

A Review about the Influence of High Speed Railway on Industrial Structure Upgrading

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Abstract: The paper makes an in-depth analysis affecting the upgrading of industrial structure and explores the factors promoting the upgrading of industrial structure. The theoretical basis and important literature involved in the mechanism analysis of high-speed railway promoting industrial structure upgrading are summarized, which pave the way for further study.

1. Introduction

It is generally considered that High-Speed railway is a railway system with a new special line running at a speed of more than 250km/h or an existing line being modified to run at a speed of more than 200km/h. Compared with traditional railway technology, High-Speed railway technology has significantly improved in terms of speed, energy conservation, environmental protection, ride comfort and so on. Among many features, “fast and convenient” has become the main feature of high-speed railway.[1] As Banister and Hall [2] put it, “The advent of high-speed railways in the twentieth century led to the second railway revolution and led to the contraction of time and space”. Economic links between regions will become closer, which may have an important impact on local economic development.

In particular, it should be pointed out that China is in a critical period of economic transformation. Although the rapid economic growth is led by industry, it also exposes serious waste of resources, low level of technology, deterioration of ecological environment and other problems. In essence, it is due to the industry-led growth and the slow development of knowledge-intensive industries, among which the core problem is the low level of China's industrial structure at present. Can high-speed rail promote the upgrading of local industrial structure? What is the mechanism? This paper will find out the research clues for the promotion of industrial structure upgrading of high-speed railway by combing the current research results, so as to provide a useful idea for the follow-up research.

2. High-Speed Railway, Knowledge Spillover and Industrial Structure Upgrading

Due to the relatively late development of high-speed railways in various countries, some relevant researches only describe the relationship between high-speed railways and industrial development in the early stage of high-speed railway development. Nakamura and Ueda [3] made a comparative analysis of Japan's Shinkansen sukoe - Tohoku section. They selected 10 districts and divided them into two groups. The first group included 6 districts that connected Shinkansen, while the other group included 4 districts that did not connect Shinkansen. The results show that from 1975 to 1985, retail, financial and business services industries in cities along the high-speed railway are significantly higher than those in cities not along the railway. Amano and Nakagawa [4] also found similar rules by taking cities along Tokaido as samples.

Pieda [5] found that the opening of the TGV southeast line mainly reduces the time for business travel and increases the frequency of business transactions. Business services activity in cities along the route increased by 112 percent. Therefore, Pieda believes that the opening of TGV is an important factor to attract the location of business service industry. Other factors are also important, including corporate profits, proximity to markets, complete transport networks (including roads and railways) and utilities.

Although early studies found that cities along the high-speed railway are more attractive to high-end service industries such as business service industry and financial industry than cities not along the high-speed railway, the mechanism has not been clarified[6].

Trip [7] first proposed that the knowledge spillover effect generated by high-speed railway is the key to the upgrading of urban industrial structure. Trip believed that the acquisition of knowledge, especially tacit knowledge spillover, was the key to improve urban competitiveness and realize economic transformation. Tacit knowledge communication usually relies on face-to-face communication. Knowledge spillovers are usually limited to a specific area.[8-9] The opening of high-speed railway can improve the accessibility of cities along the route and increase the frequency of knowledge exchange, which can effectively promote the development of knowledge economy and improve the level of industrial structure in this region.

Chen and Hall [10] combined high-speed railway, knowledge spillover and industrial structure to investigate the impact of the opening of high-speed railway on the upgrading of industrial structure. The author firstly divides knowledge into explicit knowledge and implicit knowledge [11].Explicit knowledge can be transmitted through information technology (ICT)[12-13], while tacit knowledge is transmitted through person-to-person communication [14-15]. The opening of high-speed railway accelerates the dissemination of tacit knowledge, promotes the development of knowledge-intensive industries in the cities along the line, and improves the level of local industrial structure. When they investigated the industrial structure of towns around the “Greater London area”, they found that the service and knowledge-intensive service industries in towns along the high-speed railway developed faster than those not along the railway, indicating that the opening of high-speed railway effectively promoted the upgrading of industrial structure in towns along the railway.

3. High-Speed Railway, Accessibility and Industrial Structure Upgrading

Knowledge overflow, especially tacit knowledge overflow, must depend on face-to-face communication. The opening of high-speed railway has improved the accessibility of the areas along the line, increased the frequency of face-to-face communication, and accelerated the knowledge spillover between regions. Therefore, as long as the relationship between accessibility and industrial structure upgrading is established, the relationship between high-speed railway and industrial structure upgrading can be established.

Production model, classical economic growth model and spatial econometric model are generally used to measure the knowledge spillover effect of high-speed railway. However, the above models and methods measure the knowledge spillovers of transportation infrastructure indirectly. Recent years, the accessibility analysis method has been used by foreign geographers to evaluate the spatial spillover effect of new transportation infrastructure projects. The main reason is that accessibility can be used to evaluate the strength of knowledge spillover effect from the perspectives of space and social economy. Therefore, the use of accessibility analysis method to describe the scope and intensity of spillover effect of transportation infrastructure is helpful to analyze the spatial distribution characteristics of the benefits brought by a transportation investment project to other regions, and overcome the problem of ignoring the impact of transportation network space in previous studies [16].

From the perspective of relevant studies on the relationship between accessibility and industrial structure upgrading, most scholars focus on the influencing factors of location selection behavior. With the continuous development and use of modern transportation (such as high-speed rail), the travel time between regions is greatly shortened. Does this mean that the influence of accessibility on the spatial location of economic activities is weakened? This is true in academia, but there is plenty of evidence that accessibility is still an important factor in high-tech industry location decisions. When Pratt [17] studied the distribution of multimedia enterprises in New York, it was found that location factor was still important to the distribution of multimedia enterprises, and most of them concentrated in the core area of the metropolitan area. Zhang Wen zhong [18] investigated the distribution of information services in Japan and found that information and information services were highly concentrated in The 23rd District of Tokyo, accounting for more than 50% of

the sales volume of the same industry in China. China's information service industry is mainly concentrated in Shanghai, Nanjing, Guangzhou and other municipalities and provincial capitals [19].

In this regard, Barton [20] points out that a perfect mode of transport is particularly important for high-tech enterprises, which includes not only reliable inter-city transport, but also international transport links and local transport. Taking Silicon Valley as an example, Saxenian [21] believes that a large number of small and medium-sized technology enterprises gather in Silicon Valley, mainly because mutual communication is very important for enterprise clustering, and rich knowledge is spread among enterprises and individuals through mutual communication. Keeble and Nachum [22] specify the connotation of accessibility. He believes that convenient transportation, adjacent customers and proximity to large transportation stations are crucial for high-tech enterprises. In fact, the principle of locating some high-tech industries in areas with better transportation is quite obvious. The lower the degree of knowledge coding, the more urgent the need for economic subjects to gather in space. The more accessible the location is, the more conducive to face-to-face communication among economic subjects. Thus, the cost of face-to-face communication is reduced, the speed of knowledge dissemination is accelerated, innovation activities are promoted, and the agglomeration of technology-intensive industries improves the level of industrial structure in this region. [23]

Empirically, Shao Hui [24] used econometric model analysis and other methods to analyze the spatial distribution of producer services in central and suburban Areas of Beijing. It is found that three types of producer services are basically clustered in Beijing CBD. Mainly because CBD has good traffic conditions and relatively high level of accessibility, it can make enterprises closer to customers and the market, and meet the needs of close contact between enterprises and customers. It is more conducive to the collection of information and grasp of business opportunities.

Shen Yuming et al. [25] used cluster analysis and Their index to explore the spatial differences in the development of service industry among three major zones, within three zones and 31 provinces (autonomous regions and municipalities) in China. The research shows that the level of accessibility is an important reason for the spatial difference of KIBS development in China. Taking Guangdong as an example, Fang Yuan Equalization [26] used exploratory spatial data analysis and spatial constant coefficient model to analyze the regional differences, spatial correlation characteristics and dynamic mechanism of KIBS development level in Guangdong province. The results show that urbanization, industrialization, informatization, economic externality and traffic accessibility all promote the development of KIBS.

In conclusion, it can be seen that accessibility is an important factor in determining the location selection of technology-intensive industries. The development of technology-intensive industries (information service industry, financial industry, etc.) depends on face-to-face communication, so they are selected in areas with relatively high traffic conditions.

4. Conclusion and Prospect

In this paper, the theory of industrial structure upgrading is sorted out, and the main conclusions are summarized as follows:

Firstly, the essence and characteristics of knowledge overflow are summarized. Tacit knowledge is difficult to be encoded or recorded, and can only be communicated and transmitted through direct interaction and communication, face-to-face communication and constant contact within a specific area. Secondly, the relationship between high-speed railway and accessibility is analyzed. The opening of high-speed railway shortens travel time, improves the accessibility level of cities along the route and speeds up the knowledge spillover between regions. Finally, the literature on the upgrading of industrial structure by accessibility is sorted out.

On the one hand, according to the definition of industrial structure upgrading, industrial structure upgrading represents the evolution and change of industries, while location selection is a spatial concept, which emphasizes more on the agglomeration and dispersion of industries between regions, and there are certain differences between them. On the other hand, existing studies only interpret

accessibility as traffic conditions and explain the causes of technology-intensive industry agglomeration from a static perspective. High-speed rail is a dynamic concept. The above research does not say how the industrial structure level will change after the opening. Based on the above two points, a mathematical model integrating accessibility and industrial structure upgrading will be constructed in future research to analyze the action mechanism of high-speed railway on industrial structure upgrading.

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References

- [1] S. D. Gleave, High speed rail, International Comparisons-Final Report, vol.3, pp.1-5, 2004.
- [2] D. Banister and P. Hall, The second railway age, Built Environment, vol. 19, pp. 157 –162, 1993.
- [3] H. Nakamura and T. Ueda, The Impacts of the Shinkansen on the Regional Development. The Fifth World Conference on Transport Research, pp.27-35, June 1989.
- [4] K. Amano and A. Nakagama, Study on Urbanization Impacts by New Stations of High Speed Railway. Conference of Korean Transportation Association, pp.10-19, August 1990.
- [5] Pieda. Rail link project: a comparative appraisal of socioeconomic and development impacts of alternative routes. Reading, vol.3, pp.10-13, 1991.
- [6] R. Vickerman High-speed rail in Europe experience and issues for future development. Annals of Regional Science, vol. 31, pp. 21-38, 1997.
- [7] J. Trip, Railway Station Development in Post-Industrial Rotterdam: Path Dependency and Shifting Priorities. 45th Congress of the European Regional Science Association. pp. 23-27, June 2005.
- [8] M. Storper and A. Scott, The wealth of regions; market forces and policy imperatives in local and global context, Futures, vol. 27(5), pp. 505-526, 2011.
- [9] E. Glaeser, Are cities dying? Journal of Economic Perspectives, vol.12(2), pp. 139-160, 2002.
- [10] C.L. Chen and P. Hall, The impacts of high-speed trains on British economic geography: a study of the UK's Intercity 125/225 and its effect. Journal of Transport Geography, vol 19, pp. 689-704, 2011.
- [11] M. Polanyi, Personal Knowledge: Towards a Post-critical Philosophy, London: Routledge & Kegan Paul, 1958, pp.11-15.
- [12] F. Cairncross, The Death of Distance. How the communications Revolution will Change our Lives, London: Orion, 1997, pp.39-57.
- [13] F. Cairncross, The Death of Distance, Cambridge: Harvard Business School Press, 2001, pp.1-6.
- [14] A. Andersson, Creativity and regional development. Papers in Regional Science, vol. 56, pp. 5-20, 1985.
- [15] G. Tornqvist, Creativity and the renewal of regional life. Glerup, vol.3, pp. 91-112, 1993.
- [16] J. Gutiérrez, Location, Economic Potential and Daily Accessibility: a Analysis of the Accessibility Impact of the High-speed Line Madrid-Barcelona-French border. Journal of Transport

Geography, vol.9, pp. 229-242, 2001.

[17] A. Pratt, New media, the new economy and new spaces. *Geoforum*, vol. 31, pp. 425-436, 2000.

[18] W.H. Zhang, *Economic Location Theory*, Beijing: The Science Press, 2000, pp. 41-45.

[19] S.L. Lin and H.P. Zhang, Accessibility, location choice and agglomeration in information service industry-taking Shanghai as the example. *Finance & Trade Economics*, vol. 5, pp. 106-115, 2011.

[20] Barton, *Transportation Economics*, Beijing: The Commercial Press, 2001, pp. 89-90.

[21] A. Sexenian, Inside-out: regional networks and industrial adaptation in silicon valley and route 128. *A Journal of Policy Development and Research*, vol. 2, pp. 41-60, 1996.

[22] D. Keeble and L. Nachum, Why do business service firms cluster? small consultancies, clustering and decentralization in London and Southern England. *Transactions of the Institute of British Geographers*, vol. 27, pp. 67-90, 2002.

[23] R. Baptista and G. Swann, Do firms in clusters innovate more. *Research Policy*, vol. 27, pp. 895-911, 1998.

[24] H. Shao, Agglomeration of producer services in Beijing. *Acta Geographica Sinica*, vol. 63, no. 12, pp. 1289-1298, 2008.

[25] Y.M. Shen, L. Qiu, M.J. Wang, et. al. Industry relevancy analysis of producer services in China. *Acta Geographica Sinica*, vol. 62, no. 8, pp. 821-830, 2007.

[26] Y.P. Fang, D.D. Bi and M. Xie, Spatial correlation characteristics and dynamic mechanism of knowledge intensive business service: a spatial econometric analysis of Guangdong Province. *Scientia Geographica Sinica*, vol. 34, no. 10, pp. 1193-1201, 2014.