

Original article

Application of Game Theory and Uncertainty Theory in Port Competition between Hong Kong Port and Shenzhen Port

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Abstract

This paper unveils the strong competition in container cargo between Hong Kong Port which has been emerging as an international maritime center since the 1970s and Shenzhen Port which has recently gained remarkable achievements in the Pearl River Delta region. Among various competing strategies, the study focuses on the long-term one in which two ports will decide to compete by investing in capacity. The purpose of this research is to examine their decision making process and to suggest future strategic actions in the current situation. Within its scope, only economic profit brought back from the investment is considered. For this reason, an uncertain payoff two-person game model is developed where an uncertain factor of demand is involved. In applying Uncertainty theory (Liu, 2013), the two methods to solve the game are introduced, including uncertain statistics and the expected Nash Equilibrium strategy. The results obtained from this research generate meaningful suggestions for future competition plan for the two selected ports, which conclude that Shenzhen is the dominant port in this long-term strategy. Compared to existing works on the same topic, the paper shows its distinctiveness by studying the latest competitive situation with regard to the uncertain demand in the game model.

Keywords: Hong Kong Port, Shenzhen Port, Container Cargo, Competition, Game Model, Uncertain Payoff

I. Introduction

After more than half a century since its introduction, the container continues to have an important role in enhancing the global transportation system. Especially in recent decades when containerization and the increasing bargaining power of shippers have brought freedom to shipping lines in making port choices. As a result, port competition has dramatically increased among major seaports and the competition among ports in the Pearl River Delta (PRD) is a clear example. The increase of port competition such as from Shenzhen Port (SZP) and Guangzhou port has led to a considerable decline in Hong Kong Port (HKP) industry which used to be the busiest port in the world. It has witnessed the port pie has been re-divided during the sixteen-year period because of the increasingly fierce competition among the three ports as illustrated in Figure 1. Among the ports of concern, the most visible rivalry is directly between HKP and SZP. HKP with good geographical location, transparent custom clearance and high service level, as an international maritime center, has played a dominant role in handling cargoes and containers in its linked-in regions. On the other hand, since reforming and opening, SZP experienced a notably fast developing rate as the so-called “Shenzhen speed” which has also played a decisive role in the economic development of Shenzhen (Wei, 2013). Hong Kong competes with Shenzhen in the same cargo hinterland as the PRD. In 2013, the container throughput of SZP reached 23.3 million TEU, while that of HKP is only 22.3 million TEUs (See Figure 2). Shenzhen, thus, has surpassed Hong Kong to become the world’s third busiest container port for the first time, which re-segmented the port market to be half-half for these two ports.

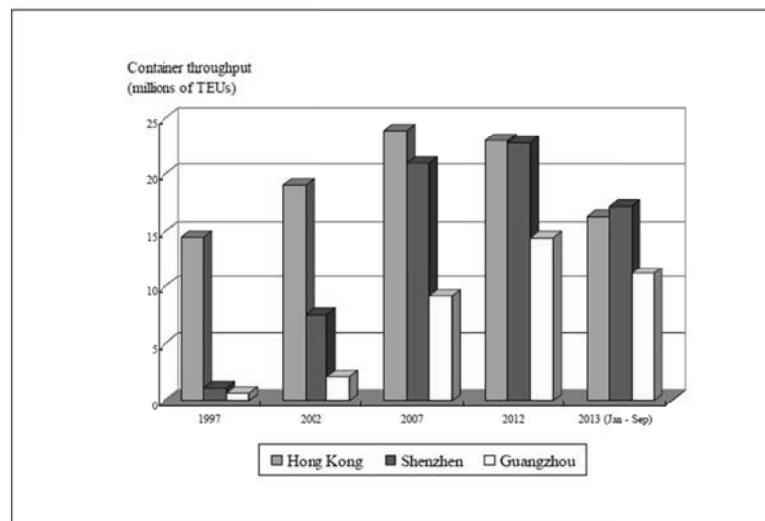


Figure 1: Comparison of container throughput in Hong Kong, Shenzhen and Guangzhou

Source: Legislative Council of Hong Kong (2013), p.3

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