Abstract:
This dissertation consists of three independent but interrelated studies associated with high-speed rail (HSR) development. It aims to provide some policy implications regarding HSR investment.

The first study examines whether cities are getting more equally accessible and connected via HSR in China over the period from 2010 to 2015. Using HSR timetable data, this work incorporates both scheduled travel time and daily train frequency of each origin-destination city pair into three centrality measures, which are widely used to evaluate the importance of nodes in the network, and further quantifies regional inequalities in these centrality measures using Theil’s T index. It reveals that as the HSR network expands, cities appear to be more equal in terms of accessibility, but their disparities in connectivity and transitivity depend on the dimension of comparison. In general, although the difference has reduced among economic regions or among megalopolises, small- or medium-sized cities not belonging to any major city cluster are further lagged behind in HSR development. It also finds that the difference between core and non-core cities in the same megalopolises has decreased despite that non-core cities are increasingly relying on core cities to access the other regions.

The second study explores the impacts of HSR development on airport-level passenger traffic by considering not only the position of the airport’s city in the HSR network but also the availability of air-HSR intermodal linkage between the airport and HSR station. Following the methods used in the first study, the position of the airport’s city is measured by degree centrality and harmonic centrality, which reflect the city’s connectivity and accessibility respectively. Employing a sample of 46 airports in China and 16 airports in Japan over the period of 2007-2015, we conduct panel regression analysis and compare the results between these two Northeast Asian countries. It is observed that as HSR connectivity or accessibility increases, there is, on average, a decline in airports’ domestic and total traffic in China but little change in Japan. Meanwhile, there is a strong complementary effect of HSR to feed international flights with the presence of air-HSR intermodal linkage. As a result, some airports may experience a total traffic increase. In China, hub airports tend to gain traffic regardless the availability of air-HSR linkage, while non-hub airports are likely to lose. In Japan, on the other hand, airports with air-HSR linkage tend to gain traffic regardless the hub status. The research also reveals some differentiated impacts of HSR connectivity and accessibility in China.

As a natural extension of the second study, the third study focuses on the association between HSR development and airport technical efficiency. In addition to passenger traffic, HSR development may influence airports’ other outputs such as cargo and flight movements and various inputs. Those inputs and outputs collectively determine airports’ technical efficiency. With access to a dataset from 2007 to 2015, the study adopts both standard two-stage Data Envelopment Analysis (DEA) and double bootstrap method to evaluate the impact of HSR development on airports’ efficiency. In addition, we evaluate the effect of HSR on the labour productivity at airports. The main results suggest that HSR development relates to a decrease in airport efficiency. Airports located in cities that have better positions in the HSR network suffer more efficiency loss than the others. It is also observed that the accessibility of HSR station from the city centre is negatively associated with airports’ efficiency. By contrast, good access to the airport from an HSR station is positively correlated with airport efficiency. Furthermore, the study reports different results between China and Japan with respect to the effect of HSR on the labour productivity at airports.

Bio:
Shuli Liu received his BSc degree (2012) from Dalian University of Technology. Before coming to PolyU in 2015, he was a research postgraduate focusing on Operations Research and Optimisation at The University of Nottingham (UK). He is currently pursuing his PhD in Transportation and Logistics under the supervision of Dr. Sarah Wan and Dr. Meifeng Luo. His core expertise lies in transportation economics and policy, transportation network analysis, and transportation data analytics.