

# The resource redistribution effect of high-speed rail stations on the economic growth of neighbouring regions: Evidence from China



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## ABSTRACT

The role of high-speed rails (HSRs) in urban development remains a much-debated topic, especially with regard to their impacts on surrounding counties without HSR stations. In this study, we construct a theoretical model explaining the relationship between the opening of HSR stations and counties' economic growth. We investigate the effects of HSR stations on county development in China, applying the propensity score-matching difference-in-difference method to county-level panel data for China from 2006 to 2014, and we examine whether and under what conditions a resource redistribution effect occurs. The findings are as follows. (1) HSR construction is conducive to the economic growth of the site area, with a promotion effect of 14%. (2) The primary source of this promotion effect is a resource redistribution effect in areas located within 30–110 km (26 min) from the station. This attractive radius significantly differs between coastal and inland areas, with the effect being greater in inland regions than in coastal regions. (3) This difference can be attributed to the heterogeneity of the surrounding counties; the larger the market size of the surrounding counties, the smaller the resource redistribution effect is, and vice versa.

## 1. Introduction

High-speed rail (HSR) allows the flow of people between regions; it is regarded as the next wave of economic growth (Tierney, 2012; Qin, 2017; Shao et al., 2017). With rapid global development in HSR technology for passenger transportation, it plays an important role in transportation systems (Bonnafous, 1987; Spiekermann and Wegener, 1994; Vickerman, 1995; Givoni, 2006; Ahlfeldt and Feddersen, 2017). Since 2008, China has made considerable investments in HSR systems, and as a result, has the longest HSR network in the world today, with more than 20,000 km of track. China's HSR network can be used to explain the economic changes in its cities over the past decade.

Development of an HSR network was a state strategy in China until 2000. The Chinese government recognised the need for high-capacity railways to accommodate the increasing growth in cargo and population. Thus, in 2004, the Ministry of Railways (MOR) aggressively pursued the Mid-to-Long Term Railway Development Plan (hereafter 'the Plan'). The Plan was further revised in 2008, to include a new national HSR network that extends the existing one. China's HSR network comprises three parts: the national HSR network, new tracks or upgrades to improve the existing HSR network, and the inter-city HSR railway. The revised Plan has an ambitious target of expanding the HSR

network to more than 29,000 km by 2020. By the end of 2016, the national railway operating coverage was more than 124,000 km, of which HSR accounted for more than 22,000 km. Upon completion, China is expected to have the world's largest and most comprehensive HSR system (see Fig. 1 and Table 1).

Given the targeted rapid expansion in HSR network, this study explores the relationship between HSR and economic output in two cases, for counties with HSR stations and for those without. In general, an HSR network can affect the economic output of counties by narrowing the time distance between regions, reducing the time cost, and increasing accessibility (Bruinsma and Rietveld, 1993; Spiekermann and Wegener, 1996; Vickerman et al., 1999; Gutiérrez, 2001; Vickerman, 2018). The home market effect indicates that the decrease in trade costs may strengthen the existing core-peripheral structure, and increase regional economic differences (Fujita et al., 1999). However, the following questions remain to be addressed in the literature. What impact do HSR stations have on the economic output of China's station counties? If station areas do have a positive effect on the economy, does the associated increase in output reflect economic growth or just a redistribution of economic resources? What is the effect on the counties that surround these stations? Does this effect lead to economic growth or decline? What are the conditions that lead to growth and decline? We

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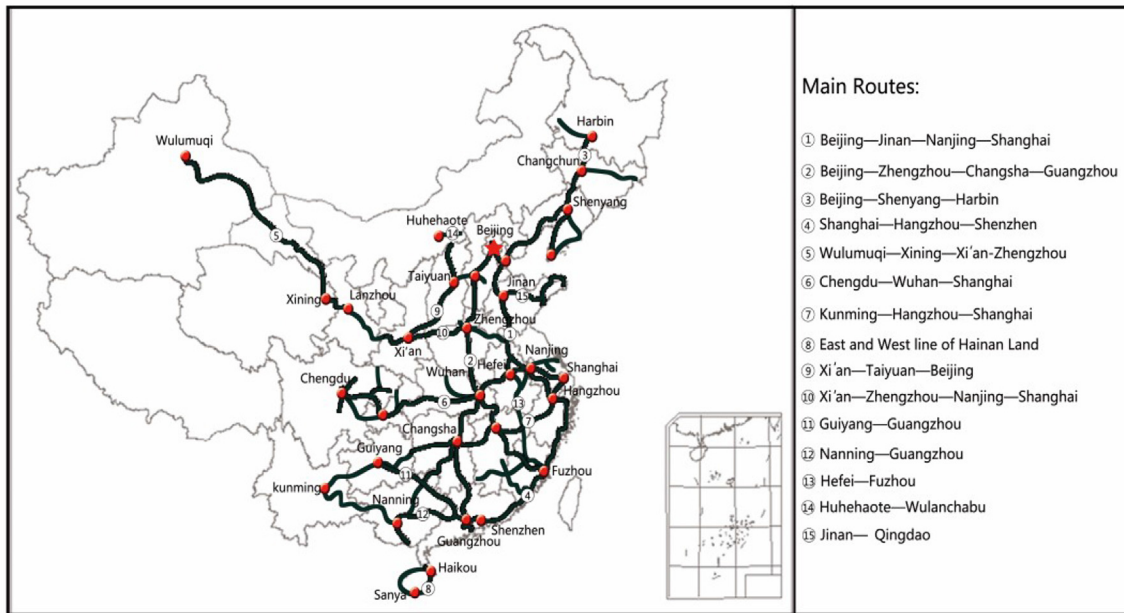


Fig. 1. Chinese HSR network as of Aug 5, 2017.

Source: Author Resources, Based on data from National Railway Corporation and China Railway Customer Service Centre<sup>1</sup>

Table 1

National railway network density in representative provinces.

Source<sup>2</sup>: Base on the statistical yearbook of each province from statistical database of China's economic and social development

Provinces	2015	2014	2013	2012	2011
Beijing	0.60	0.60	0.61	0.63	0.59
Hebei	0.94	0.85	0.86	0.77	0.72
Shanxi	1.39	1.37	1.05	1.05	1.06
Jiangsu	0.34	0.34	0.33	0.30	0.30
Zhejiang	0.47	0.42	0.36	0.33	0.33
Anhui	0.68	0.58	0.58	0.55	0.52
Henan	0.56	0.55	0.52	0.52	0.46

Unit: Railway km per million.

reference recent research to measure the resource redistribution effect of HSR stations in China.

The remainder of this paper is organised as follows. Section 2 outlines the theoretical basis for the potential influence of HSR implementation on economic activities. Section 3 discusses the methodology selection for empirical analysis. Section 4 describes the process of the database construction, and section 5 presents the empirical strategy and results. Finally, section 6 concludes the paper, highlights key findings, and proposes directions for future research.

## 2. Theoretical basis

### 2.1. Some literature evidence of wide economic effects

Studies have explained how transport infrastructures affect various cities and their economic outcomes through their impact on accessibility (Bruinsma and Rietveld, 1998; Duranton and Turner, 2012). Most scholars believe that accessibility changes stem from the benefits of agglomeration. First, with urban economics (Alonso, 1974; Muth, 1969), it can be shown that reducing transportation costs can, in some

cases, affect the trend of urban decentralisation. New economic geography (Helpman and Krugman, 1985; Fujita et al., 1999) has also improved the understanding of the effect of transport costs on the accessibility of core and periphery cities from the perspective of agglomeration (Redding and Turner, 2014; Vickerman, 2018). HSR stations affect the market potential, which in turn, impacts the occurrence of economic agglomeration (Ahlfeldt and Feddersen, 2017).

Givoni (2006) believes that HSR stations may have different impacts on the economic activities of central cities and those of medium-sized peripheral cities. Economic activity gradually shifts from a central city to its surrounding small cities because of the role of the decentralisation force (Garmendia et al., 2012; Shao et al., 2017). Faber (2014) argues that the opening of highway is not conducive to GDP growth to the cities unconnected to the edge area. If an area is not included in the cities' highway network, then, compared to the other peripheral cities, the average economic growth rate is 18 percentage points lower, and the total industrial output value of the average growth rate is 26 percentage points lower.

However, few studies empirically test the source of these accessibility changes from the perspective of resource distribution for a number of reasons, including data limitations, technical difficulties, and endogeneity. Based on panel data for China from 1990 to 2010, Baum-Snow et al. (2017) examine the impact of transport infrastructure on core and peripheral cities. The results indicate that an increase of 1 km of railway might reduce the central city industrial GDP by 20%.

Qin (2017) first focuses on the distribution effect between counties with an HSR station and those without, mainly on the latter. The empirical results indicate that with decreasing costs of delivering people in urban core areas, the peripheral counties without HSR stations may experience lower GDP because of the investment drive. This conclusion differs from that of Faber (2014) on the effects of highways on surrounding areas. Noting these differences, this article provides evidence of the increasing disparity between urban and rural China resulting from HSR development. To address the endogeneity between HSR and economic activities, we adopt the propensity score-matching difference-in-differential (PSM-DID) method for empirical research.

Since airplane and HSR are the main modes of transportation for long distance travel within a country, the impact of HSR on air transport must also be considered. Existing researches mostly focus on the

<sup>1</sup> It is a website providing information of HSR stops, timetables, ticket prices, train delay and for passengers to query and order tickets train tickets.<http://www.12306.cn/mormhweb/>.

<sup>2</sup> <http://cnki.heinfo.gov.cn/csydkns/Nav/NavDefault.aspx>.

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