author is going to develop a view of the likely future outcome of the competition between them. This paper puts forward the relative suggestions concerning their competition and cooperation with a view to promoting their development.

1.3 Structure

The dissertation consists of an introduction, four chapters centered on research, and a final chapter with conclusions and development implications.

Chapter 1 provides an introduction to the dissertation including background analysis and the explanation of the study purpose and objectives. The structure of the study are explained in the chapter too.

Chapter 2 discusses the trend of containerization, the concept, reasons and factors of both port competition and cooperation.

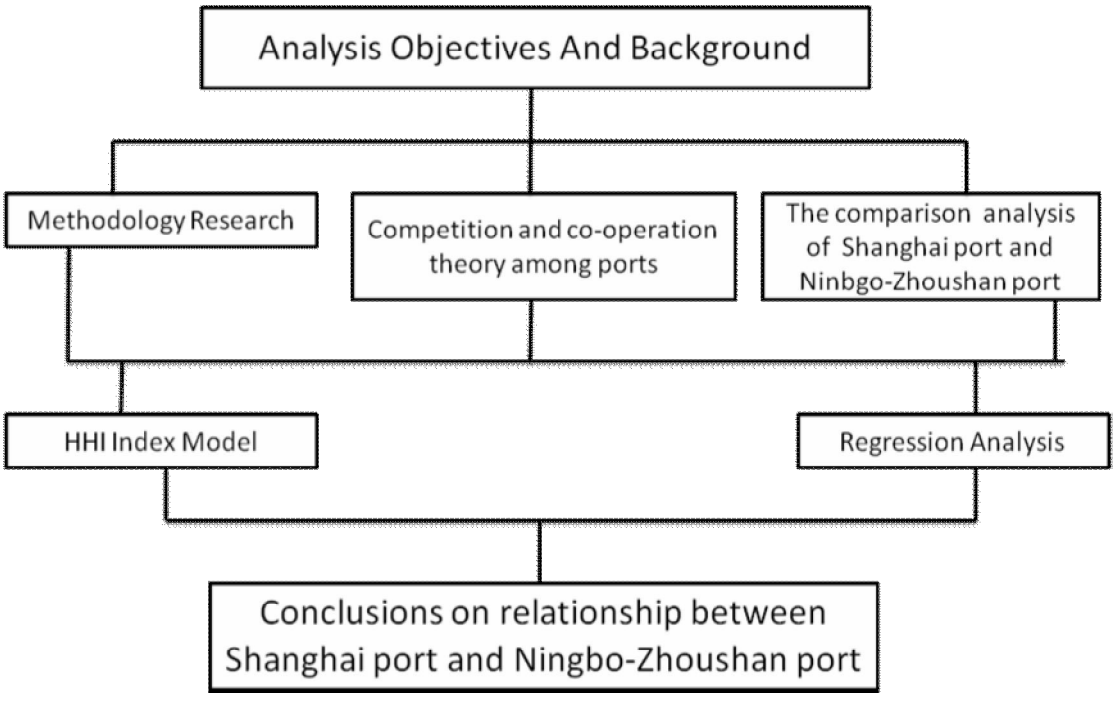
Chapter 3 is concerned with the situation of Shanghai port and Ningbo-Zhoushan port. These two ports are compared amply in different aspects such as port facilities and hinterland. According to the result of this comparison, we find the comparative advantage of Shanghai port and Ningbo-Zhoushan port. The problems of them are also researched in this chapter.

In chapter 4, the author established two models. The first one is HHI index model. We can calculate the concentration ratio of container handling in the Yangtze River Delta. The second model is linear regression analysis model. The port behavior research is based on this model.

In Chapter 5 the final chapter, the principal findings from previous chapters are integrated into a coherent set of hub port、s development implication and conclusions.

This chapter is an overview of the dissertation and the study. It helps to understand what the dissertation is going on in the following chapters.

Figure 1-1 The study and content structure



Chapter 2

Theoretical Background of Port Competition and Co-operation

2.1 The trend of containerization

Before containerization, cargo handling practices had not changed for over 100 years. Building pallets and loading them into the holds of ships was a slow and labor-intensive process, and the cargoes were vulnerable to damage and theft. Therefore, the invention of containerization is regarded by some as the most significant shipping innovation of the 20th century. Domestic container shipping emerged in the United States in the late 1950s and international flows commenced roughly a decade later.

Using a sealed steel "box" of standardized dimensions (measured in twenty-foot equivalent units or TEUs) to transport cargo has a number of advantages. Most importantly, total shipping time has been reduced because the containers may be transferred from ship to rail to truck, and back again, very quickly. As the box is secure and protects the cargo inside, theft and damage have been greatly reduced. Furthermore, the development of climate-controlled containers has made it possible to ship temperature-sensitive products over great distances by sea, rail and truck. The introduction of containers has lowered the cost of marine shipping to the extent that surface transport services are usually the more expensive components of a total import or export container movement, even though the surface transport is usually over a shorter distance. The lower costs of containerized trade have stimulated global trade, and the use of containers has been credited for double-digit growth in trade with emerging economies.

Containers can carry anything, but they are particularly well suited for transporting perishable and manufactured goods. Economic trends such as the globalization of the supply chain and trade liberalization have greatly stimulated the demand for containerized transport.

Growth in North American container volumes outstripped the pace of economic growth between 1990 and 2004. North American TEUs grew at about 7% per year over this period. That rate is expected to continue, leading to a doubling of North American container volumes in 10 years. Growth rates would vary from port to port, however, depending on their ability to accommodate

increases in traffic.[1]

World container growth appears to have been even more impressive than in North America alone. One major independent shipping consultancy estimates that growth in container volumes has exceeded 10% annually over the last 15 years. It predicts that container demand worldwide will nearly double by 2015, as shown in Table 2-1.

Table 2-1: Forecast of Container Port Demand by Region to 2015 (Million TEUs)

Region	2004	2010	2015
Asia	159.1	240.5	303.4
Americas	62.2	90.7	118.8
North America	*41.1*	*56.9*	*71.6*
Europe/Mediterranean	74.1	105.8	139.5
Others	36.8	58.2	85.6
Total	*332.2*	*495.1*	*647.3*

Source: Ocean Shipping Consultants Limited, Press Release, January 2005.

As can be seen in Table 2-1, Asia is by far the largest market for containers in the world and is expected to continue to grow rapidly. Through 2015, exceptional growth in container demand is expected in the sub-regions of Southeast Asia, Central and South America, South Europe and the Mediterranean as well as the Middle East and the Indian subcontinent. The source of the figures in Table 1 is less bullish about the North American market than the forecast in Figure 1, predicting approximately 75% growth in container demand through 2015.

As container demand has grown, the size of container vessels has also

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[1] Young-Tae Chang, "Port Competition in East Asia and Korean Strategy", *Journal of Korea Port Economic Association* 12,2001 p29-32

increased impressively. The world largest container ship in the early 1980 carried some 3,400 TEUs, compared to the largest container ships in recent years which can carry about more than 10,000. The rapid evolution ofcontainer ships is due to the significant efficiency gains and cost savings associated with operating larger ships. Today, the vessels calling at ports commonly carry between 6,000 and 8,000 TEUs.

2.2 Change in maritime industry

While international trade has experiencing new environmental changes, maritime industry has also had to adapt itself to the change. By reading the literature, the author framed the relationship of demand and supply between shippers, shipping lines and ports as in figure 2-1

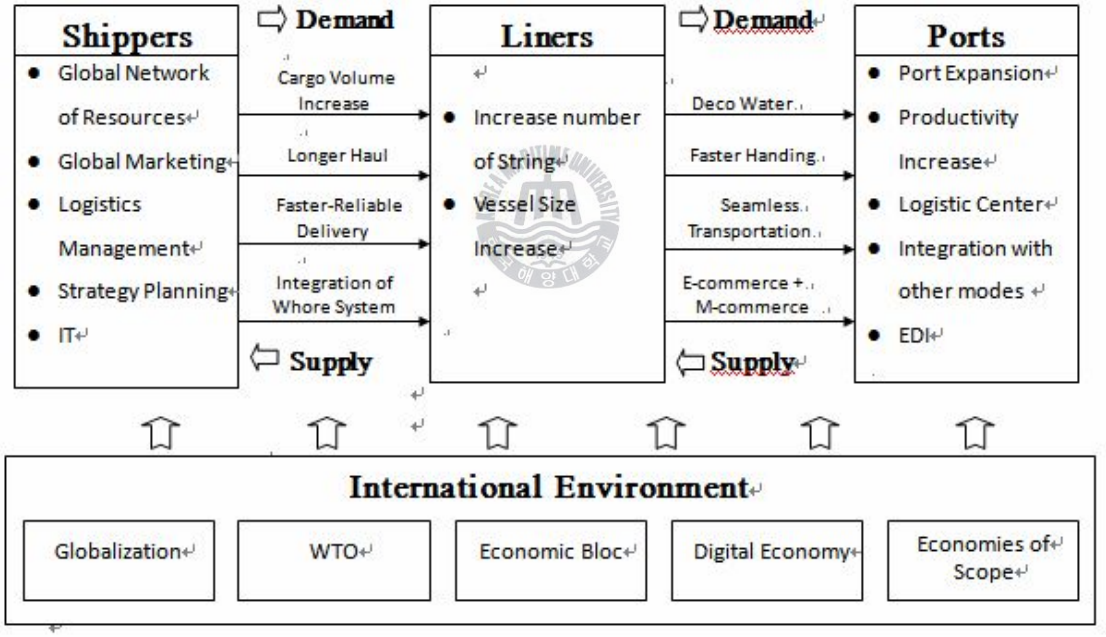

Figure 2-1 Contemporary Demand and Supply Relationship Between Shippers, Lines and Ports

As the environment of international trade has changed in influenced by those factors explained in the above, shippers might well have shaped their business in conformity with the changes. So they seem to have devoted themselves to five areas: global network of resources; global marketing; logistics management; strategy planning; and how to use IT.

To meet this demand, shipping lines have to increase their capacity of providing services either by increasing the number of strings or by upsizing their vessels. For instance, Lloyd's Shipping Economist shows a recent structure of strings in Asia/North America routes by major liner operators. Major lines are operating the strings of minimum 6 to 9. Of these, many strings are expanded to Europe to cover global passage. Considering the same number of strings in other areas, today's shipping lines have to own a great deal of vessels and run offices around the world. This is not easy for even biggest shipping lines to provide the needed capacity. In addition, there seems to exist some degrees of barriers to penetrating or entering new markets in other regions than the lines' traditional home ground for expanding their services. Therefore, major shipping lines have explored to find some ways to resolve these problems. This takes the fashion mode of global/strategic alliances by major shipping lines. The purpose of participants in strategic alliances is to establish cooperative agreement on a global basis.

Shipping lines' concerns become naturally demand for the ports as in the diagram. Bigger vessels require ports to provide deep waters in approach channels and berths, and faster handling service of cargoes in terminals. Likewise, intermodal dimension forces ports to guarantee seamless transportation among different modes. In addition, IT factor generates a new dimensional cargo handling type of work to ports, so called, E-commerce so that ports have to handle traditional M-commerce and new E-commerce. To respond to these demand forces, ports exert their utmost in various ways depicted in the diagram as supply. To begin with, a definite answer, to the question of deep-water port must be port expansion in the direction of deepening, widening and lengthening channels, berths and turning basins as well. Major container terminals have already the water depth of 15-16 meters in the berths and some of them have plans to deepen this to the depth of 18.5 meters (Wilhemsshaven[2] in Germany and Sepetiba[3]). The second solution by the ports should be increasing productivity before or concurrently with trying the port expansion, focusing on cargo handling equipment, stacking areas and gate system for operational efficiency. In increasing the productivity in terminals, faster larger cranes are the first thing explored. Currently, a discharge rate of at least 35-40 moves per crane/hour is needed when handling large ships. Top more effectively work even larger vessels this level of productivity must be improved upon. One obvious way to increase productivity is to deploy more cranes per ship.

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[2] Wilhelmshaven is a new deep-water container port in Germany by 2010, chosen by Hamburg. Bremen and Lower Saxony states. It plans to accommodate vessels over 10,000 TEU size and provide up to 24 berths. See *containerization International*, May 2001, p.35

Modern container ports tend to provide comprehensive logistic service within their areas. Port is not only the place to load and unload cargoes, but also the one for manufacturing, processing, warehousing, distribution and customs service. Examples are numerous in this area around the world and nowadays, ports become introducing Free Trade Zone within or in the vicinity of their boundary to promote more cargo works for the logistics service. Port is also exploring to have efficient intermodal linkage with other modes for inland transportation and/or relayed transportation to neighboring ports. The type of intermodal linkage depends upon ports、geographical structure, the relationship between foreland and hinterland, cost effectiveness and customer preferences and history.

Concurrently with the logistics and intermodal service, ports should also provide high-tech EDI system both within port boundary and beyond it for their customers such as shipping lines, shippers, banks, insurance companies and government. Real time transaction using the EDI among these parties and cargo tracking system are on the surge.

Thus far, global environmental change in international trade has made shippers, lines and ports more integrated with each other by physical transportation network composed of various modes, and also electronic data network thanks to the rapid development of IT industry in an unprecedented wider comprehensive scope. Every perspective of involved parties in the global network should be global whether their role in the entire network is central or peripheral. Major world class shippers seem to be already in this mode since their approach to this challenge is supply chain management, covering ambit of logistics, strategy planning and integrated IT system. Shipping lines have experienced similar adaptation strategy, illustrated by global alliances, longer haul and bigger vessels as well as more comprehensive intermodal link, with all embodying advantages of current IT technology. Compared with these two parties (shippers and lines), ports seem to have been relatively less affected so far, however, new tides of globalization perception appear to be on the surge among forerunners of hub-class ports in the world. The height of this new tide looks the highest in East Asia due to the regions the most active economic dynamism Therefore, we focus on the current scene of this region in the next section, particularly concerned with port competition in the region.

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[3] See Baird (1999)

2.3 Conceptual definition of port competition

Competition between ports is therefore fierce. The unstoppable rise of container traffic flow and the constant drive for specialization, and capacity increase of seagoing vessels have resulted in shipping companies concentrating as much as possible on a limited number of ports of call. Increasingly, connecting services are left to feeders. In the way, shipping companies are able to benefit maximally from the economies of scale that their larger vessels offer, while they are also able to provide more flexible and quicker transport services and sailing schedules. Emerging strategic alliances between shipping companies, meanwhile, have led to a further concentration of demand for port services. It seems that there is clearly a declining trend in the number of players requiring services from ports or container terminals.

Shipping companies are increasingly focusing on an integrated approach to transport in which logistical services are provided on a global scale. Many of there companies have in fact become inter-modal operators. Throughout the logistics chain they are tightening their grip on container flows. Consequently, shipping companies appear to have become the principal players when it comes to a choice of seaport. It used to be the case that only territorial considerations were taken into account in the selection of ports of call. But increasingly port characteristics are assessed in relation to the global logistics supply. Geographical aspects are less important than they used to be. The key consideration today is the summarized transport cost, i.e. the total transport cost (including out-of pocket costs, time costs, reliability etc.) associated with the logistics chain.

The purpose of a further standardization of freight traffic is not only to reduce maritime costs, but also transshipment and warehousing costs (i.e. costs incurred within port), as well as the cost of hinterland transportation. The general trend thus far has been for global transportation to become cheaper. However, there is considerable doubt about longer-term cost development.

In the context of port competition, reference is often made to Verhoeff[4](1981), who argued that seaport competition unfolds at four distinct level: competition between port undertakings, competition between ports, competition between port clusters (i.e. a group of ports in each other¸s vicinity with common geographical characteristics), and competition between ranges (i.e. ports located along the same coastline or with a largely identical hinterland).

The factors influencing competition may vary from level to level. The competitive strength of individual undertakings within a port is determined mainly by the factors of production (labor, capital, technology and power).

Competition between ports, port clusters and port ranges on the other hand is also affected by regional factors, such as the geographical location, the available infrastructure, the degree of industrialization, government policy, the standard of performance of the port (measured in terms of proxy variables, such as the number and frequency of liner services, and the cost of transshipment, storage and hinterland transportation).

This traditional approach to port competition must now make way for an approach based on competition between logistics chains, in which ports (and port undertakings) are merely links.[5] As the most important consideration is the overall cost of the transport chain, it is inevitable that, besides throughput, the industrial and commercial functions (including warehousing and distribution of goods), as well as hinterland transportation will come to occupy an increasingly important position.

A port and the undertakings established in it compete directly with a limited number of other ports, usually within the same range. Competition between ports belonging to different ranges involves just a very few types of goods flows. Consequently, the crucial question is what determines the choice of port? Why is one port preferred to another? Which undertakings located in that port are chosen? And which hinterland transport modes?

Port competition is traditionally regarded as competition between and within ports. This definition would appear to be incomplete, and it is therefore hard to assess. The operational context of the concept needs to be extended.

It should be noted in this respect that Verhoeff˛s levels of competition also interact with one another, so that they cannot be considered independently. Verhoeff˛s definition of port competition does not take into account the traffic structure of ports or port undertakings. Goss(1990c) rightly asserts that the composition of the traffic flows is essential in the context of port competition:

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[4] Vehoeff(1981) is perhaps the first scholar who discussed seaport competition in a comprehensive manner: he claims there is ˇhardly any literature on the subject˛ (Verhoeff 1981, p.49)

[5] Kevin Cullinane, ˇThe Competitive Position of the Port of Hong Kong,˛ Preceedings of KASS and KOMARES˛ International Symposium: Challenge of the World Shipping and Response of the Korean Shipping in the 21st Century, Nov.10-11, 2000, Seoul, Korea

(…)many commodities are exported from several countries, whose ports are therefore in competition. Verhoeffs definition fails to distinguish between ports and port undertakings in terms of the good (i.e. the type of traffic) in which they specialize. He considered them to be comparable units. Clearly, though, an undertaking in a container port is not in competition with a maritime concern specialized in liquid bulk or forestry produce. Port competition is further influenced by other factors, such as the type of management, the know-how of port authorities and managers, the well considered application of EDI, government intervention, the existence of niche markets, and the generation of added value. After all, ports are considered to be the competing entities. One can only arrive at an operational definition by combining the above mentioned aspects meaningfully. In the present study, we shall employ the following definition of port competition.

A Conceptual Definition of ˇSeaport Competition¸: Seaport competition refers to competition between port undertakings, or as the case may be terminal operators (the competing players involved in the organization of entire transport chains) in relation to specific transactions. Each operator is driven by the objective to achieve maximum growth in relation to goods handling, in terms of value added or otherwise. Port competition is influenced by (1) specific demand from consumers, (2) specific factors of production, (3) supporting industries connected with each operator, and (4) the specific competencies of each operator and their rivals. Finally, port competition is also affected by port authorities and other public bodies.

Port competition can be divided into 3 levels. Firstly, there is competition between operators. This type of competition may be summarized as ˇintra-port competition at operator level¸. In recent years, operators within ports have increasingly tried to diversify their activities, offering services throughout the total logistics chain. As a result, operators are now often present in several ports, where they are involved in the handling of various traffic categories.

Intra-port competition can however be put in an even roader context, as port authorities and undertakings may also compete within a single port, albeit indirectly. This form of ˇmixed competition¸ occurs if a port authority has stakes in a port undertaking or terminal operator¸. This competition could affect the competition between two hub ports in a similar geographical position.

Secondly, there is competition between operators from different port. This second level of port competition occurs mainly between operators within the same range serving more or less the same hinterland. However, Verhoeff (1977) and Goss (1990c) have both asserted that competition may also involve port ranges as such. Competition in the Hamburg-Le Havre range is usually restricted to competition within that range. Only rarely are ports belonging to

other ranges involved, as there is very little overlap between the hinterlands of ports from different ranges. Consequently, operators within a given range usually do not feel threatened by operators from other ranges, and there is no evidence whatsoever of competition as this level.

Thirdly, there is competition between port authorities-be it national, regional or local-which directly affects the determinants of port competition (particularly the infrastructure in and around a port). This is of course crucially important for the competitive position of operators. This is level 3: ˇinter-port competition at port authority level.

Implementation of this theoretical framework also requires a reconsideration of the ˇmain port. concept, which is based on ports. competitive position. In the economic literature, it is traditionally suggested that a main port is a market leader in several or even most traffic categories. Moreover, it is usually claimed that such ports provide the best services and handling facilities for a broad range of goods. Such an interpretation of the main port notion is rather misleading, as it is an illusion to believe that a port can easily become a market leader in several, let alone all, traffic categories. But a hub port for container is possible in some regions.

The fact that many ports in the world specialize in several traffic categories requires that, unlike the notion of main port, the definition of a main port should be reinterpreted as a hub port. It concerns the dominance of one port over others in relation to a specific traffic category e.g. container traffic.[6]

It should be noted in this respect that the term hub port is increasingly used by port authorities who wish to assume a certain status for marketing reasons, the actual status of the ports is to compete for T/S containers.

A great many players are involved in port competition, both conceptually and operationally. Consequently, port competition and port management is influenced to a very considerable degree by a multitude of related-sometimes conflicting interests.

Three types of port competition may be discerned, i.e. intra-port competition at operator level (competition between port undertakings from different ports), and inter-port competition at port authority level.

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[6] *Containerization International*, May 2001, p.33

A hub port which is active in this competitive environment must therefore constantly care their T/S containers、increase. The competition for T/S containers could be various and diversiform, but the inside nature of transoceanic containers is difficult to change. Thus it may be known by the study and then to grip the trend of the development. Decisions could be made according to the development how to adjust the competition strategy for hub ports and also for shipping companies, in order to retain a competitive edge.

2.4 Port co-operation against competition and port co-operation modes

The development philosophy of port development faced with competition changes from ˇhardware、to ˇsoftware、.[7] Hardware of port development includes the construction of infrastructure and superstructure. Software of port development includes port management on behalf of port privatization for high efficiency, know-how, IT technology for supporting and network structure. Now, however, software of port development can be expected to be the factor of determining importance in port competition.

The forth generation of ports is introduced by UNCTAD and characterized by co-operation in combination with competition together with horizontal and vertical integration. Port co-operation can be considered as a strategy against competition. Song (2003) said coopetition is a way of collaborating to compete.

Intra-port co-operation at operator level is the co-operation regarding terminal operations within a port. Inter-port co-operation at operator level, on the other hand, is a co-operation of terminal operators among different ports. According to the research of Song (2002), competition between the ports of Hong Kong and Shenzhen is increasing, so the Hong Kong decided to cooperate with Shenzhen port, instead of continue competing. This cooperative strategy has for objective to strengthen the position in times of high competition of South China, by a joint venture. In this Hong Kong-Shenzhen example, for the terminal operators there are elements of competition as well as co-operation, both within and among the ports. Usually the co-operation, within or among ports is accomplished by the same terminal operator. Terminal operators are used to

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[7] Mi-Sun Yoon ˇPort Competition and Co-operation as a Strategy of Busan Port, *International Journal of Navigation and Port Research* 9,2006, p749-752

expand their power sphere through investments, such as joint venture, because co-operation through joint venture enhances the competitiveness as well as the market power (Song, 2002).

Inter-port co-operation at port authority level is the co-operation of port authorities among ports. For example, Copenhagen Malmo Port as a limited company was founded by Copenhagen port of Denmark and Malmo port of Sweden on 1 January 2005. Both ports had already cooperated before they found Copenhagen Malmo Port and considered a closer co-operation. The aim of the co-operation is to realize economies of scale through collaboration of marketing and operations, and finally to improve competitiveness.

According to UNCTAD (1990), highly suggested areas for port co-operation are technical training, harmonization or exchange of tariffs and information for common service. The other areas are harmonization of statistics and operational documents or procedures, relationships between port users and pooling of port services or equipment. Song (2002) states that co-operation leads to advantageous results: risk reduction, economies of scale, rationalization, technological exchanges co-opting or blocking competition and overcoming government0mandated trade or investment barriers, both parties can be stronger by sharing techniques and information through co-operations. Finally, co-operation as a strategy of competition can be a competitiveness among parties. The parties, especially, are expected to be largely complementary. If they can cooperate through each party.s core competence, they can have unique a competitiveness and achieve a more competitive position.

Chapter 3

Overview of Chinese Container Ports and Comparative Analysis of Shanghai Port and Ningbo-Zhoushan Port

3.1 Overview of container ports in China

With China having transformed itself into the "world's factory", and with most goods exported from China being shipped out in containers, it is not surprising that China's container port throughput growth has been so rapid.

Table 3-1 Container throughput trend of China ports VS non-China ports

	Container throughput(000 TEUs)			Container throughput growth (%)			
Year	China (coastal ports)	Non-China	Overall World	China (coastal ports)	Non-China	Overall World	China market Share in world (%)
1980	79	38,693	38,772	0.0	0.0	0.0	0.2
1990	1,428	86,355	87,783	33.6	8.4	8.5	1.6
1996	6,948	150,192	157,140	30.2	9.7	10.2	4.4
2000	20,464	215,667	236,131	31.0	9.5	10.7	8.7
2001	24,700	222,028	246,728	20.7	2.9	4.5	10.0
2002	33,760	240,765	274,525	36.7	8.4	11.3	12.3
2003	43,550	271,150	314,700	29.0	12.6	14.6	13.8
2004	56,620	304,780	361,400	30.0	12.4	14.8	15.7
2005	70,020	327,980	398,000	23.7	7.6	10.1	17.6
2006	85,790	354,210	440,000	22.5	8.0	10.6	19.5
2007	103,251	389,549	492,800	20.4	10.0	12.0	21.0
2010F	147,090	480,604	627,694	12.5	7.3	8.4	23.4
1980-2007	0	0	0	30.4	8.9	9.9	0.0
2007-2010F	0	0	0	12.5	7.3	8.4	0.0

Source: IMF (2007)

As shown in Table3-1, China's coastal ports have averaged container throughput growth of 30.4% over the past 27 years. This substantially outpaces the 8.9% pa growth rate recorded at non-China container ports in the rest of the world. The result: China's ports now account for 21.0% of the container throughput market world-wide, compared with just 0.2% market share in 1980.

Container throughput at China's ports has consistently sustained double-digit growth, has consistently significantly outpaced the global average, and has outpaced growth in other modes of cargo transport in China. Hence, China's ports now account for an increasingly large proportion of the global aggregate.

But it is becoming increasingly difficult to sustain such growth. In fact, most projections call for a slowdown in growth at China's ports vis-à-vis historical norms.

For example, though Business Monitor International (BMI)'s China Freight Transport Report, released in 2007, concludes that China's maritime and inland waterway freight traffic will be the fastest-growing transport mode in China in 2006-10F, with 16.8% pa growth (measured in billion tone-km), it also calls for growth at just half of the average rate of the past 27 years.

Official projections from China's Ministry of Communication as at September 2007 call for China's total container throughput (in both coastal and river ports) to reach 157.0mn TEU by 2010F, which equates to even slower estimated growth of 12.5% pa in the 2007-10F period. While 12.5% pa growth is highly respectable, it would represent a slowdown from historical norms.

Similarly, May 2007 forecasts from the China Communication and Transportation Association (an association formed by the Ministry of Railway, the General Administration of Civil Aviation of China, the Ministry of Communication) project China's total container throughput (both coastal and river ports) will reach 170.0mn TEUs by 2010F. This translates to growth of 15.5% pa and likewise projects a significant slowdown in container throughput growth in China compared with historical performance.

Indeed, container throughput growth at China's coastal ports has slowed in recent years, coming in at an estimated 20.4% y-y in 2007, compared with 22.5% in 2006, 23.7% in 2005, and 30.4% pa growth in the 1980-2007 period.

But, the container throughput growth trend differs from port to port.

As shown in Table 3-2, the Shenzhen container port hub, for example, has experienced the most dramatic slowdown among China ports over the past 12 years, its growth slowing to an 14.2% in 2007, from 94.9% in 1997. Moreover,

its 14.2% y-y container throughput growth in 2007 was significantly below the average growth of 21.4% of the top-eight China container ports over the same period.

Table 3-2 Historical container throughput trend at China major ports

Container throughput (1000 TEUs)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	
China												
Shanghai	2,527	3,066	4,210	5,612	6,330	8,613	11,280	14,560	18,084	21,720	26,150	
Shenzhen	1,148	1,943	2,978	3,959	5,079	7,614	10,610	13,620	16,197	18,469	21,099	
Qingdao	1,033	1,214	1,543	2,116	2,639	3,410	4,240	5,140	6,310	7,702	9,462	
Ningbo	257	352	601	902	1,209	1,853	2,760	4,010	5,224	7,140	9,350	
Guangzhou	687	841	1,179	1,427	1,628	2,180	2,760	3,310	4,684	6,660	9,140	
Tianjin	935	1,019	1,302	1,708	2,011	2,408	3,020	3,810	4,801	5,950	7,103	
Xiamen	546	653	848	1,085	1,295	1,750	2,330	2,870	3,343	4,010	4,627	
Dalian	455	526	736	1,008	1,198	1,350	1,670	2,210	2,690	3,210	3,813	
Top-8 China ports	7,588	9,614	13,397	17,817	21,389	29,178	38,670	49,530	61,333	74,861	90,744	
Other regions												
Hong Kong	14,567	14,582	16,211	18,097	17,827	19,146	20,449	21,985	22,603	23,539	23,989	
Singapore	14,136	15,136	15,945	17,087	15,571	16,941	18,411	21,329	23,192	24,792	27,935	
Container throughput growth (%)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	CAGR
China												
Shanghai	28.2	21.3	37.3	33.3	12.8	36.1	31.0	29.1	24.2	20.1	20.4	26.5
Shenzhen	94.9	69.3	53.3	32.9	28.3	49.9	39.3	28.4	18.9	14.0	14.2	38.4
Qingdao	28.0	17.5	27.1	37.1	24.7	29.2	24.3	21.2	22.8	22.1	22.9	25.1
Ningbo	27.2	37.0	70.7	50.1	34.0	53.3	48.9	45.3	30.3	36.7	30.9	41.7
Guangzhou	23.1	22.4	40.2	21.0	14.1	33.9	26.6	19.9	41.5	42.2	37.2	28.9
Tianjin	13.6	9.0	27.8	31.2	17.7	19.7	25.4	26.2	26.0	23.9	19.4	21.6
Xiamen	36.5	19.6	29.9	27.9	19.4	35.1	33.1	23.2	16.5	20.0	15.4	24.9
Dalian	9.6	15.6	39.9	37.0	18.8	12.7	23.7	32.3	21.7	19.3	18.8	22.3
Top-8 China ports	31.6	26.7	39.3	33.0	20.0	36.4	32.5	28.1	23.8	22.1	21.2	28.5
Other regions												
Hong Kong	8.2	0.1	11.2	11.6	-1.5	7.4	6.8	7.5	2.8	4.1	1.9	5.3
Singapore	9.2	7.1	5.3	7.2	-8.9	8.8	8.7	15.9	8.7	6.9	12.7	7.1

The Guangzhou port hub, on the other hand, has been experiencing accelerated growth, its throughput growth rising to an 38.5% in 2007, from 23.1% in 1997. Further, its 38.5% container throughput growth in 2007 was significantly above the average growth of 21.2% for the top-eight China container ports.

The differing growth profiles of China،s port hubs by and large reflect their differing capacity expansion profiles and competitive landscapes.

The Shenzhen port hub, for example, has continued to face slowing throughput growth, likely on the back of an increasingly large throughput base and heightened competition from the neighboring port hubs of Hong Kong and Guangzhou.[8]The acquisition of Container Terminal 3 and Container Terminal 8 in Hong Kong by PSA and Dubai Port in early 2005, and the progressive opening of Nansha Phase 2 in Guangzhou between end-2006 and end-2007, has intensified competition in recent years. While the opening of Dachan Bay container terminals Phase 1 (just off the coast of West Shenzhen) at end-2007 should lift the throughput growth of the overall Shenzhen port hub in 2008F, given that the ownership structure of Dachan Bay differs from that of the existing Shenzhen port operators, Dachan Bay is expected to put even more competitive pressure on the incumbent port operators in West and East Shenzhen.

In fact, we highlight West Shenzhen as one area that could see particularly intense competition in 2008F and beyond.

3.2 The background of Yangtze River Delta economic zone and ports in the area

3.2.1 The background of Yangtze River Delta economic zone

Yangtze River Delta Economic Zone is the economic region in China that includes Shanghai municipality, Zhejiang and Jiangsu province. The region accounts for 20 percent of China's Gross Domestic Product and is responsible for one third's its imports and exports.[9]

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[8] *Containerization International Yearbook* ,2000

[9] http://www.zbjj.org/

The Yangtze River Delta (YRD) economic zone refers to 16 cities in Shanghai, southern Jiangsu, eastern and northern Zhejiang.

As been shown in figure3-1, they are Shanghai, Nanjing, Suzhou, Wuxi, Changzhou, Yangzhou, Zhenjiang, Nantong, Taizhou, Hangzhou, Ningbo, Huzhou, Jiaxing, Shaoxing, Zhoushan and Taizhou.

Figure 3-1 The main cities in Yangtze River Delta

Source:
http://www.ce.cn/kfq/zht/2006/jjzx/chj/200607/07/t20060707_7648346.shtml

The Yangtze River Delta Economic Zone is dominated by Shanghai which is mainland China's financial center and other important economic hubs like Nanjing, Suzhou, Hangzhou, Ningbo and Xuzhou. The vast interior of the Yangtze River Delta is heavily industrialized with advanced transport infrastructure such as highways, expressways, airports and ports.

The region already accounts for 4.66 trillion yuan (682.21 billion U.S. dollars) in 2007, up 15.2 percent year on year. Its forecasted GDP in the delta would hit

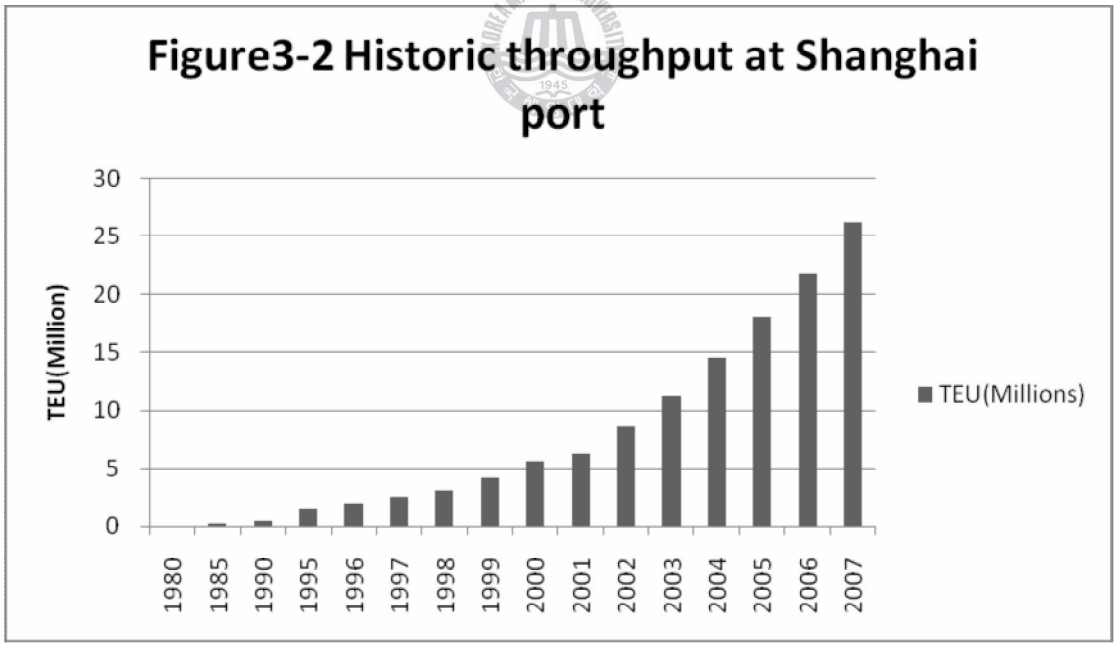
15.95 trillion yuan by 2020, based on the annual growth rate of 11 percent[10].

Shanghai predominates in the finance, banking, property, automobiles and logistics industry. Suzhou is a strong manufacturing base for foreign companies. Nanjing is a hub for the automobile industry, electronics, education, energy, iron and steel industries. Ningbo is a growing economic port which provides imports and exports routes for neighboring provincial cities.

The waterways in the YRD are the most important in eastern China. Two of the top busiest ports in China are located in this region. They are the Port of Shanghai and Port of Ningbo.

3.2.2 Ports in Yangtze River Delta

As mainland China's traditional industrial centre, Shanghai is often the focus of worldwide attention. As shown in figure3-2, the throughput of Shanghai container port has developed dramatically since the reform (or 'opening up') of mainland China's economy began in 1978.



Source: Constructed by author using information from various sources

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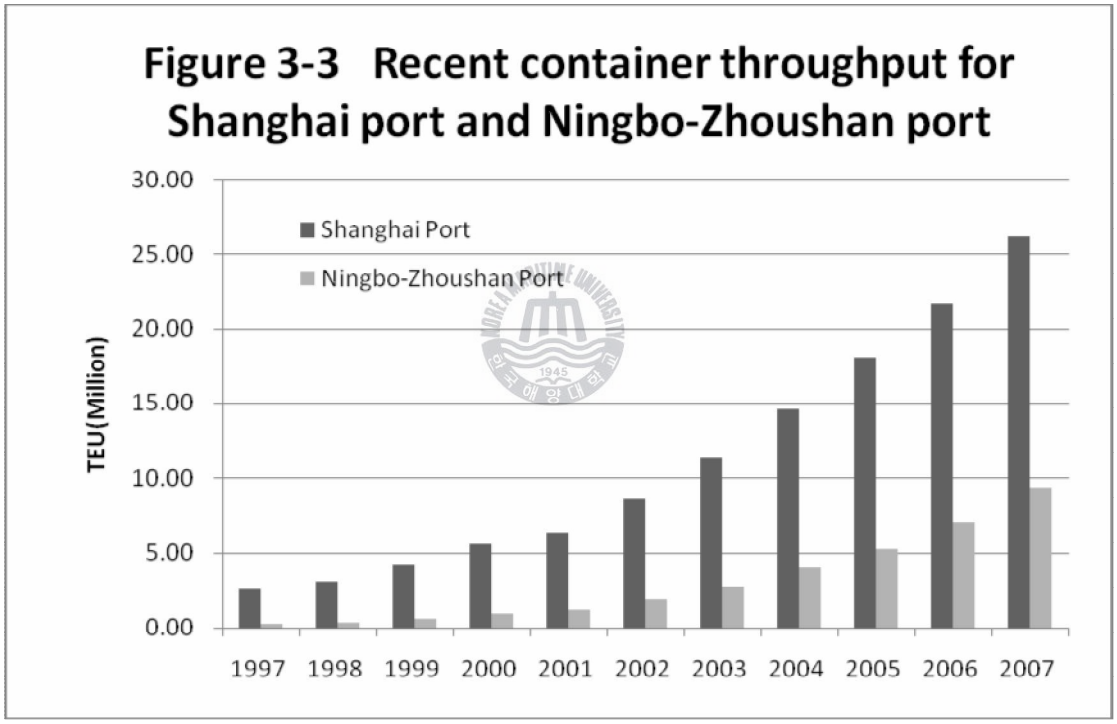
[10] *Statistical Yearbook of China* 2008

A more recent picture of container throughput at both Shanghai and Ningbo container ports (see figure3-3) reveals that the phenomenal growth of Shanghai's international container throughput has continued. It also shows, however, that the port of Ningbo now constitutes a significant threat to Shanghai's position as the leading container port on the central eastern seaboard of mainland China. As can be seen in the graph, the (largely international) container throughput to the hinterlands of the two ports has continued to expand at a very high average annual growth rate of approximately 31% over the period 1997-2007. In addition, the graph reveals that Ningbo's market share of the two ports' total international container throughput has been consistently increasing over this period, at the expense of Shanghai.



Source: Constructed by author using information from various sources

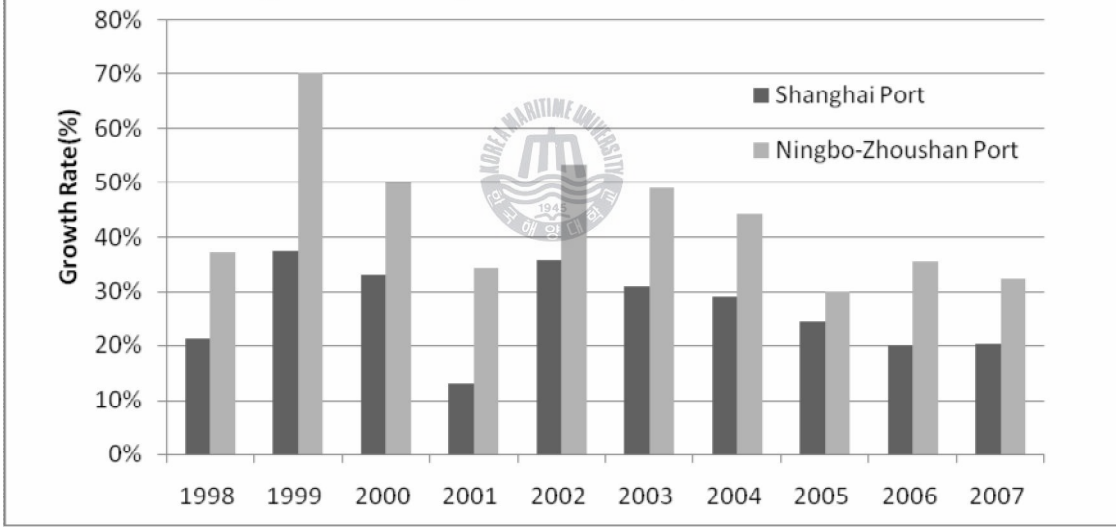
By inspection of the comparative annual growth rates in throughput at the two ports over the period 1998-2007, some insight can be gained into why this has been the case. Figure 3-4 clearly shows the vastly superior growth at Ningbo compared to Shanghai over this period. Given its lower base in terms of absolute level of throughput, however, this is not a wholly unexpected result.

In 2007, Ningbo achieved a great annual increase in container throughput--32%.

Spurred on by a tremendous expansion in the industrial output of its natural hinterland of Zhejiang province, as well as by the fact that it is one of just four credible transshipment hubs in the Chinese mainland, Ningbo handled just over 9 million TEU. In consequence, in terms of throughput handled, it moved from being ranked 23 to 11 in the world league of container ports.[11]

Port of Suzhou is an important inland river transport hub. It is in situated in Jiangsu province. It consist of three ports in Zhangjiagang, Changshu and Taicang on the lower reaches of the Yangtze River. The total cargo throughput is about 127 million tons in 2006. It is the largest inland river port in China. The majority of the port trade is in coal, ore, steel, and construction materials such as cement.

Figure 3-4 Recent annual growth rates in container throughput for Shanghai and Ningbo-Zhoushan port



Source: Constructed by author using information from various sources

Port of Nanjing is the largest inland port in China, yearly throughput reaching 108.59 million tons in 2007. The port area is 98 kilometers (61 mi) in length and has 64 berths including 16 berths for ships with a tonnage of more than 10,000. Nanjing is also the biggest container port along the Yangtze River; in March 2004, the one million container-capacity base, Longtan Containers Port Area opened, further consolidating Nanjing as the leading port in the region. In

[11] *Containerization International Yearbook,* 2008, p.79

the 1960s the first Yangtze river bridge was completed, becoming almost the only solid connection between North and South in eastern China at that time. The bridge became a source of pride and an important symbol of modern China, having been built and designed by the Chinese themselves following failed surveys by other nations and the reliance on and then rejection of Soviet expertise. Begun in 1960 and opened to traffic in 1968, the bridge is a two-tiered road and rail design spanning 4,600 meters on the upper deck, with approximately 1,580 meters spanning the river itself.

Wenzhou Port lies on the southeast coast of China with Ningbo Port the north and Fuzhou Port the south. In the southeast, Kaohsiung and Keelung of Taiwan are separated by the sea. It locates the Economic Delta of Yangtze River which is led by Pudong, Shanghai. The port's coastline is 350-kilometre-long. With the superiority in geography, Wenzhou Port is one of the 25 main coastal ports of China and the center of offshore transportation and ocean shipping of southern Zhejiang Province, playing an important role in the integrated transportation system of China.

3.3 Shanghai port

3.3.1. Overview of Shanghai port

Port of Shanghai is situated at the middle of the 18,000km-long Chinese coastline, where the Yangtze River, known as "the Golden Waterway", flows into the sea. It is the leading port in the T-shaped waterway network composed by the Yangtze River and the coastline, and is also China's largest comprehensive port and one of the country's most important gateways for foreign trade.

It is faced towards the northern and southern coastal seas of China and the oceans of the world, and is linked with the Yangtze River and the inland waterways of Yangtze River Valley region such as Jiangsu, Zhejiang and Anhui provinces etc. Expressway and state-level highways lead the Port to the national highway network to all regions of the country.

Therefore, the Port enjoys an advantageous geographical location, favorable natural conditions, vast economically developed hinterlands, and complete inland distribution infrastructure and facilities.

Port of Shanghai serves vast hinterland in the Yangtze River Delta and the entire Yangtze River valley. The Yangtze River Delta is home to a cluster of cities which are the most economically vibrant area in China. These areas will prove to be the powerhouse for the sustainable growth of the Port of Shanghai.

The annual import and export trade through Shanghai, in terms of value, accounts for a quarter of China's total foreign trade. The Port's container throughput in 2006 reached 21.71 million TEUs, ranking it the third largest container port in the world for three years running.

3.3.2 Strategies of Shanghai port

To become an outstanding global terminal operator is our vision; and "further developing the home port while expanding to the world" is our main strategy.

In five years into the future, through the implementation of the Yangtze River Strategy, the Northeast Asia Strategy and the Internationalization Strategy, SIPG will maintain a sustained, healthy and fairly fast growth of its container-related businesses, secure major breakthroughs in the transshipment business, and establish and reinforce Shanghai's position as an international shipping center.

(1) The Yangtze River Strategy is designed, through the exportation of management, capital and technology, to foster the container market, strengthen cargo consolidation network and gather hinterland cargo sources, with a view to serving the Yangtze River Delta and Yangtze River Valley and achieving the sustainable development of SIPG.

Through the implementation of the Yangtze River Strategy and on the basis of the framework characterized by "dot-line-plane" that has already been accomplished, SIPG will carry out more in-depth optimization of its investment layout in Yangtze River ports, and foster a number of main feedering hub ports in the Yangtze River represented by Chongqing, Wuhan and Nanjing. The potentials of the "Golden Waterway", that is, the Yangtze River, will be fully developed and exploited, and the advantages of intensive management of the Dispatch Center for Yangtze River Inner Feeder Services will be further utilized. SIPG will join in the efforts to promote the upgrading of vessel size and standards on the Yangtze River, and the improvement of navigational and shipping capacity. Eventually, as a result of consolidating port, shipping and agency resources, a regional cargo gathering network will take shape, one that has Shanghai as its terminus and covers the entire Yangtze River Valley.

(2) The Northeast Asia Strategy is designed to develop ship-to-ship transshipment operations with Yangshan port area as the center, establish the Port of Shanghai as an international shipping center, and achieve the rapid development of SIPG.

To implement the Northeast Asia Strategy, the functional positioning of Yangshan deepwater port area, Waigaoqiao port area and Wusongkou port area

will be decided so as to determine the focal aspects of the services provided by the respective port areas, to design a rational shipping service placement plan, to establish a highly efficient and economical barging system, and to enable integrated operation of the port areas. These efforts will lead to the decision by liner companies to choose the Port of Shanghai as their priority hub for their container transshipment operations in Northeast Asia. The development of a coastal public feeder network will upgrade Shanghai's ability to gather cargo within the Northeast Asia region, and achieve seamless connections of Yangtze River, coastal and international transshipment. Overall marketing and major account management will be promoted so as to win customers with high-quality services. The concept of "The Port of Shanghai, Your Best Choice" will be publicized, and a good pattern will be take shape whereby various stakeholders and the Port can achieve mutual progress and growth.

(3) SIPG will also implement its Internationalization Strategy. To this end, it will foster its capability of international operations, improve its levels of international management, and gradually form a cross-regional and multinational operational pattern that is geared both to the domestic and international markets[12]

3.3.3 Container terminal operators in Shanghai

Shanghai International Port (Group) Co., Ltd. is the exclusive operator of all the public terminals in the Port of Shanghai. Incorporated in January 2003 by reorganizing the former Shanghai Port Authority, SIPG is a large-scale business conglomerate specialized in the operation of port and related businesses. In June 2006, SIPG was turned into a share holding limited company. After listing as a whole company in October 2006, Shareholders of SIPG are: the municipal government of Shanghai with 44.23%, China Merchants International Terminals (Shanghai) Co., Ltd. With 26.54%, Shanghai Tongsheng Investment (Group) Corp. with 16.81%, Shanghai State-assets Operation Co. and Shanghai Dasheng Assets Co. with 0.44% respectively.(shares that cannot be sold without certain conditions)

In total, SIPG operates 125 berths on a total quay length of around 20 kilometers, among which, 82 of these berths can accommodate vessels of 10,000dwt class or above. QC. Except the container terminal, SIPG also owns public bulk, specialized Ro/Ro terminal and cruise terminal. SIPG operates warehouses with

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[12] http://www.portshanghai.com.cn/sipg/intro/intro5.php

a total area of 293,000m2, storage yards with a total area of 4,721,000m2, and owns 5,143 units of cargo handling equipment.

In total, SIPG currently has 16 branch companies, 8 wholly-owned subsidiaries, 9 majority-owned subsidiaries, and 3 companies with equity participation.

The main branch companies of SIPG are:

(1) Shanghai Pudong International Container Terminals Ltd (Waigaoqiao Phase-1 Terminals):

Shanghai Pudong International Container Terminals Limited is a joint-venture established on March 1, 2003 and invested by Shanghai Waigaoqiao Free Trade Zone Stevedoring Co., Hutchison Ports Pudong Limited,COSCO Pacific (China) Investments Limited and COSCO Ports (Pudong) Limited.

Shanghai Pudong International Container Terminals Limited is located on the south bank of the Yangtze River, in Area A of the Waigaoqiao Free Trade Zone, and adjacent to the Outer Ring Road, Yanggao Road and the Hu-Chong-Su (Shanghai-Chongming-Jiangsu) Cross-River Project which is under preparation for construction. The Terminal has a total quay length of 900 meters, and its three container berths are able to accommodate the fifth and sixth generation container ships. Its land area is 500,000m2 with a container yard of 8,200 flat container slots capable to stack 30,000 TEUs at the same time.

The well-equipped and technology-intensive Shanghai Pudong International Container Terminals Limited has 147 machinery and equipment of various kinds, including 10 quay cranes, 36 RTGs, 73 container trucks and 11 forklifts. It is one of the modernized container terminals with high-tech content in China, through technological development and innovation, it employs advanced systems in the operation of containers such as CTMS real-time production, marshalling and controlling of the container trucks of the whole yard, handling of containers with the same multiples and the intelligent container yard. The Company provides the shipping lines and its customers with tailor-made quality service by the establishment of a safe, convenient, economic and reliable service platform.

(2) SIPG Zhendong Container Terminal Branch Ltd (Waigaoqiao Phase 2-3 Terminals):

SIPG Zhendong Container Terminal Branch, a SIPG wholly-owned subsidiary company, is situated on the west bank of the Yangtze River at the north side of

Waigaoqiao, Pudong New Area, Shanghai. It is at a distance of 6km from Wusongkou in the west, and about 85km from the mouth of the Yangtze River in the east. The terminal has a quay length of 1,566m with 5 large container berths and is equipped with 13 quay cranes. The land area is 1,659,000m2. It has maintained a momentum of development by leaps and bounds since its formal operation in July 2000.

(3) Shanghai East Container Terminals Co., Ltd (Waigaoqiao Phase-4 Terminals):

Shanghai East Container Terminals Co., Ltd is a joint-venture company invested and established by Shanghai International Port Group Co., Ltd and APMT Terminals. The Company was set up on September 12, 2002 with a registered capital of RMB 1.10 billion. It has a total quay length of 1,250 meters, four container berths for the main services and other two for the inland feeder services. It covers a land area of 1,550,000m2 and is equipped with 13 quay cranes and 48 RTGs.

The company possesses 4 berths which can accommodate the 4th generation container vessel and two berths for barge . The total length of the berth is 1250 m for line haul and 186 meters for barge respectively. The designed water depth reaches 14.2 m with total land area of 1.55 million square meters and yard area of 707,800 square meters. The designed throughput is 1.8 million TEU per annum.

There are 14 Quay Cranes which consists of 12 OPM cranes with lifting capacity of 61 ton each and outreach of 63 meters; 2 barge cranes with lifting capacity of 40 ton and outreach of 35 meters; and 48 RTGs with 40 ton and 50 ton rated loading capacity respectively of single lift, 72 hustlers (OTTAYA-capacity-of-60 ton) and 15 other handling equipments (reach stacker, top loader, empty handler & forklifts).

(4) Shanghai Mingdong Container Terminals Ltd (Waigaoqiao Phase-5 Terminals):

Shanghai Mingdong Container Terminals Limited was jointly invested by SIPG and Hutchison in September 2004. The investment is RMB 4 billion, with each party holding 50% of the share. The main business scope includes: handling, transfer, storage and distribution of containers and bulk and break-bulk cargoes; washing, maintenance, stuffing and stripping, storage and keeping of containers; freight depot and transport within the port area; provision of relevant technical consulting and information service.

Located at the estuary of the Yangtze River, Mingdong Company covers an area

of 1,630,000m^2. It is about 15.5km away from Wusongkou, opposite to Changxing island in the north, adjacent to Shanghai East Container Terminal Co., Ltd in the northwest. The port area is connected to the Outer Ring Road and Wuzhou Avenue, with easy access.

The Company has four container berths of 50,000-tonnage with a quay length of 1,100m. The two domestic feeder line berths are of 3,000-tonnage with a quay length of 190m. The water depth of the container terminal and the domestic feeder line terminal is ㅣ12.8m and ㅣ4.0m respectively. It has 12 quay cranes that can deal with the containership with 20 rows of containers.

(5) Shanghai Shengdong International Container Terminals Co., Ltd (Yangshan Port):

Shanghai Shengdong International Container Terminals Co., Ltd was invested by SIPG on May 31, 2005 with a registered capital of RMB 5 billion. The major responsibility of the Company is to operate and manage the Phase-1 and Phase-2 terminals of the Yangshan Deepwater Port Area as well as to fund and run the auxiliary and supporting project, the International Logistics Park in the Port Area.

The Phase-1 terminal of the Yangshan Deepwater Port was officially launched on December 12, 2005. Since then, the Company has constantly improved the production efficiency with its matured production management system, perfect computer operation system, sophisticated equipment and facilities and high-qualified staff teams. And now the Yangshan Phase-1 terminal is second to none in terms of operation with its annual designed capacity of 2.2 million TEUs at the first year of its launching. On December 10, 2006, Yangshan Phase-2 terminal was successfully opened, and the harmonious and combined operation of the Phase- 1 and Phase-2 terminals was realized. Currently, the Port boasts a 3,000m-long deepwater quay length, 34 world most up-to-date container quay cranes, 120 RTGs and other handling and transportation facilities.

3.4 Ningbo-Zhoushan port

3.4.1 Overview of Ningbo-Zhoushan port

Ningbo Port is well situated in the middle of China､s coastline, at the T-shaped joining point of China､s coastline and the Yangtze River. It､s a famous deep-water port of mainland China. It enjoys unique natural conditions with

convenient traffic reaching in all directions. Outwardly the port links East Asia and the whole round-the-Pacific region. It's within 1000 sea miles to Hongkong, Gaoxiong of Taiwan, Pusan, Osaka and Kobe It connects inwardly China's coastal ports and covers directly the whole East China and the economically developed Yangtze River Valley by river-sea through transport via the Yangtze River and the Grand Canal. It's therefore an ideal place for developing ocean-going transport to the ports of America, Europe, the Middle East and Oceania. With deep water and smooth current, the port area of Ningbo is free from strong winds and waves. The entry channel is normally over 18.2 meters deep. Large ships of 250,000 up to 300,000 tonnage can come and leave at tide. With an exploitable deep-water coastline of over 120 km, Ningbo Port owns broad developing and construction prospects. On the north of Beilun Port Area, Zhoushan Islands serve as its natural defense, so there is no need to build breakwaters when constructing berths at Beilun Port Area. Less investment can produce better benefits. Besides there is a wide and plain dockland behind the deep-water coastline, which is extremely good for developing port storage, warehousing and littoral industry.

3.4.2 Strategies of Ningbo-Zhoushan port

The rapid development of Ningbo Port benefited from its unique natural conditions. By now the port's throughput capacity and cargo throughput have all surpassed 100 million tons. There are 110 shipping lines for container transport and 480 regular liner services per month. The first 20 shipping companies of the world have all set up their agencies in Ningbo. There are complete port inspection set-ups in Ningbo, which are speedy and efficient in work. From May of 1996, all the inspection and service set-ups of Ningbo entered the port area and worked together, undertaking coordinated services of customs declaration, inspection, finance, insurance, ship agency and cargo agency for customers. From the end of June of 1999, approved by the Customs Administration General, the business of through clearance between Hangzhou and Ningbo was formally started, facilitating cargo owners in Hangzhou district to go through locally the formalities of customs declaration of international container, exchange settlement and drawback. The through container transport between Hangzhou and Ningbo reduced transshipping links greatly. At the same time, storage yards for international container were built at the industrial park of Jinhua City and a commodity inspection organ was set up at the through supervising spot from Jinhua to Ningbo Customs House, providing an economic and convenient passage to the sea for the inland areas of Zhejiang Province. In order to speed up the construction of a deep-water hub port and a main line port for international container to suit the needs of developing international trade and ocean-going container transport, many super large terminals for international container will be planned and built in Ningbo Port. By 2007 a first-class international deep-water hub port and a main line port for

international ocean-going container transport will take an initial shape, serving as an outer deep-water port for Shanghai International Shipping Center. Ningbo Port will also be the leading logistics enterprise of Ningbo and Zhejiang. By then 5 transshipment bases for container, crude oil, iron ore, liquid chemicals and coal, as well as the port logistics information platform will be completed and put into operation. Cargo throughput is to reach 250 million tons, making Ningbo Port one of the 5 largest ports of the world. The port will own container throughput of 7 million TEU to rank among the first 15 ports of the world and among the first 4 of China[13]

3.4.3 Container terminal operators in Ningbo-Zhoushan

Jointly founded by Ningbo Port Group, China Merchants International Container Terminals and other six companies, Ningbo Port Group Stock Co., Ltd., was officially launched on April 18th, 2008, which means Ningbo Port、s initial public offering is on countdown.

Ningbo Port Group Co., Ltd. was established in April 2004 when the former Ningbo harbor Bureau separated government functions from enterprise management as per the requirements of the State Council and Ningbo City on Reform of Port Management System. For the four years since its establishment, the port has achieved a sustained, rapid and healthy development with all the production and operation indicators coming up top in port industry in China. The port has remained the second in cargo throughput and the 4th in container throughput in China (world、s top 11th)

Based on this new starting point, the newly established Ningbo Port Stock Co., Ltd. adopts perfect corporation governance structure, sound internal control system and sufficient construction capital and resource to gear with the international market ensure preservation and appreciation of state assets value and to return the shareholders and the society by an outstanding performance.

Ningbo Port Stock Co., Ltd. was formerly named Ningbo Harbor Bureau. Ningbo Port is composed of Beilun Port Area, Zhenhai Port Area, Ningbo Port Area, Daxie Port Area and Chuanshan Port Area and is a multi-functional and comprehensive modern deep-water port integrated by inner river port, estuary

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[13]http://www.nbport.com.cn/wps/potal/gongsijieshao?WCM_GLOBAL_CONTEXT=/wps/wcm/connect/WebContent/cdb0bd69-b266-4e99-987d-67e20adf1fec/b2a07142-5153-42c2-9f58-00f13944549d/24fe2faa-85fc-435e-82ee-5ea48ccf8ce7/

port and sea port. Presently, the port has 309 productive berths, including 60 10,000-dwt deep-water berth or above. The largest terminals including a 250,000-dwt crude oil terminal, 200,000-dwt ore stevedoring terminal (also capable of berthing 300,000-dwt ships), the 6th generation specialized international container berth and 50,000-dwt specialized liquid chemical products berth. The port has open to navigation to more than 600 ports in over 100 countries and regions around the world. Ningbo Port mainly engaged in stevedoring, storage and transfer of imported iron ores, domestic and foreign trade containers, crude oil and product oil, liquid chemical products, coals and other bulk cargos. The cargo throughput of Ningbo Port was 345 million tons in 2007, increased by 12% year on year, second only to Shanghai Port and ranking the second among ports in China. Despite of slowdown of world economy in 2008, the container throughput of Ningbo Port hit the breakthrough of 10 million to 10,846,000 TEUs, an increase of 16% year on year. As a result, the port ranked among world‧s Top 10 ports, ascending to 8th from 11th.

3.5 The Competitiveness of Shanghai port and Ningbo-Zhoushan port

3.5.1 Natural condition

Ningbo Port is well situated in the middle of China‧s coastline, at the T-shaped joining point of China‧s coastline and the Yangtze River. It‧s a famous deep-water port of mainland China. With deep water and smooth current, the port area of Ningbo is free from strong winds and waves. The entry channel is normally over 18.2 meters deep. Large ships of 250,000 up to 300,000 tonnage can come and leave at tide14. With an exploitable deep-water coastline of over 120 km, Ningbo Port owns broad developing and construction prospects. On the north of Beilun Port Area, Zhoushan Islands serve as its natural defense, so there is no need to build breakwaters when constructing berths at Beilun Port Area. Less investment can produce better benefits. Besides there is a wide and plain dockland behind the deep-water coastline, which is extremely good for developing port storage, warehousing and littoral industry.

Ningbo-Zhoushan ports have obvious advantages in depth of water which was the most important factor of port nature factor. According to the index of

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[14] Kevin Cullinane Port Competition between Shanghai and Ningbo

International Shipping Center, the depth of water should be more than -14 meters. The average water depth is about -9 meters in Shanghai before the construction of Yangshan deep sea port, the container vessels are limited seriously by it. The deep water factor is one of the comparative advantages of Ningbo-Zhoushan port.

3.5.2 Price (direct cost to liner companies)

Port charges in mainland China are based very closely on a standard rate specified by China、s Ministry of Communications. It includes separate charges for stevedoring, piloting and tugs. Currently Shanghai and Ningbo both adopt a more flexible pricing policy than sticking simply to the centrally set standard rates. Their approach is characterized by a differentiation between large and small customers, especially with respect to the stevedoring charge. Generally, large mainline operators receive a 10% discount compared with coastal liner operators. As at the time of writing, in May 2009, the stevedoring charges listed in Table3-3 and it shows it is same at the two ports.

Table 3-3 Stevedoring charges in Shanghai and Ningbo-Zhoushan container terminals in RMB (May 2009)

	20GP	40GP	40HQ
Terminals in Shanghai	370	560	560
Terminals in Ningbo-Zhoushan	370	560	560

Source: *Port competition between Shanghai and Ningbo,* Maritime Policy & Management 2005 p. 341

The piloting tariffs are all based on a Ministry of Communications standard rate. For distances less than 10 nautical miles, the rate is 0.5 RMB per net ton. For any distance above 10 nautical miles, the rate for the rest of the voyage is 0.005 RMB per net ton per nautical mile. Since the piloting distance for Ningbo is relatively shorter than for the terminals in Shanghai, especially STC, so the piloting charges payable in Ningbo are generally less than those prevailing in Shanghai.

The tug tariffs for the ports of Shanghai and Ningbo are given in table 3-4 and table 3-5.

Table 3-4 Shanghai port tug tariff in RMB (May, 2009)						
Length of vessel (meters)	>220	180-220	155-180	122-155	95-133	<95
Yangshan port	58600	45200	35200	33100	18400	17800
Waigaoqiao	59200	48800	43500	34200	32600	27300

Source: *Port competition between Shanghai and Ningbo,* Maritime Policy & Management 2005 p. 342

Table 3-5 Ningbo-Zhoushan port tug tariff in RMB (May, 2009)					
Length of vessel (meters)	>320	251-320	171-250	121-170	<120
Yangshan port	48760	39000	31620	22140	14700

Source: *Port competition between Shanghai and Ningbo,* Maritime Policy & Management 2005 p. 342

Stevedoring, piloting and tug charges are the three major port costs incurred in calling at a mainland Chinese port. Together, they account for about 90% of the total direct cost of a vessel、s call at port. By broadly comparing the cost associated with the port calls of ships of similar size, it is self-evident that Ningbo possesses a definite price advantage.

3.5.3 Informationization level

Informationization level is also an important index of hub ports. The efficiency of port works could be increased by high informationization level. The informationization level depends on the implement condition of EDI.

Shanghai port has paid much attention to promote informatization and advanced equipments. The service objects of EDI platform are wide, which include government, port authority, liner, ship agent, cargo agent, tally company and so son. Especially in recent years, Shanghai has accelerated the construction of port infrastructure.

Comparatively speaking, although Ningbo-Zhoushan port has started the development of EDI system, the coverage rate is much lower than in Shanghai

port because of the backward equipments and it limit the further development of Ningbo-Zhoushan port.

3.5.4 Port service

The quality of port service in shanghai is better than in Ningbo-Zhoushan port. It is one of the most important factors of port competitiveness. The major reason of that Hong Kong Port and Port of Singapore could be huge ports of transshipment is high level port service and relative low price. Compare with Ningbo-Zhoushan port, the port service in Shanghai port is much better in piloting service as well as VTS, port facilities and port safety work. The list of major port facilities of the two ports are given in table 3-6 and table 3-7

Table 3-6 List of port facilities of Shanghai port (2007)

Company	Length of Berth	Number of berth	Quay Cranes	GTG	Forklifts and Reach Stackers	Truck
	(Meter)	(Unit)	(Unit)	(Unit)	(Unit)	(Unit)
Shanghai Pudong International Container Terminals Ltd	900	3	11	42	12	73
SIPG Zhendong Container Terminal Branch Ltd	1634	6	25	78	20	80
Shanghai East Container Terminals Co., Ltd	1250	4	14	48	15	72
Shanghai Mingdong Container Terminals Ltd	1110	4	16	48	25	88
Shanghai Shengdong International Container Terminals Co., Ltd	3000	9	34	108	26	220
Shanghai Container Terminals Ltd	2281	10	19	56	22	89
Total	10175	36	119	380	120	622

Source: Constructed by author using information from various sources

Table 3-7 List of port facilities of Ningbo-Zhoushan port (2007)						
Company	Length of Berth	Number of berth	Quay Cranes	GTG	Forklifts and Reach Stackers	Truck
	(Meter)	(Unit)	(Unit)	(Unit)	(Unit)	(Unit)
Beilun Second Container Limited Company	1238	5	14	42	12	110
Ningbo Beilun International Container Harbor Limited Company	900	3	11	36	9	28
Ningbo Port Ji Harbor Business Limited Company	1400	4	5	52	8	110
Ningbo Far East Harbor Business Limited Company	385	1	8	12	10	50
Merchants International Terminals Co,Ltd. Daxie Ningbo Port	930	2	9	30	8	12
Zhenhai Harbour Limited Company	460	1	3	4	2	4
Total	5313	16	50	176	49	314

Source: Constructed by author using information from various sources

According to the two tables, it is obvious that major facilities in Shanghai port are about twice as much as in Ningbo-Zhoushan port. It supports Shanghai port providing high level service by reduce average loading time of vessels.

3.5.5 Hinterland

The major comparative advantage of Shanghai port is its huge hinterland | Yangtze River Delta area. Collecting and distributing system of this area is developed and it has advantage in industry, science, nature resource,

skilled labor and demand of consumption. As the economic development of western in China, it would generate a lot of container cargoes from this area. Shanghai port could absorb these cargoes through multi-modal transport system and make western of China to be the direct economic hinterland of Shanghai port.

The hinterland of Ningbo-Zhoushan port is much smaller than Shanghai port. The main hinterland of Ningbo-Zhoushan port is south-east of Zhejiang province. Cargoes generated from Hangzhou, Jiaxing, and Huzhou are mostly exported or imported through Shanghai port. Because of the underdevelopment of railway transport in Ningbo, road transport is the main way for cargo collecting and distributing. In addition, the liners and sea routes in Shanghai port are much more than in Ningbo-Zhoushan port, so under the same condition, the shipper in other area would choose Shanghai port.

Chapter 4

Analysis of relationship between Shanghai port and Ningbo-Zhoushan port

4.1 HHI Index model

Several indicators may be used to measure concentration. A very direct way to measure concentration is simply to count the players in the market. Intuitively, a higher number of competitors are more likely to be associated with a lower level of concentration. This approach has the advantage of simplicity. It also suffers, however, from the serious drawback that the market share of each company is not reflected in the approach.

Defined as the sum of market shares of the four largest firms, the C4-index, along with the similar C8, C20 and C50-indexes, can to some extent overcome the weaknesses associated with counting the number of the firms in the market. This index has been used for analysis and regulatory policy up to the 1980s. The main problem with this indicator is the arbitrary character of its cut-off point. For instance, in some markets, the four largest suppliers may indeed be the relevant level to measure concentration. In other markets, the two or the five largest suppliers may be more relevant.

The HHI index accounts for the number of players in a market, as well as their concentration, by incorporating the relative size (measured by market share) of all firms in a market. It is calculated by squaring the market shares of all firms in a market and then summing the squares, as shown in (1):

$$D = \frac{\sum_{i=1}^{n} TEU_i^2}{\left(\sum_{i=1}^{n} TEUi\right)^2} \quad (1)$$

In equation (1),

D= the Concentration ratio of port system in Yangtze River Delta,

TEUi = the container throughput of port i.

n= the number of ports in the port system.

Consider the extreme case where one port has a market share of one hundred percent , than HHI index equals to 1. By contraries, if the container throughputs of the ports located in the port system are same, HHI index should be 1/n. Generally speaking, HHI index more than 0.1 represents the port system is concentrated. It shows that the port system is highly concentrated when HHI index is more than 0.18.

In order to research the concentration ratio of container ports in Yangtze River Delta, the author calculates the result by HHI index model using the recent 8 years throughputs of 8 main ports in this area. The author also calculates the share of the Port of Shanghai, the share of the Port of Ningbo-Zhoushan and the share of the summation of the two ports. The result is shown as Table 5-1

Table 4-1 Concentration Analysis of ports in Yangtze River Delta

	2000	2001	2002	2003	2004	2005	2006	2007
HHI index	0.623	0.597	0.589	0.566	0.549	0.533	0.512	0.487
ROSH	76.4%	75.9%	76.1%	72.3%	71.0%	68.6%	64.5%	60.7%
RONB	12.2%	14.5%	16.4%	17.8%	19.5%	19.8%	21.0%	21.7%
ROTP	88.6%	90.3%	92.6%	90.1%	90.6%	88.4%	85.5%	82.4%

Source: Constructed by author using information from various sources
ROSH represent the market share of Shanghai port.

RONB means the market share of Ningbo-Zhoushan port.

ROTP is the summation of ROSH and RONB.

In the recent 8 years, the market share of Shanghai port is floating between 60%--77%. It represents that as the hub port of Yangtze River Delta, Shanghai port has big advantage compare with other ports in this area. As the development of other small and medium ports located in Yangtze River Delta, the share of Shanghai port decreased from 76.4% to 60.7%, and it is estimated to getting lower in the future but it still enjoy absolute advantage in this area.

The share of Ningbo-Zhoushan port keeps on a rise during the last 8 years from 12.2% to 21.7%. The average annual increasing rate of Ningbo-Zhoushan port is 42.1%, which is much more than the increasing rate of China mainland. Because of the increasing of Ningbo-Zhoushan port、s share, ROTP increased from 81.2% to 90.7%, which represents the two ports has absolute advantage of container transport in the region and the concentration ratio is very high.

The HHI index of this port system is floating between 0.487-0.623. It is much more than 0.18 and we can prove the result again that the concentration of Yangtze River Delta is very high.

4.2 Correlation analysis

The initial purpose of this chapter is to investigate econometrically the current mechanism of Chinese port behavior. More concretely, special attention is given to the Port of Shanghai and the neighboring Port of Ningbo-Zhoushan. Both ports clearly form a competitive relationship and are managed by completely independent port bureaus under the control of the City of Shanghai and the City of Ningbo respectively. Their competitive relationship can be confirmed by the correlation analysis as detailed in Table 5-2, where the Port of Shanghai has negative sign in relation to the correlation coefficient. This indicates that the higher the market share of the Port of Shanghai is, the lower the share of the Port of Ningbo-Zhoushan.

The ˇunstable、 condition of the Port of Ningbo-Zhoushan is also clearly indicated in Table 5-2. Five other port (Zhangjiagang, Wenzhou, Changzhou, Nanjing, Nantong) are also clearly prime competitors to the Port of Ningbo-Zhoushan. In almost all cases, the correlation coefficient between Ningbo-Zhoushan port and the other five port are significant and negative. In contrast, the Port of Shanghai has a complementary relationship with the five ports. On the other hand, as a sea port in north Jiangsu, the Port of Lianyungang of the second competitor to Shanghai port and it has a ˇfriendly、 relationship with the Port of Ningbo-Zhoushan.

Table 4-2 Result of Correlations									
		Shanghai	Ningbo	Zhangjiagang	Wenzhou	Changzhou	Nanjing	Nantong	Lianyungang
Shanghai	Pearson Correlation	1	-0.887	0.837	0.830	0.914	0.325	0.884	-0.958
	Sig. (2-tailed)		0.003	0.009	0.011	0.002	0.432	0.004	0.000
	N	8	8	8	8	8	8	8	8
Ningbo	Pearson Correlation	-0.887	1	-0.621	-0.601	-0.718	-0.626	-0.992	0.847
	Sig. (2-tailed)	0.003		0.100	0.115	0.045	0.097	0.000	0.008
	N	8	8	8	8	8	8	8	8
Zhangjiagang	Pearson Correlation	0.837	-0.621	1	0.949	0.875	0.142	0.663	-0.850
	Sig. (2-tailed)	0.009	0.100		0.000	0.004	0.738	0.073	0.008
	N	8	8	8	8	8	8	8	8
Wenzhou	Pearson Correlation	0.830	-0.601	0.949	1	0.877	0.048	0.626	-0.852
	Sig. (2-tailed)	0.011	0.115	0.000		0.004	0.909	0.097	0.007
	N	8	8	8	8	8	8	8	8
Changzhou	Pearson Correlation	0.914	-0.718	0.875	0.877	1	0.235	0.707	-0.893
	Sig. (2-tailed)	0.002	0.045	0.004	0.004		0.575	0.050	0.003
	N	8	8	8	8	8	8	8	8
Nanjing	Pearson Correlation	0.325	-0.626	0.142	0.048	0.235	1	0.643	-0.418
	Sig. (2-tailed)	0.432	0.097	0.738	0.909	0.575		0.085	0.303
	N	8	8	8	8	8	8	8	8
Nantong	Pearson Correlation	0.884	-0.992	0.663	0.626	0.707	0.643	1	-0.864
	Sig. (2-tailed)	0.004	0.000	0.073	0.097	0.050	0.085		0.006
	N	8	8	8	8	8	8	8	8
Lianyungang	Pearson Correlation	-0.958	0.847	-0.850	-0.852	-0.893	-0.418	-0.864	1
	Sig. (2-tailed)	0.000	0.008	0.008	0.007	0.003	0.303	0.006	
	N	8	8	8	8	8	8	8	8

4.3 Linear regression model

4.3.1 Export logistics function

The export logistics volume through the Port of Shanghai and Port of Ningbo-Zhoushan is hypothesized to be determined by four factors. These include three basic economic factors (x1-x3) which are concerned with the port environment in China and one other factor (x4) which represent the service level and the market power of the port. Figure 3-5depicts their simplified causal relationship.

The function of the export logistics for the Port of Shanghai can be written as follow:

$$Y_{ei} = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + \varepsilon \qquad (2)$$

where:

Yei: Export logistics volume for the Port i

x1: Foreign direct investment in Yangtze River Delta by the six economies (Korea, Japan, Taiwan, Hong Kong, America and Europe). The sign of the coefficient of X1 will be in principle positive.

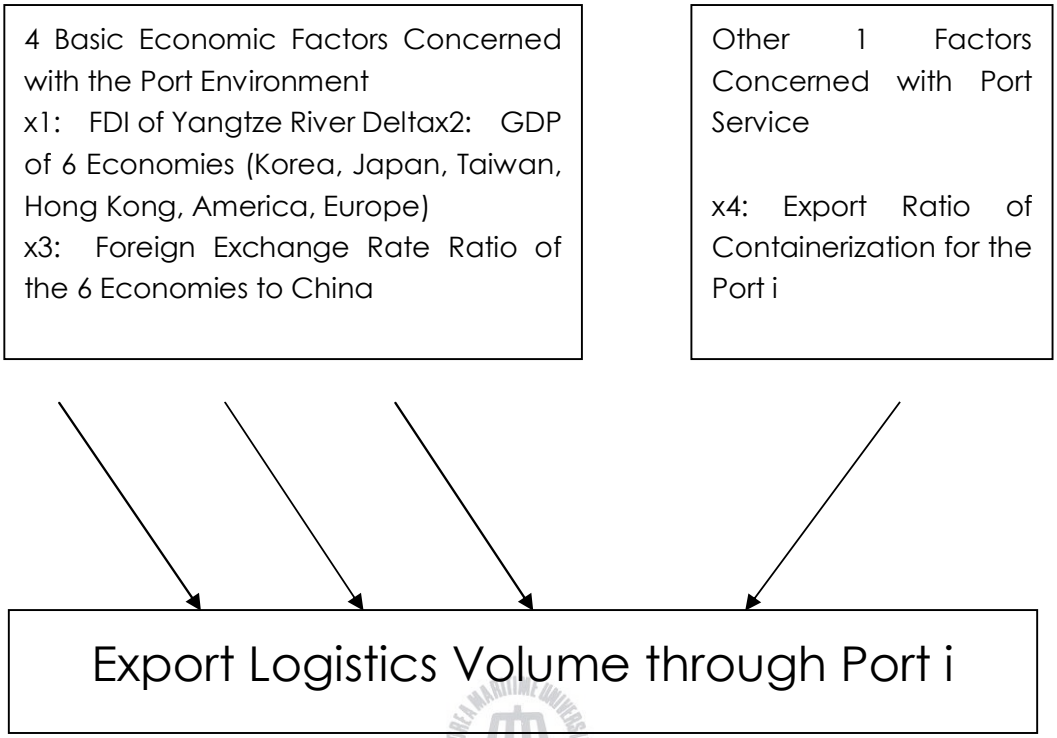
x2: GDP (Gross Domestic Product) of the six countries and economies. The coefficient will be positive.

x3: Ratio of the foreign exchange rate of China to the six countries and economies. The coefficient will be positive.

The other one export factors concerned with port service is as follow:

x4: Ratio of export container cargo volume through the Port i to its total cargo volume, which can be referred to as the ˜Export Ratio of Containerization for the Port i. Its coefficient will be positive because it is assumed that a high level of port infrastructure will attract export container cargo.

Figure4-1 Export Logistics Framework Found in Port i



The fourth factors (x4) is operational factors whose value depends on the type of port management system utilized. In general, the greater the influence of the one operational factors on export container volume, the stronger the competitive position of Port i.

Export-related variables selected as factors causing changes in volumes of cargo through the Port of Shanghai include four determinant factor (x1-x4) as shown in Figure 4-1. The percentage point change for each factor was determined by measuring the elasticity of the change in total seaborne trade in relation to each of the variables under study. It is calculated by using econometric methods.

This study identified the following characteristics of export flows through the Port of Shanghai, which can be confirmed in Table 4-3. Initially, on the export side, GDP has the largest influence on export container volume flowing from Shanghai to the six countries and economies under study. Thus, GDP is the determinant variable with highest elasticity among the three main economic factors. The elasticity value of 1.526 indicates that a percentage point increase in the GDP growth rate in an nation or economy results in more than 1.5 percentage increase in seaborne trade for that economy.

A second point to emerge from the analytical results is that the elasticity of FDI is generally lower than the elasticity of the GDP variable. But it still influence on

export container volume in a positive way.

Thirdly, it should be noted that the containerization ratio for the Port of Shanghai has desirable effect of increasing export logistics volumes. Therefore, the Port of Shanghai、s infrastructure is well suited to the technological progress apparent in container shipping

It is abnormal that the coefficient of foreign exchange rate ratio is minus which should be plus according to the theory of international trade. In my opinion, there are three important reasons:

Table 4-3 Export Logistics function

Determinant Factors	Shanghai port	T Value	Sig.	Ningbo-Zhoushan port	T Value	Sig.
FDI of Yangtze River Delta	0.153	3.213	0.003	0.053	0.694	0.492
GDP of the Six Countries and Economies	1.526	12.116	0.000	0.815	4.014	0.000
Foreign Exchange Rate Ratio	-0.717	-5.905	0.000	0.024	0.125	0.901
Ratio of Containerization for Shanghai	0.239	5.001	0.000	0.277	3.614	0.001
Constant	-88.408	-4.768	0.000	-26.699	-3.901	0.000
Statistical Result	RB2=0.929 SE=16.10			RB2=0.817 SE=12.512		

Source: Constructed by author using information from various sources

(1) The exchange rate is deeply affected by Chinese government. It can not change freely according to the relation between market supply and demand.

(2) The second reason is trade policy such as export rebate and export subsidies. The negative affect of CNY increasing in value can be offset by push these kinds of policies.

(3) Half of the foreign trade in YRD is processing trade and this part of trade will not influenced by exchange rate.

In the case of the Port of Ningbo-Zhoushan, Table 5-3 indicates that GDP is still the largest positive effect on export container volume flowing from the Port of Ningbo-Zhoushan to the six countries and economies under study. The elasticity value of 0.815 indicates that a percentage point increase in the GDP growth rate in an nation or economy results in 0.815 percentage increase in seaborne trade for that economy.

Secondly, the containerization ratio of the Port of Ningbo-Zhoushan has a great effect on its export logistics.

4.3.2 Import logistics function

The import logistics function can be developed utilizing the same logic as described above. Three basic economic factors concerned with the port environment as well as one other factor concerned with port service and market power determine import logistics volumes through the Port of Shanghai. The framework for import logistics behavior is described in Figure 4-2

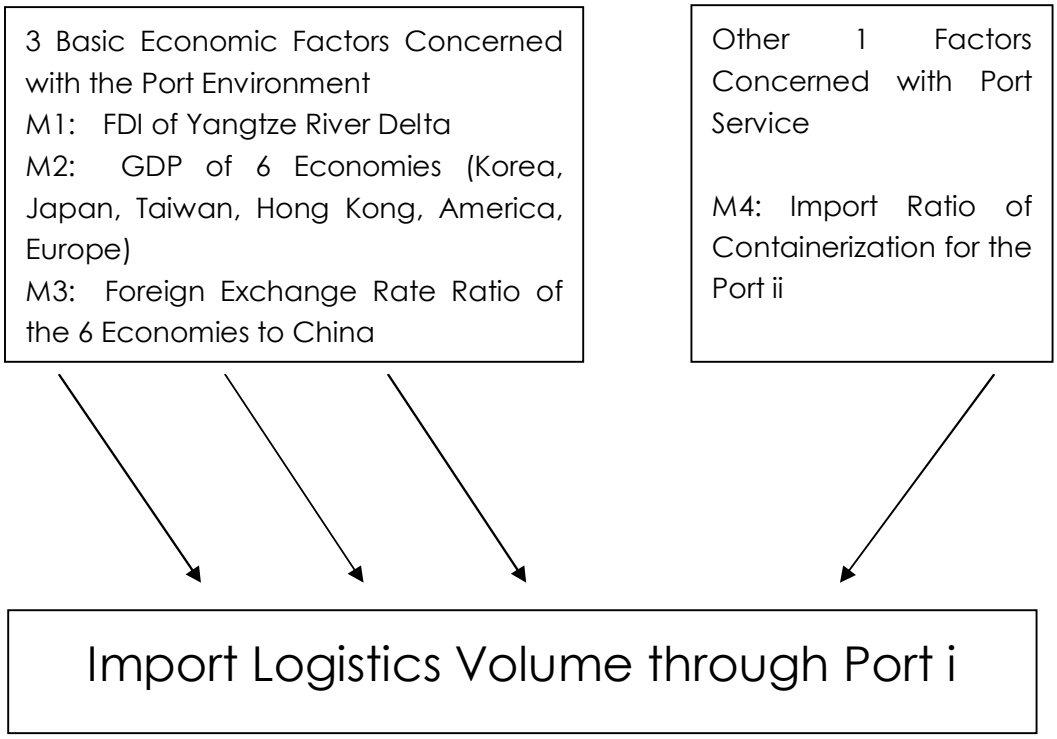
Hence,

$$Y_{mi} = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + \varepsilon \qquad (3)$$

where x1-x3 represent the three basic economic factors and x4 represent port service. The four basic economic import factors concerned with port environment are as follow:

Ymi: Import logistics volume for the Port i

Figure 4-2 Import Logistics Framework Found in Port i



x1: Foreign direct investment in Yangtze River Delta by the six economies (Korea, Japan, Taiwan, Hong Kong, America and Europe). The sign of the coefficient of x1 will be in principle positive.

x2: GDP (Gross Domestic Product) of the six countries and economies. The coefficient will be positive.

x3: Ratio of the foreign exchange rate of China to the six countries and economies. The coefficient will be positive.

The other one import factors concerned with port service is as follow:

x4: Ratio of import container cargo volume through the Port i to its total cargo volume, which can be referred to as the ˇImport Ratio of Containerization for the Port of Shanghai. Its coefficient will be positive because it is assumed that a high level of port infrastructure will attract export container cargo.

The first noticeable characteristic on the import side of Shanghai port is the positive elasticity of the GDP. This indicates that imports into the Port of Shanghai will increase as the growth of the six nations or economies GDP.

Secondly, the foreign exchange rate ratio shows an anticipated negative value.

The elasticity of exchange rates in relation to import volumes, in general, approaches the unit value of 1.

Thirdly, it should be noted that the containerization ratio for the Port of Shanghai has a weak positive effect on the import logistics volume for all of the six nations or economies under study. Thus, the containerization of the Port of Shanghai is contributing to import logistics or import logistics volumes.

In the case of the Ningbo-Zhoushan Port,the first noticeable characteristic on the import side is also the positive elasticity of the GDP. This indicates that imports into the Port of Ningbo-Zhoushan will increase as the growth of the six nations or economies、GDP.

Secondly, the containerization rate shows a great positive value. The elasticity value of 0.482 indicates that a percentage point increase in containerization rate will result in almost 0.5 percentage increase in seaborne trade for that economy.

Table 4-4 Import Logistics function

Determinant Factors	Shanghai port	T Value	Sig.	Ningbo-Zhoushan port	T Value	Sig.
FDI of Yangtze River Delta	0.012	0.170	0.866	-0.104	-1.149	0.258
GDP of the Six Countries and Economies	1.595	8.747	0.000	0.698	2.880	0.007
Foreign Exchange Rate Ratio	-0.893	-5.081	0.000	-0.051	-0.219	0.828
Ratio of Containerization for Shanghai	0.254	3.679	0.001	0.482	5.259	0.000
Constant	-77.137	-3.034	0.004	-28.067	-4.173	0.000
Statistical Result	RB2=0.851 SE=21.632			RB2=0.738 SE=12.337		

Source: Constructed by author using information from various sources

Chapter 5

Summary and Suggestion

5.1 Summary

This study analyzed the concentration ratio of Yangtze River Delta by HHI index model. The result shows container transport is highly concentrated in this area. Based on the research of port behavior, we found that the two biggest ports in this port system (Shanghai port and Ningbo-Zhoushan port) have a fierce competitive relation. As the two biggest ports in China, Shanghai and Ningbo-Zhoushan have a great impact on the national port industry. However, the over competition in container handling is very serious between Shanghai port and Ningbo-Zhoushan port. After Yangshan port came into operation and Ningbo port combined with Zhoushan port into a single entity, the competition had become more and more fierce.

Through the comparative analysis of the two ports, we get the result that each of them has its own comparative advantages which would make the cooperation of them impossible and reasonable. For example, Ningbo port has an advantage of nature deepwater berth and major bulk handling service. Shanghai port enjoys an advantage of management, finance and container handling service. Therefore, the cooperation of Shanghai port and Ningbo-Zhoushan port is both necessary and emergent.

5.2 Suggestion on cooperation and future studies

When we discuss the cooperation between Shanghai port and Ningbo-Zhoushan port, we should carry out the nation‧s macro policy. According to the construction program for ports within Yangtze River Delta (2004-2010) done by The Ministry of Communications and Shanghai aggregated ports policy, the Shanghai international shipping center will be established under ˇfour development system‧ and ˇone rule‧. The four systems are as followed:

(1) To establish the container transport system | as Shanghai port in the core.

(2) To establish the iron ore transshipment system | as Ningbo-Zhoushan port in the core

(3) To establish the crude oil transshipment system--as Ningbo-Zhoushan port in the core

(4) To establish the coal transshipment system | as Shanghai port and Ningbo-Zhoushan port in the core

Yangtze River Delta should major construct the transshipment systems of container, iron ore, crude oil and coal cargoes. In order to establish Shanghai International Shipping Center, Shanghai should be the center of this region, Jiangsu and Zhejiang to do the role as the supporters. Jiangsu to be the role as the north limb of Shanghai International Shipping Center and Zhejiang to be the role as the south limb are the rule of Shanghai aggregate ports.

If Shanghai port and Ningbo port want to cooperate with each other, the first phase is to realize the information and port resource sharing. Both ports of Shanghai and Ningbo-Zhoushan should share the information, port resources and facilities, technique resources and the human resources. Then both ports should communicate in port engineering technique, container management and cargo handling technique. Through resources sharing and port communication, both ports can reduce the cost and achieve the mutual benefits.

Two ports should establish an extensive platform for ports information sharing. The information sharing is incarnated in integration of the network including customs, inspection, shipping companies, cargo owners, shipping agencies and so on. This activity will build a solid basis for the future cooperation between these two ports. In addition, Shanghai and Ningbo-Zhoushan has basis for cooperation in information sharing aspects. These two ports sing an agreement on customs integration in 2005. In the future, the integration of EDI system, which has been done between Shanghai and Ningbo, can be adopted between these two ports.

Since these two ports can cooperate with the others in order to achieve the business benefits, they can also cooperate with each other. Especially, the development project of Zhoushan Island affords a good opportunity for the port enterprises of Shanghai and Ningbo to do the business cooperation. In the market economy the business cooperation between two port enterprises is the best mode for ports to achieve coordinated development.

There are some limitations of this study needs to be discussed. It is limited in the insufficient sample size used in the study. As the statistical information system in China is not so developed as in Japan or other developed countries, some data can only be found from 2001. Ningbo port has not developed for a long time, so it is hard to collect the related data before 2000. It could be researched more in the future for verifying the model and predicated data, and to apply to other neighboring ports such as Port of Busan and Port of Gwangyang.

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Yearbook of China Port Industry 2008