Travel Behaviour and Society 12 (2018) 23–29

Contents lists available at ScienceDirect

Travel Behaviour and Society

journal homepage: www.elsevier.com/locate/tbs

The industrial impact of the Beijing-Shanghai high-speed rail

Xuezhen Dai[a,*], Min Xu[b], Ningzhao Wang[a]

[a] School of Management Science & Engineering, Central University of Finance & Economics, Beijing 100081, China
[b] China Architecture Design Group, Beijing 100044, China

ARTICLE INFO

Keywords:
High-speed rail (HSR)
Agglomeration-diffusion theory
Labor market
Cities with a station (CWS)
Cities without a station (CW-OS)

ABSTRACT

This paper focuses on 19 subdivided industries of city nodes around the Beijing-Shanghai high-speed rail (BSHSR). The effects of the BSHSR on different surrounding subdivided industries are compared and analyzed based on the agglomeration-diffusion theories. Several conclusions are drawn. First, with the operation of the BSHSR, the market potential of cities along the rail has improved in different degrees, and the location quotient of different subdivided industries has changed substantially. Second, the BSHSR results in an agglomeration effect on 11 subdivided industries among cities with a station (CWS), while the diffusion effect on 13 subdivided industries among cities without a station (CW-OS). Third, in the tertiary industry, nine of 14 subdivided industries experience an agglomeration trend in CWS, but a diffusion trend in CW-OS. However, the degree of the diffusion effect is larger than that of the agglomeration effect. This seems to indicate that CWS achieve industrial upgrades as a benefit of the BSHSR. Our research can enrich the economic and geographical study of space structure efficacy, as well as offer theoretical references for the organizational pattern of space structure. It also has practical significance for guiding the construction of high-speed rail and encouraging cities along the rail to make full use of development opportunities.

1. Introduction

Investment in public infrastructure can effectively promote a region's economic output, driving private investments and increasing employment (Munnell, 1992). High-speed rail (HSR) is an important form of transportation, attracting huge investment and significantly contributing to the stimulation of economic growth and employment. The regional and urban effects of HSR were summarized: HSR increased transportation strength, expanded labor and service markets, and influenced spatial organization, industrial composition, and the structure of factor inputs and regional comparative advantages. On this basis, HSR can promote economic integration and forming functional areas, thus expediting relocation and band adjustment of enterprises and families (Blum et al., 1997). A research revealed that the construction of HSR causes two forces: agglomeration and diffusion. Agglomeration has led to the growth of cities, the formation of megalopolitan regions, the concentration of population and industry, and the changing of space efficacy patterns; diffusion has resulted in spatial differentiation of economic and social activity, globalization, and spatial interaction, thus promoting the formation and development of the network model in spatial organization (Jin, 2012).

Scholars generally believe that a positive relationship exists between industrial agglomeration and traffic accessibility (Duranton and Puga, 2004; Sasaki et al., 1997). However, some empirical studies have found that the improvements in traffic conditions do not necessarily generate agglomeration of regional industry along the rail. Investment in transportation can decrease overall travel times, which reduces economic agglomeration (Graham, 2007). Some researchers noted the relationship between traffic accessibility and regional economic activity will be weakened when various factors are restrained (Paze, 2004; Ribeiro et al., 2010). Further, the development of traffic services can even make some agglomeration disappear (Chandra and Thompson, 2000). Therefore, we believe there may be regional and socioeconomic differences in the effects caused by agglomeration and diffusion along the HSR. It is beneficial to explore the reasons and mechanisms behind regional outcomes through the analysis of tangible impacts in different regions and on different socioeconomic elements such as resources, labor, capital, raw materials and land.

By the end of 2015, the total mileage of the Chinese HSR reached 19,000 km, with the range extending to 28 provinces – ranking first in the world according to xinhuanet.com. Several large high-speed passenger-dedicated lines operate in China, most notably the Beijing-Shanghai high-speed rail (BSHSR). The BSHSR opened on June 30, 2011, linking two big economic centers – Beijing and Shanghai, which are municipalities directly under the central government (MDUCG). It also links two economic zones – the Yangtze River Delta and the

* Corresponding author.
E-mail address: daixzh@cufe.edu.cn (X. Dai).

https://doi.org/10.1016/j.tbs.2018.03.002
Received 24 September 2017; Received in revised form 1 March 2018; Accepted 8 March 2018

Circum-Bohai-Sea region – with a high-level of urbanization and urban agglomeration along the rail. The construction of the BSHSR has greatly reduced traffic time on the Beijing-Shanghai railway, and it is expected to profoundly influence regional development along the rail and the spatial layout of China's economy.

Taking the BSHSR as an example, we will discuss industrial reconstruction theory for the linear structure. We hope to enrich the economic and geographical study of space structure efficacy and improve the analytical technology framework of the economic and social influences of HSR. We also want to offer theoretical references for the organizational pattern of space structure efficacy and have practical significance in guiding the construction of HSR and the cities along the rail, so they can make full use of future development opportunities.

The paper is divided into the following sections: Section 2 contains a state of the art on the agglomeration and diffusion effects of HSR on the areas along the rails; section 3 gives a detailed description of our research model and data sources for this paper; section 4 explains the different effects of the degree of industrial clustering caused by BSHSR; section 5 shows an analysis of response mechanisms for urban industries along the BSHSR; and section 6 includes the lessons and policy arguments derived from our research.

2. State of the art

The traffic transformation caused by HSR has changed the location accessibility, interaction strength and direction of economic relations among the towns along the rail, thus having significant impacts on the economic development, economic connections and spatial structural evolvements of the towns. Ever since the first HSR was built in 1964 in Japan, much attention has been paid to the influence of the construction and operation of HSR to the accessibility of cities along the line, with scholars primarily analyzing this influence by constructing different measurement indexes. Accordingly, simple measures of distance (or time) have been used as a means of accessibility measures. Some scholars have looked at the weighted average of travel times (Gutiérrez et al., 1996), while other scholars have been concerned with daily accessibility (Javier, 2001; Vickerman et al., 1999) or population potential (Zhu and Liu, 2004; Levinson, 2012; Vickerman et al., 1999). All of the studies have concluded that HSR improved the accessibility of cities along the rail. As research continues, scholars have focused on the unbalanced impact that HSR can have on regional accessibility, presenting the differences of socioeconomic factors between cities with a station (CWS) and cities without a station (CW-OS) and also the differences among cities with different sizes, analyzing each city at local regional and national levels. It seems that the HSR brought limited benefits to the corridor, with the possible benefits mainly concentrated in CWS, major cities and the transfer stations or interchange points. Thus, spatial imbalance increased (Pol, 2003; López et al., 2008; Vickerman, 1997). By studying the BSHSR, we also found that HSR has improved the accessibility of cities along the rail – especially CWS – while it has increased the differences between CWS and CW-OS and also the differences among CW-OS themselves. This can aggravate the imbalanced development of the sample area (Dai et al., 2016). Taking three CWS in France and Spain as examples, HSR changed the connection and transfer time between small cities or medium-sized cities and metropolitan areas, thus changing the urban hierarchy (Ureña et al., 2009). The polarization and equilibrium effects of HSR determined by geographic scale were revealed by analyzing the accessibility of HSR between France and Spain. We can see the polarization effect at a national level, but the equilibrium effect is evident at the European and HSR corridor levels (Javier, 2001) as well.

To explore these influences, scholars have launched investigations into the agglomeration and diffusion effects of HSR. Empirical studies on the Japanese Shinkansen and European HSR network have indicated that HSR had an obvious agglomeration effect on the regional economies. The growth of population and employment in the CWS and the area around the Japanese Shinkansen HSR has been more robust than in CW-OS. However, the Shinkansen HSR hasn't solved the problem of excessive economic agglomeration as it fails to promote regionally diffuse development (Sasaki et al., 1997). Among the three new CWS on the TGV-HSR from Paris to Lyon, France, only Lyon has experienced an improvement in regional economic development, where prices of land and office space near the station have increased significantly after the HSR began operating. At the same time, there has been a remarkable rise in land prices around the Le Mans Station on this line, but another CWS, Le Creusot, had very little growth in employment or business activity (Haynes, 1997). Research on China's HSR shows that the agglomeration and diffusion effects on regional industry are important parts of the regional economic effect caused by HSR (Luo and Cao, 2010). Some scholars also have discussed the influence of HSR on the Madrid metropolis from the perspective of labor migration (Guirao et al., 2017).

The agglomeration and diffusion effects of HSR vary indifferent industries. HSR can increase production and specialization by promoting regional comparative advantages: simultaneously, the fast, frequent and reliable transportation of people, goods and services promotes the development of knowledge-intensive industry in developed areas, thus affecting the composition of industrial structures (Blum et al., 1997). It is generally believed that the construction of HSR promotes the rapid growth of the knowledge economy (Tierney, 2012). Research on the Japanese Shinkansen HSR has shown that retail, wholesale, industry, construction and other industries in the CWS experience marked growth compared to CW-OS, with the accommodation industry of the intermediate stations having significant growth and the wholesale industry centralizing to the center of the bigger city (Haynes, 1997). Another research on the East-European HSR line in France identified the extent to which HSR could contribute to the location and renewed dynamism for firms by exploring the results of two surveys, and it was found that the business district did not massively attract external firms, also, financial and insurance activities were then the predominant sector in Reims (Beckerich et al., 2017). A comparative study on HSR in northwest Europe and China revealed that the changes in accessibility altered the professional model in the core city and its hinterland. It also found that the polarization and diffusion effects caused by HSR in different economic sectors were different; according to the relative changes of the specialization index in CWS, HSR promoted industrial agglomeration in developed regions in northwest Europe, but it brought a dispersed impact on the rapidly developing Pearl River Delta region of China (Cheng et al., 2015). Another comparative study on tourism in Spain and China revealed that the HSR implications on the tourism output (number of visitors and income) were different in China and Spain. Positive effects are much larger in China, where the alternative transport infrastructure (roads) are less developed (Campa et al., 2016). Studies on HSR in China revealed that, industries with a higher reliance on nonroutine cognitive skills benefited more from HSR-induced market access to other cities (Lin, 2016). Another work pointed out that HSR in China promotes the development of spatial polarization of tertiary industry in big cities, but accelerates the cooperation and balanced development of secondary industry in large, small and medium-sized cities (Song et al., 2015). Research on the manufacturing industry in the region along the Wuhan-Guangzhou HSR has shown that HSR promoted the manufacturing industry migration from the Pearl River Delta region to Hubei Province and Hunan Province (Dai et al., 2011). An analysis of enterprises surrounding the Nanjing station uncovered that HSR brought a concentration of transportation and real estate industries, and a scattered distribution of wholesale and retail industries within the scope of the rail station, while bringing a uniform distribution of accommodations and catering, computer services, technology services and residential services industries around the station (Wang et al., 2012). However, for small cities which lack competitive advantages, it would be easier to prevent a local recession if they do not connect to the HSR (Swann, 1988).