Chapter 7
Analyzing Intercity Modal Choice and Competition Between High Speed Rail (HSR) and Other Transport Modes in Indian Context

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ABSTRACT

In this study, a theoretical framework is developed in order to assess the viability of transport infrastructure investment in the form of High Speed Rail (HSR) by assessing the mode choice behaviour of the passengers and the strategies of the operators, in the hypothetical scenario. Discrete choice modelling (DCM) integrated with a game theoretic approach is used to model this dynamic market scenario. DCM is incorporated to predict the mode choice behaviour of the passengers in the new scenario and the change in the existing market equilibrium and strategies of the operators due to the entry of the new mode is analysed using the game theoretic approach. The outcome of this market game will describe the strategies for operators corresponding to Nash equilibrium. In conclusion, the impact of introduction of HSR is assessed in terms of social welfare by analysing the mode choice behaviour and strategic decision making of the operators, thus reflecting on the economic viability of the transport infrastructure investment.

INTRODUCTION

This chapter focuses on analyzing the intercity modal choice of the passengers which eventually affects the intermodal competition between the modes. In the event of High speed rail mode entering the market, passenger’s mode choice in the new scenario may differ from the mode choice in the current scenario. This change in the mode choice is examined using a Discrete choice model too get the mode share in

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the new market scenario. The mode share thus obtained is used to study the resulting strategies played by the mode operators to maximize their utility using a game theoretic approach. Thus the primary objectives of this chapter are:

- Analyze intercity modal choice in the new hypothetical scenario.
- Determine the optimal mode attributes which maximizes the social welfare and the operator’s profit.
- Determine the optimal strategies of the mode operators under different market scenarios using game theoretic approach.

BACKGROUND

In India, rapid urbanization, growing economy and increasing per capita income has caused increasing growth in intercity travel. High speed rail (HSR) system has been globally proven to be an efficient transportation mode to fulfill the demand gap for faster intercity movement of passenger traffic. According to International Union of Railways (UIC), passenger trains that travel at 250 km/h or more on a new track or 200 km/h for an upgraded track is a High Speed Rail. Thus, in order to cater to the ever increasing passenger traffic and demand for better services, the Government of India is exploring the option of introducing HSR system as a sustainable mode of transportation. Verma et al. (2010) described HSR as a sustainable mode while comparing it with the current mode scenario in Indian context. They compared HSR and conventional rail using parameters like per-passenger km, occupancy levels and electricity de-carbonization. They concluded that HSR is anticipated to produce lower GHG emissions than Conventional Rails.

India has one of the largest rail networks in the world. Currently, India does not have any high-speed rail lines capable of supporting speeds of 200 km/h (124 mph) or more. However, high-speed corridors have been proposed and are under prefeasibility studies. The Indian Railways’ vision 2020 envisages the following on High Speed Corridors: “India is the only country among the major nations of the world which do not have a high speed rail corridor. In order to escalate the speed of the corridors Indian Railway will follow a two-step approach. Based on the feasibility of the passenger corridors, speed will be raised to either 160-200 kmph using conventional technology or up to 350 kmph by building state-of-the-art high-speed corridors through on PPP mode in partnerships with the State Governments. By 2020, at least four corridors of 2000 km would be developed and planning for 8 other corridors would be in different stages of progress”. High Speed Rail Corporation of India Limited (HSRC) has been formed on the directions of Ministry of Railways, Government of India, for development and implementation of high speed rail projects. HSRC (2015) mentions the railway budget speech 2012-2013 which states the issue of capital intensiveness and innovative funding mechanism to make this project a reality. Six corridors have already been identified for technical studies on setting up of HSR as shown in Table 1.

Since Indian government perceives HSR as a feasible future mode of intercity transportation, this study is timely as current literature on HSR in Indian context is sparse. The Indian Railway budget 2014 stated some of the issues related to HSR thereby ascertaining the need for studies in the mentioned context.

HSR projects are highly capital intensive, requiring high passenger volumes and high tariff to justify investment (Railway Budget, 2014).