Historical changes in the port and shipping industry in Hong Kong and the underlying policies

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ABSTRACT

In this paper, a number of ports in Hong Kong and mainland China are grouped and the concentration ratio and Herfindahl-Hirschman index of the container throughputs are calculated to analyze the changes in the port and shipping industry in Hong Kong. By tracing the trajectory of the barycenter of the standard deviation ellipse of the annual container throughputs, we can analyze whether port transportation is shifting away from Hong Kong towards mainland China. The impacts of underlying policies of mainland China and Hong Kong on the port and shipping industry in Hong Kong are also revealed. The analyses show that the port and shipping industry in Hong Kong has experienced three development stages: rapid growth from the 1970s-1990s, solid growth from 2000 to 2005, and sluggish growth from 2006 to 2015.

1. Background

The port and shipping industry in Hong Kong originated in the 1840s. In the middle of the 1960s, containerized transportation appeared in Hong Kong. Beginning with the opening of the Kwai Chung container terminal in 1972, containerized transportation in Hong Kong began experiencing formal growth. During the 1990s, the port and shipping industry in Hong Kong began growing rapidly. In 1990, the container throughput in Hong Kong reached 5.1 million TEU, and in 1992, the Hong Kong port became the world’s top container port (Zhu, 1992). Moreover, the annual calls of container ships in Hong Kong in the 1990s reached 35,000, which is far greater than that in mainland China. However, after entering the 21st century, the increment of port container throughput in Hong Kong has slowed. In 2005, the Singapore port became the world’s top container port.

The above phenomena were a result of the social and economic development under Hong Kong’s free port policies as well as China’s reform and opening-up policies, which include entering the World Trade Organization (WTO), decentralizing the port governance and establishing bonded ports.

The port and shipping industry is a hot study topic, and many researchers have focused on the growth of the port and shipping industry in Hong Kong. In 1997, Chan (1997) analyzed the past, current and future of the port and shipping industry in Hong Kong, and Zhou (1999) studied its growth potential for the 21st century. These authors found that Hong Kong gradually lost capital, which was invested in ports other regions, and the power underlying the developing port and shipping industry in Hong Kong began to be lost to other parts of the world. Seabrooke et al. (2003) also analyzed the trends for container throughput and the changing roles of the Hong Kong port. The port and shipping industry in Hong Kong has been facing challenges, which has resulted in slowed growth.

We believe that it is necessary to study the rise and fall of the port and shipping industry in Hong Kong and the impacts of the underlying policies from recent decades. Such studies may explain the reasons underlying the prior prosperity of the port and shipping industry in Hong Kong and provide a direction for its future development. Moreover, such work may provide insights for policy recommendations for the port and shipping industry in Hong Kong.

Market concentration rate is an index that quantifies the market structure of an industry, and it can be used as a tool to analyze the development trends of the port and shipping industry. The concentration ratio (CRn) and Herfindahl-Hirschman Index (HHI) are popular indicators to evaluate this concentration. Hayut (1981), Hayuth (1988) was the first person to study the port concentration rate, and they used the CRn to describe the development process of ports in the United States. Notteboom (1997) used the HHI to study the evolution of European ports. Le and Ieda (2010) used a similar approach to study the spatial variability of
ports in China, Japan and South Korea. Li et al. (2015) used the \( CR_n \) to analyze the concentration of coastal ports in China and found that the market is gradually moving towards the fourth stage of an oligopoly, namely, that the market is gradually decentralizing.

Few studies have utilized the port concentration rate to analyze the growth of the port and shipping industry in Hong Kong. Only Wang (1998) has used the \( CR_n \) to perform an empirical study on port growth in Hong Kong. Using a group of several ports in Hong Kong and mainland China, we use the \( CR_n \) and \( HHI \) to analyze changes of the port and shipping industry in Hong Kong. In addition, by using the annual port container throughput indices for this group, we calculate the standard deviation ellipse and judge whether port transportation is shifting away from Hong Kong toward mainland China by tracing the trajectory of the barycenter.

Zhao (2014) used the standard deviation ellipse to study economic disparities in coastal areas. By following his study as a reference, we use the same method to explore the disparities of port container throughputs within the group. Then, we analyze the policy background to analyze the impacts of these underlying policies of mainland China and Hong Kong. A number of studies have analyzed the impacts of policies on the port and shipping industry. Bristow et al. (1995) analyzed the growth process of the Hong Kong port in the 20th century and the influencing factors, and he found that port governance is a key factor influencing the port and shipping industry in Hong Kong. Zhang et al. (2015) found that global manufacturing transfers have great impacts on the port and shipping industry in Hong Kong. Cullinane et al. (2004) concluded that container terminal development in mainland China reduces the competitiveness of the port of Hong Kong and further reduces the speed of growth of the port and shipping industry in Hong Kong. Many researchers have noted that governmental policies have affected regional port and shipping industries. Han (1999) forecasted the impacts of China’s entry into the WTO on the port and shipping industry, and the productivity of terminals has been found to vary within host cities and with the construction of bonded port areas. The contribution of this paper is the formation of a group of ports consisting of Hong Kong, Guangzhou, Shenzhen, Shanghai, Ningbo, Tianjin, and Qingdao and an analysis of the changes in port container throughput at Hong Kong to illustrate the growth situation of the port and shipping industry in Hong Kong and explain the underlying policies using the \( CR_n \), \( HHI \) and standard deviation ellipse. This paper provides a theoretical foundation for the coordination between the ports in Hong Kong and mainland China so that their comparative advantages can be exploited and to avoid wasting resources.

### 2. Development of port and shipping industry in Hong Kong

In the 1960s, the port and shipping industry in Hong Kong experienced growth with the development of containerized transportation, although container terminals were not well specialized. In 1969, Hong Kong’s annual port container throughput was approximately 12,000 TEU, and this value reached a breakthrough of 200,000 TEU in 1972 after the Kwai Chung container terminal opened. Afterwards, the port and shipping industry in Hong Kong entered a rapid growth period, whereas in the same period, the port and shipping industry in mainland China lagged and presented limited port terminal construction. Before 1980, specialized container terminals had not been constructed in mainland China.

Therefore, the port and shipping industry in Hong Kong has experienced periods of rapid growth, stable development and suspension (Fig. 1). Here, we use the \( CR_n \), \( HHI \) and standard deviation ellipse indicators to analyze the quantities of container transportation at ports in Hong Kong and mainland China. We also analyze the policy background related to the rise and decline of the port and shipping industry in Hong Kong.

\( CR_n \) is a function of the number of firms and their respective shares of the total production, and this indicator is used to measure differences in firm size and represents an important quantitative indicator of market power (Li et al., 2015). The \( HHI \) is a composite index for measuring industrial concentration, which is the square sum of competitors that account for the total revenue in an industry, and it can be used to measure changing market shares (Li et al., 2015). The calculation methods of \( CR_n \) and \( HHI \) are as follows:

\[
CR_n = \frac{\sum_{i=1}^{n} X_i}{\sum_{i=1}^{n} X_i}
\]

\[
HHI = \sum_{i=1}^{n} \left(\frac{X_i}{X}\right)^2
\]

where \( CR_n \) represents for the monopoly situation of the top \( n \) ports; \( HHI \) indicates the concentration of port throughputs; \( X_i \) represents the container throughput of port \( i \); \( I \) represents the port collection; and \( X \) represents the container throughput of all concerned ports. And ports are ordered in decreasing order of the throughput. Because \( HHI \) indicates the market share of top 50 ports to all ports, and if the number of ports is smaller than 50, we choose all of the ports to calculate \( HHI \). The number of ports involved in this study is seven.

To analyze the growth trends of the port and shipping industry in Hong Kong, we select the ports of Hong Kong, Guangzhou and Shenzhen in the Pearl River Delta, the ports of Shanghai and Ningbo in the Yangtze River Delta, and the ports of Tianjin and Qingdao in the Bohai Rim to form our study group. Then, we use the \( CR_n \) to determine the concentration ratio and study the changes in the container shipping market and the status of the Hong Kong port. Because the port container throughput in Hong Kong ranked first from 1990 to 2000, we calculate the \( CR_1 \) during this period to obtain the data listed in Table 1.

The results show that although the market share of the Hong Kong port was decreasing, it was still over 50% until 2000. Thus, from 1990 to 2000, the Hong Kong port was in an oligopolistic position within our group, which may imply that the port and shipping industry in Hong Kong had been in the leading position. The reason for the market share decline is related to the reform and opening-up of the port development in mainland China, which weakened the status of the Hong Kong port. After 2000, this phenomenon becomes more obvious. Although the port container throughput in Hong Kong still ranked first from 2001 to 2006, the \( CR_1 \) fell to 30%–25%, which is in stark contrast to the value of over 50% in the 1990s. The annual average decreasing rate of the \( CR_1 \) was only

![Fig. 1. Port container throughput in Hong Kong.](image)

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<tr>
<td>CR1</td>
<td>82.84%</td>
<td>81.85%</td>
<td>82.66%</td>
<td>81.27%</td>
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<td>68.77%</td>
<td>64.30%</td>
<td>57.81%</td>
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<td>2005</td>
<td>2006</td>
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<tr>
<td>CR1</td>
<td>41.41%</td>
<td>37.06%</td>
<td>33.42%</td>
<td>29.06%</td>
<td>25.84%</td>
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