

Impact of high-speed rail on regional economic disparity in China

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ABSTRACT

This paper investigates a fundamental question related to the massive railway infrastructure development in China. What is the impact of high-speed rail (HSR) on regional economic disparity? The question is investigated from three perspectives. First, the influence of HSR on regional economic disparity is discussed theoretically from the perspective of New Economic Geography. Second, the variation in economic disparity at both the national and regional levels is investigated using three indexes: the weighted coefficient of variation, the Theil index and the Gini index. Third, the linkages between regional economic growth and HSR is measured empirically from a quantitative and qualitative perspective using an endogenous growth modelling framework with a panel data covering the period 2000–2014. The rail network density is adopted as a proxy to reflect the quantity change in rail investment. Three accessibility indicators (weighted average travel time, potential accessibility and daily accessibility) are introduced to capture the improvement of HSR transport quality. Our findings confirm that regional economic disparity has been decreased since the development of HSR. HSR has promoted regional economic convergence in China. Specifically, the positive effect of rail network density on regional economic growth is found to be significant in the East and North, whereas the positive effect of accessibility change is found to be more significant in the Middle Reaches of Yangtze River, the Southwest and the South China.

1. Background

With rapid economic growth following the opening-up policy, regional economic disparity has become a major challenge in China (Jian et al., 1996). For instance, from 1978 to 1998, provinces located along the eastern and southern coast, such as Fujian and Guangdong, experienced very fast economic development, with an average annual real GDP growth rate of more than 10%, whereas economic development in other inland provinces, such as Gansu and Guizhou, were much slow with an average annual growth rate of 6% (Zhang and Zou, 2012). Such an increased regional disparity has raised numerous concerns about social stability and economic sustainability.

To address these challenges caused by uneven economic growth, the Chinese central government launched a series of policies to promote a coordinated regional economic development. One of these initiatives was the expansion of public investment to improve transportation infrastructure. This is important because China has diverse geo-topographical features but with a poor transportation network. For many years, distribution of factors supporting economic growth such as capital, labor and information were limited particularly in inland areas

with poor accessibility. To overcome this bottleneck high-speed rail (HSR), became a focus of public infrastructure investment. Essentially, the idea was to promote regional economic convergence through a coordinated development linked by HSR networks (Chen and Haynes, 2015a). As one of the most advanced ground transportation modes, HSR is able to be operated at a speed of 250 km per hour or higher, hence inter-regional travel time can be greatly reduced. According to the Chinese national railway planning guideline “The Mid- and Long-term Railway Network Plan” (Ministry of Railways, 2008), the key objectives of the national HSR development plan for the Year 2020 were: 1) to increase accessibility among major economic regions through an interconnected HSR networks, and 2), to promote a coordinated and balanced regional development via improved regional transportation connectivity.

With a strong investment from the central governments, the Chinese railway network was expanded at an unprecedented speed over the past decade (Chen and Haynes, 2015a). As illustrated in Fig. 1, after a constant growth for over fourteen years, the national rail network density has almost doubled from its base level of 6.07 km per thousand km² in 2000. However, the growth pattern of railway network density

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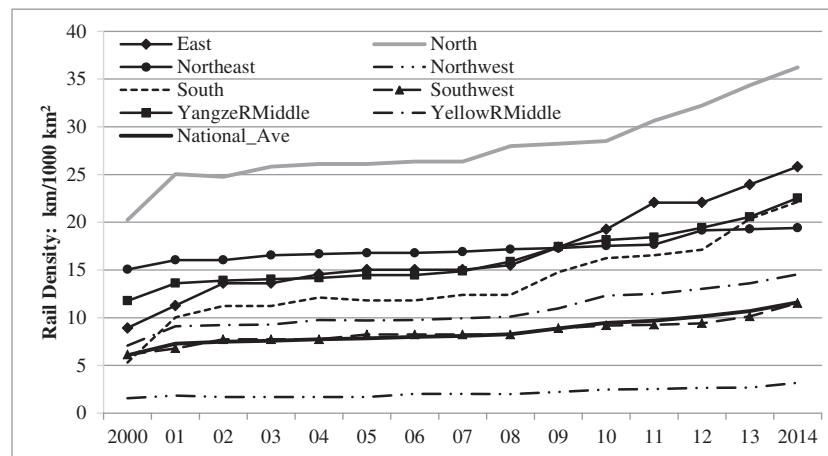


Fig. 1. Change of Chinese railway network density by region.

Source: The National Bureau of Statistics of China.

The North includes Beijing, Tianjin, Hebei and Shandong. The East includes Shanghai, Jiangsu, and Zhejiang. The Northeast includes Heilongjiang, Jilin, and Liaoning. The South includes Fujian, Guangdong and Hainan. The Middle Reaches of Yellow River (YellowRMid) includes Inner Mongolia, Shanxi, Henan and Shaanxi. The Middle Reaches of Yangze River (YangzeRMid) includes Anhui, Jiangxi, Hubei and Hunan. The Southwest includes Chongqing, Sichuan, Yunnan, Guizhou and Guangxi. The Northwest includes Tibet, Ningxia, Qinghai, Gansu and Xinjiang.

at the regional level is quite diverse. For instance, the north region, including Beijing, Tianjin, Hebei and Shandong, has the highest average rail network density in China, with an average level of 27.93 km per thousand km^2 . Conversely, the northwest region, including Tibet, Ningxia, Qinghai, Gansu and Xinjiang, have the lowest rail density at only 2.13 km per thousand km^2 . Since HSR systems are primarily developed to serve regions with a relatively higher population density, it is not surprising that the density of railway networks increased much faster in regions with high population, such as the North, the East and the South than in the less dense western region.

It is clear that with more people choosing high-speed train as their preferred mode of travel, the impact of HSR on China's urban agglomerations and regional economic development is expected to be amplified. However, several key questions related to the effectiveness of HSR planning and investment remain to be addressed. For instance, questions such as to what extent the deployed HSR systems have changed the quality of regional accessibility in China and more fundamentally, what is the impact of the Chinese HSR on regional economic disparity?

The objective of this research is to address these questions by conducting an *ex post* impact assessment mainly from three perspectives. First, we examine the linkages between HSR and regional economic disparity from the perspective of the New Economic Geography. Second, the variations of economic disparity at both the national and the regional levels are measured using three different indexes: weighted coefficient of variation, Theil index and Gini index. Third, the linkages between regional economic growth and HSR are investigated quantitatively and qualitatively under an endogenous growth modelling framework based on a panel data for the period 2000–2014.

We believe that clarifying the impact of the Chinese HSR system on regional economic disparity is crucial for the following three reasons. First, given the fact that the enormous HSR systems were funded dominantly through public financial sources (e.g. Central Budget Fund and various railway bonds) and bank loans from the national bank system, the assessment will help to validate the effectiveness of public investment in HSR and the research findings may provide implications for future decision making on infrastructure investment. Second, understanding such an issue will provide evidence and guidance for regional planning and development aimed at reducing regional disparity. Third, the experience of impact assessment of HSR on regional economic disparity in China will also provide implications for other countries that either have a similar system or are planning to develop

such a system.

The rest of the paper is organized as follows. Section 2 provides a review of the studies on regional disparities in China, which serves as the theoretical foundations for our empirical assessment. Section 3 introduces the conceptual modeling framework. Section 4 presents the disparities of regional economic growth and rail demand in China using different disparity indicators. Section 5 introduces methodology and data. Section 6 presents empirical results while Section 7 summarizes and concludes.

2. Literature review

Understanding the causes of regional disparity is one of the main research themes in regional economic development in China given its relevance to the Chinese central government's goal for achieving a harmonious society¹. Many studies have attempted to clarify whether the regional economic growth in China has led to regional economic convergence, divergence, or dispersion. The classical literature suggests that the change in regional disparity is an inverted U-curve, known as Kuznet curve (Kuznets, 1955). This is because regional differentials, in terms of income, for example, normally increase in early development stages, then stabilize, and then diminish in mature period of growth (Williamson, 1965). As pointed out by Fujita and Hu (2001), the growth theory provides an explanation for the decrease in disparity (convergence), and this is that poor economies tend to grow faster in per capita terms than rich ones. For instance, the empirical evidence for states in the U.S. during the 1880–1990 period, for Japanese prefectures from 1930 to 1990, as well as among the regions in eight different European countries for the period 1950–1990, all showed a convergence pattern (Barro and Sala-i-Martin, 1995). If the GDP growth rate in regions with a lower GDP per capita is higher than that in advanced regions, then a gradual convergence is expected (Tvrdon and Skokan, 2011).

Conversely, the phenomena of regional divergence, or the increase in disparity has also been observed among developing countries, which cannot be well explained by the traditional growth theory. Instead, the New Economic Geography provides an alternative explanation from the perspective of the economics of agglomeration (Fujita and Thisse, 1996;

¹ Harmonious society (“hexie shehui”) is a concept introduced by President Hu Jintao. It serves as a vision for the country's future socioeconomic development (Chan, 2010).

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