

The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar

Evolution of High-speed Rail and Its Impact on Air Transport in Northeast Asian Markets: A Network Perspective

by

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(Conducted in English)

Abstract:

Providing faster, more convenient and environment-friendly services, high-speed rail (HSR) has been in operation in over 20 countries and attracted many passengers who used to travel by other transport modes. Among these countries, Japan built the world's first HSR line in 1964 and its network has been highly developed since 1990s; China has the world's largest HSR systems since 2010 and is continuing to expand its network with a goal to reach almost twice of its current length by 2020, forming a network of 'Eight Vertical and Eight Horizontal' corridors.

Spatiotemporal evolution of HSR has rarely been modeled in previous literatures. By introducing social network analysis (SNS) method, in the first part of this study, we quantitatively measure the development of high-speed rail networks in three main Northeast Asian countries (China, Japan and South Korea) and the changing positions of major cities in their corresponding networks. The network structures in these three countries are very representative for typical analysis: mesh-like connection, line-like connection and tree-like connection. Additionally, various topological structures are discussed, namely, L-space, P-space and service structure. Instead of the traditional topology method, which is controversial for its performance in reflecting real-world transportation networks, we introduce daily service frequency and generalized cost to weight the rail service networks in our research. To understand the pattern of HSR network evolution and nodes' relative position in the network could help firms making decisions on locating or relocating their factories.

The emergence of HSR has been affecting air traffic demand variously in different OD markets, but its impact on airport remains unknown. The second part of this work is to investigate the influence of high-speed rail expansion on airport efficiency. This study is based on a sample of 46 airports in China and 16 airports in Japan over 2007-2015. We conduct data envelopment analysis (DEA) in the first stage to obtain airport efficiency scores, which, in the second stage, are regressed on the variables of interest. Bootstrapping technique is applied to address potential problem with utilizing DEA scores in regression analysis. We find evidence of a positive impact of HSR on airport efficiency in both countries. This empirical study might assist local authorities to determine future investments in improving the efficiency of regional transportation systems.

Recent years have witnessed a significant increase in the theoretical studies of cooperation and competition between HSR and air transport, covering traffic demand, ticket price, seats and flight frequency, environment and social welfare, whereas studies taking HSR network structures into account are rare. In the third part of this study, we will theoretically investigate the strategies of airlines in response to different HSR network structures.

Bio:

Mr Liu Shuli is a PhD student at the Department of Logistics and Maritime Studies of The Hong Kong Polytechnic University. He received his BSc degree in Logistics from Dalian University of Technology (2012) and was a postgraduate researcher majoring in Operations Research and Optimization in the School of Computer Science at the University of Nottingham, UK (2015). His research interests include transportation network, transportation economics, transport geography and transportation data analytics. He is currently pursuing his PhD under the supervision of Dr. Sarah Wan and Dr. Meifeng Luo.

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All are welcome!