Research on Passenger Market Competitiveness of China High Speed Railway and Railway Traffic

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Abstract – High speed railway (HSR) in China will have a rapid growth in the following years. This paper first analyzes the different technological and economic characteristics of HSR, railway, air traffic and highway traffic and finds their unique comparative travelling distances. And then, three representative categories of O-D distances are studied. Specially, when HSR improves its speed from 300 km/h to 350 km/h, the competitive O-D distance extends from 1000km to 1300km. Considering competition and cooperation of HSR and railway traffic, it is suggested transforming the prevailing management mechanism and get adapted to the transportation market competition.

Index Terms – High speed railway, railway traffic, passenger market, technological and economic characteristics

1. Introduction

With the implementation of China Long and Medium Term Railway Network Plan (2008 adjusted), illustrated in Fig. 1, high speed railway (HSR) in China begins to expand progressively. China Railway Corporation has drawn up an ambitious blueprint that by the end of 2020, the total length of HSR, including passenger dedicated line, intercity railroad, and passenger and freight lines on which trains operate more than 200km/h, will be extended up to 50000 kilometres which account for 45% of the railway lines approximately.

Fig. 1 Long and Medium Term Railway Network Plan in China (2008 Adjusted)

As can be seen from Fig. 2, the railway passengers increase from about 1 billion to 1.89 billion during 2004 to 2012. In 2012, air transports finish 0.32 billion passengers which become the most competitive rival of HSR. Under such a circumstance, China HSR spares no effort to improve its transportation product quality, and adopt competitive strategies to promote core competence and optimize management mechanism transformation. Generally, HSR dominates the market within 1000 kilometres at the speed of 300km/h while the competitive distance of air transport is over 1200 kilometres. Nevertheless, there are several factors influencing consumer's choice of civil aviation or HSR, e.g., travel time, comfort, price, safety, convenience and etc. In short, basic characteristics, additional value, and transportation product are three core functions for passenger market competitiveness. Thus, HSR competes for passenger market in distance, speed, time, price, safety, energy consumption and etc.

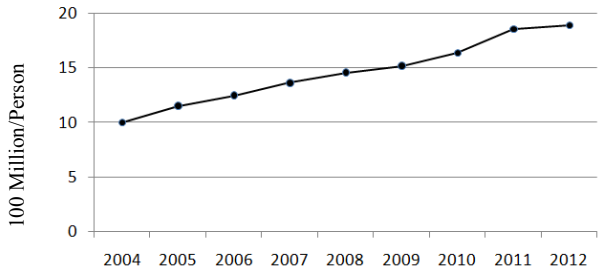

Fig. 2 The number of railway passengers in 2004-2012 (100 million/person)

To begin with, we review some research on HSR market. Adler[1] analysed a high-speed rail system in order to investigate the implications of changes to the network on social welfare. Campos[2] discussed the economic definition of HSR, trying to identify its different development and operating models. Hsu[3] analysed the potential competition and cooperation between the high-speed and conventional rail systems by studying the two roughly-parallel rail systems along a densely populated corridor in Taiwan. Román[4] utilized disaggregate demand models to research different WTP measures for improving service quality of high-speed and air traffic.

2. Comparison of HSR with Other Transportation Models

In this section, we compare HSR with railway, air transport and highway traffic in travel time and price which become the most concerns of passengers. According to O-D distance, three representative categories are selected in Table 1, say, short distance (Beijing-Tianjin), medium distance (Zhengzhou-Xian) and long distance (Beijing-Shanghai).

TABLE I Comparison of HSR with Other Transportation Modals

O-D	Modal	Mileage (km)	Time (h)	Price (RMB)
Beijing-Tianjin	Railway	127	2	19-73
	Air traffic	124	--	--
	Highway	135	2	70
	HSR	120	0.55	55/66
Zhengzhou-Xian	Railway	511	6-7	72-204
	Air traffic	470	1.5	650
	Highway	500	6	270
	HSR	505	2-2.8	230/370
Beijing-Shanghai	Railway	1463	9-20	156-648
	Air traffic	1160	2.25	1300
	Highway	1262	13	650
	HSR	1318	4.8	555/935

It can be found that railway, air traffic and highway traffic have similar distances from the origin to the destination. However, air traffic has its advantage in travelling time. At the same time, railway and highway traffic spend almost equal time finishing the O-D trip. In price, railway is the most economical. It is only 30% of the air traffic price and 60% of the highway traffic price, respectively.

Research the characteristics of HSR, we find HSR has a little longer travelling time than air traffic in long distance travelling if we calculate the urban transit time. Considering the punctuality, HSR is as competitive as the air traffic. As to medium distance, i.e., near 500km mileage, HSR has its attractive advantage. The strength of HSR becomes more obvious in short distance travelling. In price, HSR is almost similar with the highway traffic that is 40% of air traffic or so.

3. Effects of HRS on Transportation Patterns

As introduced in the above section, HSR and railway transport play distinct roles in the passenger market. We illustrate the cooperation strategy of HSR and railway in Fig. 3 and a new transportation patterns create. Obviously, HSR strengthens the competition of railway in long distance travelling. In the following, we will analyse the effects of HSR on new transportation patterns.

Considering both the travelling time and travelling price, air traffic is the main competitive rival to HSR. With the operation of HSR, the current transportation patterns of railway, air traffic and highway traffic will be affected absolutely and then create a new competitive pattern. With the development of HSR speed, e.g., from 300 km/h to 350 km/h, a deep influence will occur.

We find the higher the speed of HSR, the more spirited of the passenger market of HSR will be. Taking Beijing-Shanghai HSR for example, if HSR runs 300 km/h, passengers are inclined to choose air traffic because it is faster than HSR. On the other hand, if HSR improves its speed to 350 km/h, passengers prefer HSR to air traffic. In this circumstance, HSR has shorter travelling time when we count the additional urban traffic time. In general, if we fix the HSR speed at 300 km/h and air traffic speed at 750 km/h, a boundary O-D distance is 1000km. That is, passengers prefer HSR when the distance is within 1000 km. On the contrary, they will choose air traffic. Under the same situation, we assume that HSR is 350 km/h and air traffic is 750 km/h. The boundary O-D distance is extended to 1300km. Without losing generosity, we have the following conclusions.

A. Medium-and-long distance O-D

Travelling distance within 1000km, HSR has a sharp competition with other transportation modals. It is mainly reflected on travelling time and price. For example, HSR is 40%-50% price of the air traffic. And the total trip time of HSR is less.

Travelling distance between 1000km and 1300km, the competition of HSR and air traffic is neck and neck. At this moment, the price of HSR is 50% or so of air traffic, while the HSR travelling time is a little more.

As to the long distance trip, i.e. more than 1300km, air traffic attracts more passengers because of travelling time.

B. Short distance O-D

When we refer to short distance travelling, e.g. Beijing to Tianjin, Shanghai to Nanjing or Shanghai to Hangzhou etc, HSR plays an important role in one-city effects. In other words, passengers travelling ideas, citizen inhabitation conceptions and work choices have changed progressively because of intercity traffic. To megalopolis, the difference between intercity travelling time and urban traffic time is not obvious. Thus, HSR will largely change the transportation patterns among railway, air traffic and highway traffic.

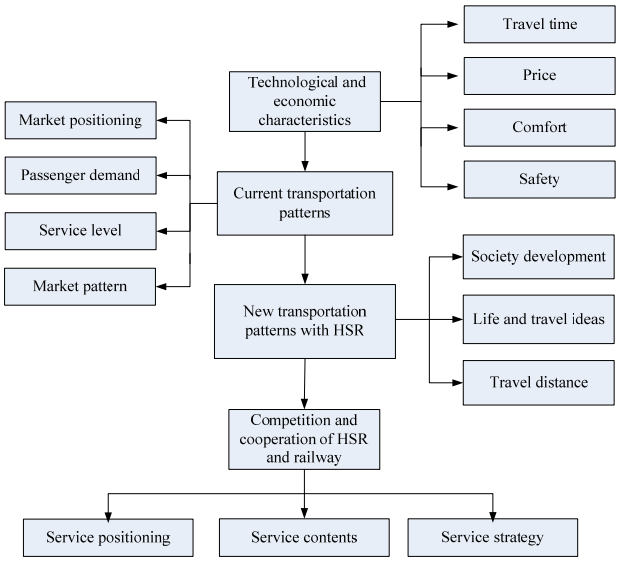

Fig. 3 HSR and Railway Cooperation Strategy

4. Conclusions

Because of different technological and economic characteristics, HSR, railway, air traffic and highway traffic

have their comparative advantage and fundamental market. To begin with, HSR transportation serves as the fundamental function in the passenger market. By improving transportation product quality, market competitiveness will be promoted. In addition, owning to traditional market strategies, HSR industry can simultaneously adopt distinct competitive strategies including resource, humanization service, competition and cooperation, knot, information and etc. Besides, it is necessary to draw lessons from the experience at home and abroad. Transform the prevailing management mechanism and get adapted to the transportation market competition.

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