

An Ex-post Cost Benefit Analysis of Beijing-Shanghai High Speed Railway: Reasons for Positive Net Social Benefits

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Abstract

High speed railway is a major technological breakthrough in passenger transportation, and it has a competitive advantage over road and air transportation modalities in the mid to long range travel sector. After a careful planning and feasibility analysis, construction of the Beijing-Shanghai high speed railway commenced. It was determined that this project would be the best way to expand Beijing-Shanghai transportation capacity, in a way which meets passenger demand, and improves the quality of passenger service. Construction of the Beijing-Shanghai high speed railway began in April of 2008. The railway line was made its debut in June of 2011, and was considered a great success based on passenger occupancy rates, and a noticeable impact on regional development. However, it is important to remember that these undeniably beneficial economic and social benefits do come at cost that society has to bear. To objectively measure the true impact of the project, it is necessary to compare the costs and benefits from the point of view of society as a whole, not merely from that of the agents or people directly involved. To achieve this, methodological tools used to assess the welfare of the state economy, such as cost-benefit analysis, may be deployed to evaluate the net social benefit of the investment project.

The purpose of this paper is to conduct an “ex post” cost-benefit analysis for Beijing-Shanghai high speed railway project. First, the cost and benefit of CBA evaluation framework are described. In terms of cost, the total investment of Beijing-Shanghai high speed railway project is 196.53 billion RMB, and the investment period is considered for 4 years. In terms of benefits, the Beijing-Shanghai high speed railway improves the traffic conditions of the Beijing-Shanghai channel and reduces the transportation costs. With reference to Japan's evaluation method for transportation projects, the benefits of the Beijing-Shanghai high speed rail project can be divided into three parts: user benefits, supplier benefits and environmental improvement benefits. User benefits are measured by establishing a generalized travel cost, where the most important factor is the saving of travel time. Supplier benefits are the profits created by the Beijing-Shanghai high speed railway project. Environmental improvement benefits are measured by establishing a generalized pollution cost to reflect the environmental advantages of high speed railway over road and air transport. The transferred volume of Beijing-Shanghai high speed rail accounted for 81.93% of the total traffic volume from 2008 to 2016. This implies that the traffic volume of the Beijing-Shanghai high speed railway is mainly based on transferred volume. The gradual networking of China's high speed railway, caused an increase in the cross-line traffic volume of Beijing-Shanghai high speed railway. In 2011, the cross-line traffic volume accounted for 48.02% of total traffic. In 2017, the proportion of cross-line traffic volume has reached 68.43%. This paper analyzes the network effect of the Beijing-Shanghai high speed rail project, namely the benefit of the replaced transportation mode and the benefit of connected transportation mode. In this paper, an ex post CBA is carried out from demand and cost data

available and under several assumptions about the life span of the project, growth hypothesis, travel time value (VOT), and with a social discount rate of 3% in real terms. The results show that the NPV of the Beijing-Shanghai high speed railway project is significantly positive and has extensive economic and social benefits. The success of the Beijing-Shanghai high speed rail project reveals the importance of passenger traffic volume and VOT for such projects. The following conclusions can be drawn: (1) User benefits are closely related to VOT and passenger traffic volume. VOT is taken into account when calculating the generalized travel costs of various transportation modes. Since high speed rail can shorten traffic time, when the VOT is higher, high speed rail has more advantages in travel costs, thus generating positive user benefits. At this point, the larger the passenger volume, the more significant the user benefit. (2) Supplier benefit is closely related to passenger traffic volume. Due to the remarkable economies of scale achieved by the high speed railway, only sufficient passenger traffic can turn the operating enterprises from losses to profits, thus increasing the total project benefits. If the supplier benefits are negative, this will have an adverse impact on the total project benefits. (3) Environmental benefits are closely related to the replacement of air and road traffic by HSR, and this replacement is also closely related to VOT and total traffic. (4) The construction cost of high speed railway projects is relatively fixed, but in economically developed areas, due to the increase of demolition cost, the assembly will be relatively higher.

Furthermore, by comparing with the evaluation of high speed railway projects in Spain, Japan and Taiwan and other areas, this paper attempts to summarize the common conditions for the construction of high speed rail and provide reference for the high speed rail projects in the planning stage of other countries. At the same time, the cost-benefit framework is compared with other studies to discuss how to use CBA tools more effectively.

Keywords: High Speed Railway, Ex post, Cost Benefit Analysis

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