High-speed Rail and Urban Decentralization in China

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Abstract: The construction of large-scale high-speed rail (HSR) network in China is altering the time-space relationships between cities. As a result, HSR is changing the traditional hierarchical urban system in China and regions with large-scale networks of cities are forming. At the city level, the construction of HSR new towns could contribute to urban decentralization. In this paper, we focus on the impact of HSR at the city level and study how HSR is transforming cities in China through the urban spatial restructuring process. We conduct case studies on two cities located on the Beijing-Shanghai High-speed Rail corridor, and discuss the impact of the planned HSR new towns on the decentralization patterns of these two cities, as well as the potential effects on their economic development. We found HSR tends to function as a double-edged sword for cities. For large cities, the decentralization is actively driven by HSR since these cities are able to carefully choose the locations of their HSR stations. In this case, a HSR new town (i.e. a new district built around the HSR station) serves as an opportunity for well-planned spatial restructuring and a catalyst for sustainable economic growth. For medium to smaller cities, decentralization is often passively driven by HSR as the site selections of HSR stations are beyond their control. The long distance between the HSR new town and the urban center weakens the economic strength of the existing urban core. In this case, the HSR new town presumably functions as a distraction, rather than an attraction, to the economic growth of the city as a whole. The leapfrog type of development also induces a wasteful use of land and other resources, and further increases the living costs of its people and the operation costs of its firms.

Key words: high-speed rail (HSR); Decentralization; HSR new town; Beijing-Shanghai high-speed rail

1. Introduction

In the 1990s, constructing a nationwide high-speed railway (HSR) network was incorporated within the framework of national policies to facilitate China's economic development. As early as December 1990, the idea of constructing a high-speed rail (HSR) system was introduced in a proposal submitted by the China Ministry of Railways, titled "Beijing-Shanghai High-speed Rail Conceptual Scheme." For over a decade, a debate on whether to utilize steel-wheel rail tracks or maglev technology ensued. Ultimately, the Ministry of Railways decided to construct steel-on-steel HSR. This decision resulted in the completion of the Qinhuangdao-Shenyang passenger-dedicated line in October 2003, representing the beginning of a new era of rapid HSR construction in China. On January 2004, the China State Council passed "the Mid-to-Long Term Railway Network Plan," which suggested the construction of a nationwide passenger-dedicated HSR network, with a framework consisting of "four horizontal and four vertical lines" (four North-South lines and four East-West lines) (Figure 1).

China's HSR network is expected to involve four sources: the construction of the eight new national HSR major lines (railways), the upgrade of the existing railway, the new railway constructed in Western China that is operational for high-speed trains, and part of the intercity HSR (e.g. Beijing-Tianjin inter-city HSR and Shanghai-Nanjing inter-city HSR). On April 18th, 2007, the Ministry of Railways implemented its sixth National Rail Speed Upgrade, with the speed of HSR trains reaching 200 to 250 kilometers per hour. Since then, China's HSR has been officially put into large-scale operations. From 2007 to 2010, average daily passenger capacity increased from 237,000 to 796,000. By October 2010, the total length of HSR in China has reached 7,431 kilometers (or 4617 miles) with more than 30 lines (Table 1). The initially planned framework of "four horizontal and four vertical lines" has been completed. Since then, China has entered "an era of high-speed rail." According to the plan by the Ministry of Railways, the total length of HSR in China will rank second in the world (next to European Union) by 2020. By that time, the nationwide HSR network will connect all provincial capital cities as well as medium-sized cities with populations over 500,000. The HSR is expected to serve 90 percent of China's total population.

[Figure 1 Here]

[Table 1 Here]

Changes in the time-space relations due to enhanced mobility is the primary underlying factor that leads to the evolution of the spatial structures of regions and cities. The traditional hierarchical urban system and monocentric spatial structure of many cities in China were, to some extent, determined by the low-speed transportation system.

The increased speed and mobility promoted by HSR suggest the inevitable evolution of conventional patterns of urban space, as manifested in two aspects: 1) at the regional level, the HSR will strengthen and reshuffle the existing hierarchal urban system, and gradually form regions with large-scale networks of cities; 2) at the city level, the impact of HSR on urban spatial structure is mainly reflected in the large-scale urban land development in HSR new towns as well as in the patterns of urban decentralization. In this paper, we focus on the impact of HSR at the city level and study how HSR is transforming cities in China through the urban spatial restructuring process. Facing rapid urbanization while it enters "the era of high-speed rail," China is experiencing decentralization in many cities. This phenomenon has been further strengthened by the fact that most HSR stations are usually located in urban fringe areas. Through case studies of two cities located on the Beijing-Shanghai High-speed Rail corridor, this paper discusses the impact of the planned HSR new towns on the decentralization patterns of these two cities, as well as the potential effects on their economic development. We hope to provide some policy implications for cities and regions in China and other countries that are facing similar challenges of balancing urban decentralization and sustainable growth while they enter "an era of HSR."

2. Literature review of the impact of HSR on regions and cities

In 1964, the first HSR Tokaido Shinkansen began revenue service in Japan. In 1981, France completed its first TVG line from Paris to Lyon. With the technology of HSR continuing to mature in the 1990s, developed countries began to enter a peak period of HSR construction, including the ICE of Germany in 1991, the AVE of Spain in 1992 and the KTX of South Korea in 2004. As HSR is increasingly becoming an important factor affecting urban decentralization, it also becomes a popular research topic. Based on their different scales, the research can be classified into two categories: regional perspective and urban perspective.

Based on the regional perspective, research has focused on the impact of HSR on the city-reion relationship, inter-city relationship, regional economic development, and regional accessibility[see for example, Garmendia et al. (*1*) and Monzón et al. (*2*)]. Many studies have found that HSR has a positive impact on regional economic development, For example, Nakamura and Ueda (*3*) studied Shikansen in Japan and concluded that HSR played an critical role in promoting the development of regional business, especially in the information industry, as well as in increasing regional income and employment opportunities. Lynch et al. (*4*) studied the proposed HSR corridor in Florida and estimated that HSR would have profound influences on promoting regional economic development and improving the region's technology level. Bonnafous (*5*) also argued that, although the introduction of TGV mainly intended to increase the attractiveness of Paris, it actaully also facilitated the economic development of mid-sized

cities outside Paris. In terms of the magnitude of the economic benefits, Graham and Meol (*6*) estimated that HSR could enhance the productivity by 1%-10% and lead to an increase of GDP between 0.02% and 0.19%.

In the meantime, research have also suggested that HSR tends to have different economic impacts on different cities within a region. After analyzing the development of HSR in the European Union, Gutierrez et al. (*7*) concluded that there existed discrepancy in terms of the impact of HSR on different cities, because some cities substantially benefited from HSR while some cities in Spain and Portugal were marginalized. Urena et al. (*8*) examined the effects of HSR from a multi-level analysis at the national, region and local levels. They found that the HRS brought new opportunities for big and intermediate cities along the HRS line in Spain and France. More importantly, intermediate cities in France and Spain experienced a positive impact of HSR only when they had an effective local political leadership with national political weight.Through a study of UK's InterCity, Chen and Hall (*9*) found that cities connected to a new HSR could gain opportunities that were not available to non-HSR cities, and that non-HSR cities could only benefit from the HSR when it is integrated with their intra-regional transport systems. Furthermore, Pol (*10*) suggested that the development of HSR does not necessarily mean that all cities on the HSR corridor will benefit in terms of their economic development, and that the net impact depends on the superposition of the "spillover effect" and the "echo effect". Chen and Hall (*11*) also argued that the wider spatial-economic impacts of HSR is a complicated process. While HSR does strengthen the regional capital as a whole, it does not necessarily improve all sub-regions around it, especially those former industrial subregions.

Additionally, studies have found that HSR improves the regional accessibility. In Japan, the Skinkansen HSR network has shown that developed regions are benefiting more from HSR than remote regions, but remote regions are indeed benefiting from more access to central regions (*12*). In Spain, evidences from the last 20 years have also shown that the accessibility of sparsely populated territories has been improved greatly with the Madrid-Seville HSR (*13*). As a consequence, small isolated cities distant from the metropolis are becoming partially integrated into the metropolitan area, especially if these small cities are located within one hour of travel by HSR (*14*). Martinez and Givoni (*15*) also found that people living in cities close to, but not on the HSR line in the United Kingdom will not have better accessibility to London. The authors believed that in order to assess the impacts of HSR, a regional analysis is needed. Ortega et.al (*16*) studied the regional cohension impacts of HSR from different planning levels and found that there are many variables that contribute to why periphery cities do not have access to HSR. They recommended that secondary networks may reduce disparities in the regional accessiblity.

With the urban perspective, studies have mainly concentrated on the impact of HSR on urban spatial structure evolution. Givoni (*17*) noted that HSR has a large effect on development of new town and/or urban renewal, but the success remains inseparable from other elements. Through research on HSR in Japan, France and Germany, Sands (*18*) argued that government agencies should play an active role in HSR construction by establishing an integrated transportation system to facilitate development around the HSR station. The China Urban Planning and Design Institute argued that HSR would fuel the urbanization process and effectively facilitate the transition from a moncentric urban spatial structure to a polycentric structure (*19*). Garmendia et al. (*13*) concluded that, with HSR, people are able to travel farther while travel time and budgets remain the same; thus, HSR is a key factor for understanding the urban spatial structural evolution.

In sum, HSR has been shown to have profound impacts on regional economic development and regional accessibility. It also increases the pace of the development of new town and urban renewal, as well as accelerates urban spatial restructuring. Since the construction of HSR in China is relatively new, existing research mostly focuses on developed countries. However, China is currently in the process of rapid urban decentralization. Large-scale HSR development in China will highlight the complicated urbanization process and accelerate the urban spatial restructuring (*20*). Therefore, HSR might have a more profound impact on the urban spatial restructuring and economic development in China than in other countries. However, whether the “time–space” perception brought by China’s mass HSR constrcution will evolve into an expected “space-economy” pattern is still unknown (*21*). Thus, it’s necessary to study the effects, characteristics, and mechanisms of HSR-driven-decentralization in China.

3. HSR new town and patterns of decentralization

Different from many other counties，decentralization in Chinese cities is usually under the guidance of local government—the so-called “new town” construction model. It is not a spontaneous urban spatial restructuring, but an active “command-and-control” type of planning. Most new towns in China's cities have been driven by the combination of large-scale public-funded infrastructure projects and private-funded real estate development. Within this context，HSR new towns quickly become a popular development model for many cities located on the HSR network. On the one hand, the development of HSR new towns can simplify the legal process for land acquisition and promptly satisfy the huge demand for land due to rapid urban space expansion. On the other hand, it becomes an irresistible choice for cities to maximize their investment in the HSR stations and HSR new towns due to the anticipated large economic return. In the development of a HSR new town, the HSR station works as an "amplifier" and shows both obvious agglomeration effect and diffusion effect. The agglomeration effect in relation to HSR refers to how HSR stations raise the new town’s centricity by enhancing

its transportation accessibility and thus it facilitates the concentration of businesses. The diffusion effect refers to how the HSR station increases the area's viable commuting distance, reaches larger economic hinterland in the city-region, thereby enhances the ability to access various resources (e.g. goods, labor, markets). The HSR new town gains greater economical potential because of this "amplifier" function of the HSR station.

Indeed, developing a HSR new town has become the focus of many local governments and investors. Since Changchun West New Town began construction in 2008. about 36 HSR new towns have emerged, and were mainly distributed in Eastern China, especially along the Beijing-Shanghai HSR. The Beijing-Shanghai HSR began operation on July 1, 2011 with a total distance of 1,318 kilometers. It links the political center of the country (Beijing) with the economical center (Shanghai), traveling through two rapidly urbanizing regions (i.e.Yangtz River Delta Region and Bohai-Rim Economic Region) that have very dense populations and vibrant economic activities. Along this route, 16 of the 23 cities have planned HSR new towns (Figure 2). Each of the 16 HSR new towns are planned to be extremely large. For example, the East-Wuxi New Town has a planned area of 125 square kilometers (km^2). Similarly, Dezhou HSR New Town is planned to be 56 km^2; West-Jinan New Town is planned to be 55 km^2; Cangzhou New Town is planned to be 28 km^2.

[Figure 2 Here]

Given the amount of land needed for HSR new towns, most of the HSR stations and new towns have been chosen to be located in suburban areas of large cities. In some intermediate and small cities, HSR new towns are purposefully planned to "leapfrog" from their existing urban boudaries.. Taking the Beijing-Shanghai HSR as an example, Wang (*22*) found that HSR stations in 10 out of 23 cities are located outside the existing built-up area, e.g. in outer suburbs. Figure 3 shows the location of HSR stations for all cities along the Beijing-Shanghai HSR route. For large cities, HSR stations are more likely to be located in inner suburbs; for small and medium cities, HSR stations are more likely to be located in outer suburbs.

[Figure 3 Here]

This phenomenon can be explained as a consequence of both the urban spatial structure evolution and the enhanced mobility due to HSR. It is also closely related to the macroeconomic context of China's rapid urbanization and large-scale infrastructure investment. Suburbs have an abundant resource of cheap land, which not only reduces the costs of the new town construction, but also provides benefits from land-value appreciation stemming from the HSR stations. In this way, HSR new towns can

self-support and promote the public infrastructure construction. In addition, from the technical perspective (e.g. track turn radius), HSR tracks are most likely to be placed in the suburbs to significantly reduce project cost. As a result, it is not surprising that HRS stations in China are primarily located in suburbs, sometimes even in remote rural areas.

Since all HSR new towns are planned to be high-density urban sub-centers with mixed land use, the location of a HSR new town with respect to the existing urban center(s) will play an important role in the urban spatial restructuring. In many cities, the HSR new town is no longer simply treated as a district of the city, but as a new growth pole that attracts new economic activities. Theoretically, the location of the HSR new town should conform to the trend of the existing urban spatial development. However, each city has different bargaining chips with the China Ministry of Railways when facing the HSR station site selection. Due to their economic power, large cities generally are more likely to negotiate a “better” location for their HSR stations. Because the Beijing-Shanghai HSR needs to shorten its overall distance as well as total time, the track line is far away from many smaller cities along the route. As a result, large cities could play a more active role in the HSR-driven decentralization than small and medium-sized cities. Thus, HSR provides an unique opportunity for a large city to facilitate its urban spatial restructuring--namely, the redistribution and optimization of the locations and functions of its multiple urban centers, or a successful transition from monocentric to polycentric urban structures. In contrast, HSR new towns in small and some medium cities are misplaced to areas that are far away from the current urban area, which often leads to leapfrog development with ineffiencent use of land and other resources.

4. Case Studies

Two HSR new town cases are introduced to illustrate different decentralization phenomena driven by HSR at different city-levels. We also explain the different causes and effects of the HSR new towns in these two cases.

4.1 Active decentralization driven by HSR in large cities: the case of Nanjing

The Nanjing HSR new town is planned to have a total area of 184 square kilometers, with a population of 1.6 million. Since Nanjing is the state capital of Jiangsu Province, it has a vibrant economy and thus a strong bargining power to negotiate with the Ministry of Railways for its HSR station site selection. As a result, Nanjing has strategically selected the location for its HSR station; and the Nanjing HSR new town is postured to be one of the three major urban centers of Nanjing. The first stage start-up area that surrounds the HSR station has a planned total area of 30 square kilometers. Indeed, since it started construction in 2010, Nanjing HSR new town has been able to facilitate the

urban decentralization process, reshape the urban spatial structure, and fuel the economic development (Figures 4).

[Figure 4 Here]

First, Nanjing HSR new town promotes the landscape quality and mixed use in the suburbs of Nanjing. Given that Nanjing HSR new town is located in suburban areas, where the existing construction level is relatively low, the fast and effective construction of HSR new town has rapidly changed the landscape of that area. The land use plan of Nanjing HSR new town mandates a high level of mixed use, including residential use, commercial use, public infrastructure and facilities, and green space. Second, Nanjing HSR new town emphasizes the efficient use of land through mandating minimum density requirements in its zoning. Therefore, the landscape and function of Nanjing HSR new town is very different from traditional suburban districts that are filled with low-density residential neighborhoods.

The market swiftly responded to the development of Nanjing HSR new town. The Chinese central government is the main investor and contractor for the nationwide high-speed rail network. In 2009, the central government distributed 37.5% of the four trillion Yuan (about 660 billion USD) stimulus package to invest in transport infrastructure, most of which was used for the construction of high-speed rail tracks and stations. In addition, local governments have invested generously to build infrastructure for the HSR new towns. Private investors and developers have also participated vigorously in real estate development. This public-private partnership funding scheme prompted the rapid construction process. To illustrate how the real estate market has reacted to the development of Nanjing HSR new town, we selected a radius of 2.5 km and 10 km from the Nanjing HSR station and calculated the average housing price within each range. Our measures show that, for real estate properties in HSR station surrounding areas (i.e., 2.5-10 kilometers from the HSR station), the avareg price is about 2000-3000 Yuan (per square meter) less than the average housing price in the entire city, though it increased at a rate similar to the average housing price in the city. For real estate properties in HSR station core area (i.e., 0-2.5 kilometers from the HSR station), the average housing price increased at a faster rate over the past three years (i.e., from November 2011 to November 2014) than the average housing price in Nanjing. Since September 2013, the appreciation rate of the housing price in the HSR station core area has far exceeded that of the average housing price in the city, with a price premium of 2500-3500 Yuan per square meter (Figure 5). Additionally, the market response is not just reflected in the average housing price but also in the sale volume. According to

statistics on the sale of real estate properties, in the first two months of 2012, the amount of housing units sold within the Nanjing HSR new town accounted for almost 50% of the sales in the entire city. These findings support the idea that the Nanjing HSR new town is indeed becoming not only a new transportation hub but also a new center for economic activities, suggesting a successful redistruction and reoptimization of urban spatial structure is on its way.

[Figure 5 Here]

4.2 Passive decentralization driven by HSR in medium-small cities: the case of Suzhou

The construction of HSR could also have impact on medium-small cities. However, small and medium-sized cities that failed to integrate HSR investment with urban development would benefit less than large cities (*21*). In addition, research has shown that the magnitude of agglomeration benefits in the context of high speed rail is expected to be small in medium-small cities (*6*). In pactice, since small and medium-sized cities in China typically lack the economic power to negotiate with the Ministry of Railways for their HSR station site selection, their station sites are often far away from their existing urban areas. However, these cities sometimes use the same planning/construction model as in large cities, partly because their master plans are subject to the approval of provincial government. Their master plans also mandate high-density and mixed land-use patterns. Nevertheless, the passive decentralization driven by HSR in these medium-small cities often leads to leapfrog development. Their planned HSR new towns are far away from the existing urban centers, when these old centers still have great potentials to further grow and produce vibrant economic activities. In addition, traffic congestion in these old centers is not yet a problem. It appears that the agglomeration economies of these existing urban centers are still much greater than the agglomeration diseconomies. Most of these medium-small cities are not ready yet to proceed with urban decentralization. The construction of HSR new towns in these cities simply absorbs a significant amount of economical activities from the existing centers. In addition, the long distance between the HSR new town and the existing urban center substantially increases the travel costs, which may prohibit economic interactions and thus isolate the two centers. To make things worse, the HSR brings their competitors closer in the region. Small and medium-sized cities now have to face the competitions from neighboring cities as well as large cities more directly. To ensure their success, they need to adjust to their new roles among the new urban hierarchical system.

Suzhou, a small city in Anhui Province, is a typical example of passive decentralization driven by HSR. Suzhou HSR new town is located in a rural area that is 24 kilometers from the existing built-up area. This distance between HSR new town

and the exising city is the longest among all 23 cities connected by the the Beijing-Shanghai HSR (Wang L, 2012). According to the Suzhou Master Plan (2010-2030), the entire city will have a population of 1,100,000 by 2030, while Suzhou HSR new town will have a total area of 30 square kilometers and a population of 300,000. However, the existing population is merely 50,000. The local government plans to encourage the development of industrial parks through massive infrastructure investment and construction, in addition to the central government-funded HSR station. Local government also plans to relocate all farmers from surrounding areas to the new town. Even if the government can achieve the goal of reaching a population of 300,000, there is likely to be a large number of farmers who are going to lose their farmland and probably have few skills to survive in an urban setting. This may directly cause social unrest. In addition, given the worldwide recession and the slowdown in the Chinese economy, this massive construction of infrastructure with a goal to attract international and domestic capital in manufacturing industries may not be a sustainable growth strategy, at least in the foreseeable future. Finally, the existing development trend of Suzhou is south-north, with three major districts currently located on a vertical corridor. Yet the planned HSR new town is 24 kilometers east of the city. This leapfrog development intrigued by the construction of HSR new town is a wasteful use of land and other limited resources. To a certain extent, this leapfrog development also compromises the original urban texture (Figures 6).

[Figure 6 Here]

The market response in this case has proved above concerns. Since it started construction in 2010, the Suzhou HSR new town has attracted few firms to (re)locate there. Farmers in surrounding areas have been reluctant to move to the new town. The construction of HSR new town has been sluggish. The map in Figure 7 shows the status quo of the land use in this planned new town in 2014. It has a lot of vacant lots, although the major street network has been completed using funding from the local budgets. The demand for housing in this new town has also been minimum. From interviews with the residents of the city, they mention that they seldom go to the new town except when they have to take the train. Admittedly, it has only been 4 years since the new town started construction and it might take much longer than that to achieve its full development, given the size of the city itself and the slowdown of housing construction since early 2014. Nonetheless, the economic activity initiates we observed in Suzhou HSR new town is substantially less compared to those in Nanjing HSR new town over the sampe period of time.

[Figure 7 Here]

5. Conclusion and Discussion

With the continuous improvement of high-speed rail networks in China, HSR has gradually enhanced the regional accessibility and regional economic development. At the city level, HSR new town facilitates the urban spatial restructuring process and has the potential to become the new economic pole that attracts a wide range of economic activities. However, policymakers need to be cautioned that HSR could function as a double-edged sword to many cities in the process of urban spatial restructuring.

For large cities, the development of HSR provides them a unique opportunity to carefully choose the locations of their HSR stations and HSR new towns so that they can achieve an optimized spatial structure for future economic growth. In many of these large cities such as Nanjing, the trend of decentralization has become inevitable as their central business districts (CBDs) are becoming too expensive and overcrowded. The agglomeration diseconomies in the CBDs have already been pushing these cities to transform from a monocentric urban form to a polycentric structure. The construction of national HSR networks provides these cities a timely opportunity to initiate a new center for economic activities. With their strong economic power, these cities are able to negotiate with the Ministry of Railways to carefully select a site for the HSR station. With this advantage, these cities can build a HSR new town at the best location that optimizes the polycentric spatial structure. With intra-city transportation systems such as subway and light rail, the HSR new town is efficiently connected to the existing urban centers. Indeed, HSR new towns in many large cities have been built for a few years. It is evident that this type of HSR-driven decentralization has been quite successful in these large cities, with HSR new town and the existing urban centers complementing each other. In this sense, HSR serves as a catalyst to their sustainable urban growth.

For medium-small cities, their decentralization is often passively driven by HSR as the locations of their HSR stations are beyond their control. The long distance between the HSR new town and the existing urban center weakens the economic strength of its existing urban core. In this case, the HSR new town will presumably function as a distraction, rather than an attraction, to the economic growth of the city as a whole. In addition, the leapfrog type of development will induce a wasteful use of land and other resources, and further increase the living costs of its people and the operation costs of its firms. Forcing farmers to relocate to the HSR new towns will cause poverty and even social unrest. For these cities, local policies that encourage the development of industrial parks through massive infrastructure investment and construction will not longer achieve its expected economic goals, especially when China is facing the diminishing (low value add-on) exporting industry and the slowdown in its housing market.

The opposite outcomes faced by large cities and medium-small cities suggest that officials of local governments should pay close attention to the different stages of their

urban development when facing the opportunities and challenges brought by HSR. For a large city, when the existing urban center(s) has more agglomeration diseconomies than agglomeration economies, it should use HSR new town as an unique opportunity to facilitate the urban spatial restructuring—either redistribute and optimize the locations and functions of its multiple urban centers, or transit from monocentric to polycentric urban structure. For a medium or small city, when the existing urban center still have much potential to further grow, we need to be careful about the timing of its urban decentralization. In this case, HSR often poses lots of challenges in addition to opportunities, especially when the HSR station is far away from the existing urban center. It needs strategic planning for this city to decide the direction of its future urban expansion and the timing of each development stage, including when it should develop the HSR new town. Until the appropriate time comes, the city should concentrate its limited resources on further increasing the economic vitality of its existing urban center and reinforcing its economic strength in industries that complement the regional economy. Through its intra-city transportation system (e.g. frequenty bus service), the city could fully utilize its HSR station and better connect to other cities in the region. With increasing economic activities, the city will naturally expand. At one point, the location of its HSR station might no longer be that remote and it can finally initate the development of HSR new town.

As China enters its own “era of high-speed rail”, many cities need to adjust their roles in the new urban hierarchical system, due to the shortened time-space relation between cities and regions. Cities now need to rethink about their economic strength, weakness, opportunities and threats, as they get “closer” to each other. More importantly, cities will need to sustainably use their land and other resources, organically incorporate their HSR new towns into their existing urban texture via intra-city transportation systems, and effectively promote the quality of life in these new towns. The construction of the HSR network in China provides a great opportunity for cities. Yet only those who can successfully adjust to their new roles in the urban hierarchy and “smartly” transition its urban structure will survive.

Endnote

⊖ high-speed rail operating speeds up to 250 km / h or more of the railway system. There are subtle differences between on the definition of high-speed rail a variety of standard: according to the definition of the International Union of Railways (UIC International Union of Railways), high-speed rail through the transformation of the original line operating rate reach 200 km / h (124 mph) or more, or The new line operating speeds up to 250 km / h (155 mph) above the rail system. U.S. Transportation (U.S. Department of Transportation) high-speed rail is defined as the speed of 201 km / h (125 mph) above; Federal Railways Department (Federal Railroad Administration) standard is 177 km / h (110 mph).

⊜ Nanjing Railway Station is located in the city center of Nanjing as an ordinary train station, different from the Nanjing South Station, below the high-speed rail.

⊛ Southern District Core Nanjing south of the main city center and the main city, Hexi together to build the three pillars of a pattern.

♍ According to the railway station rating approved approach "provides, according to the railway station of passenger / freight traffic to rail division of the Principal stations, six levels of the first-class station, the second station, the third-class stations, four stations, five other stations. 21 stops of the Beijing-Shanghai high speed railway line there are seven first-class station, and the rest as second-class station.

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List of Tables

List of Figures

Table.1 Chinese HSR lines in operation （Data Source：Ministry of Railway）

Line	Open Date	Length (km)	Design Speed (km/h)
Qinshen PDL(Qinhuangdao-Shenyang)	2003.10.12	404	250
Hening PDL (Hefei-Nanjing)	2008.4.18	166	250
Jiaoji PDL (Qingdao-Jinan)	2008.12.24	364	250
Shitai PDL (Shijiazhuang-Taiyuan)	2009.4.1	190	250
Hewu PDL (Hefei-Wuhan)	2009.4.1	351	250
Yongtaiwen PFL (Ningbo-Taizhou-Wenzhou)	2009.9.28	268	250
Wenfu PFL (Wenzhou-Fuzhou)	2009.9.28	298	250
Fuxia PFL (Fuzhou-Xiamen)	2010.4.26	275	250
Chengguan PDL (Chengdu-Guanxian)	2010.5.1	65	250
Changjiu ICL (Nanchang-Jiujiang)	2010.9.20	131	250
Changji ICL (Changchun-Jilin)	2010.12.30	111	250
Hainan ER ICL (Haikou-Sanya)	2010.12.30	308	250
Jingjin ICL (Beijing-Tianjin)	2008.8.1	115	350
Wuguang PDL (Wuhan-Changsha-Guangzhou)	2009.12.26	968	350
Zhengxi PDL (Zhengzhou-Xi'an)	2010.1.28	455	350
chengdu-Dujiangyan ICL	2010.5.12	65	220
Huning HSR (Shanghai-Nanjing)	2010.7.1	301	350
Huhang PDL (Shanghai-Hangzhou)	2010.10.26	150	350
Jinghu HSR (Beijing–Shanghai)	2011.6.30	1318	350

Guangzhou-Zhuhai ICL	2012.12.31	117	200
Ninghang ICT(Najing-Hangzhou)	2013.7.1	261	350
Tianjin-Shenyang HSR	2013.12.1	665	250
Guangxi Coastal HSR	2013.12.28	261	250
Hangfushen HSR (Hangzhou–Fuzhou–Shenzhen)	2013.12.28	1450	250
Maoming–Zhanjiang HSR	2013.12.28	103	250
Liuzhou-Nanjing ICT	2013.12.28	223	250
Wuchang-Xianning	2013.12.28	90	250
Wuhan-Huangshi ICL	2014.6.18	97	250
Wuhan-Huanggang ICL	2014.6.18	66	250
Huhanrong HSR (Shanghai-Wuhan-Chengdu)	2014.7.1	2078	250

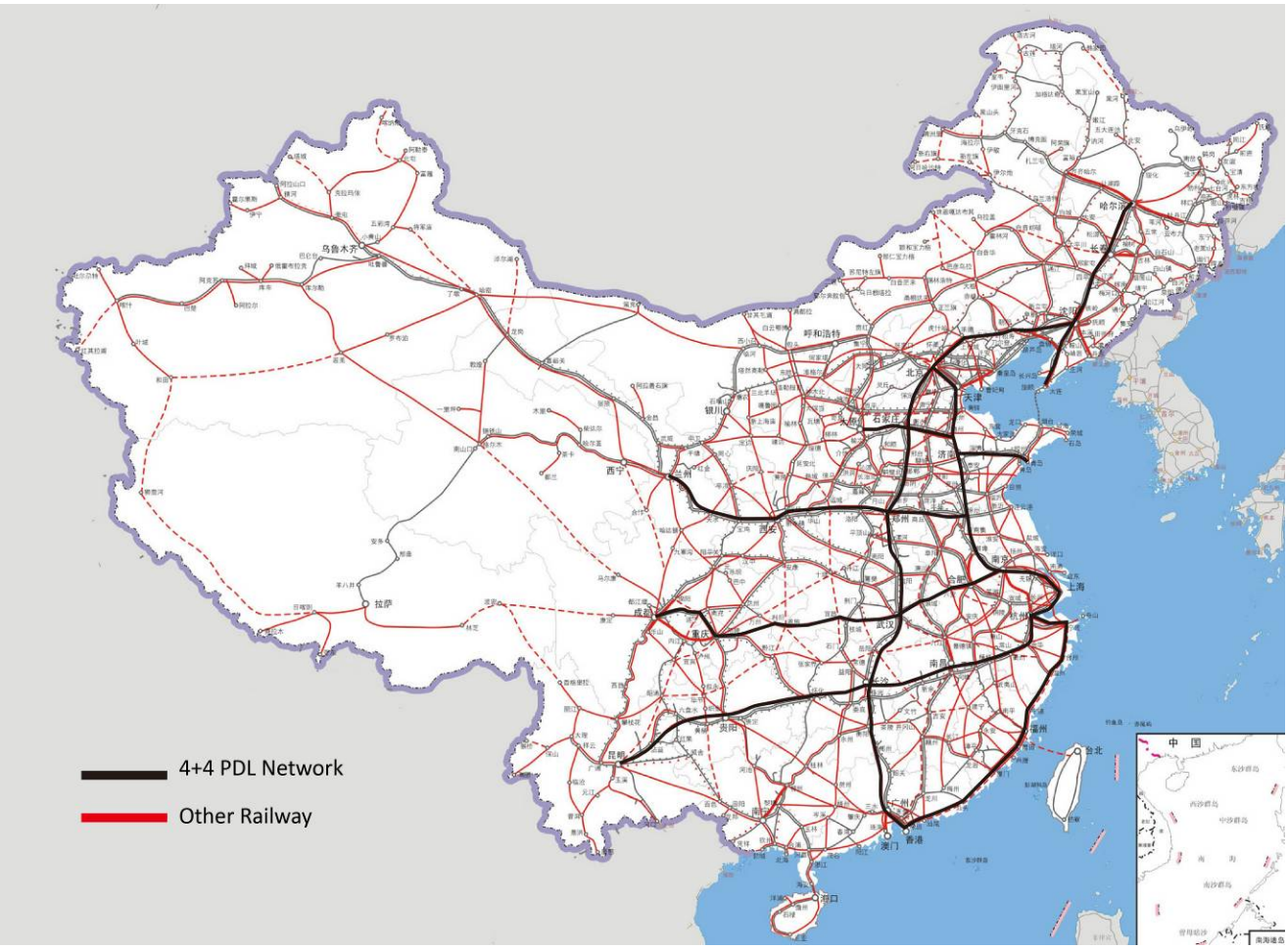

Figure 1. Plan of medium-to-long term national railway network (modified version of 2008) Data Source: Chinese Ministry of Railways

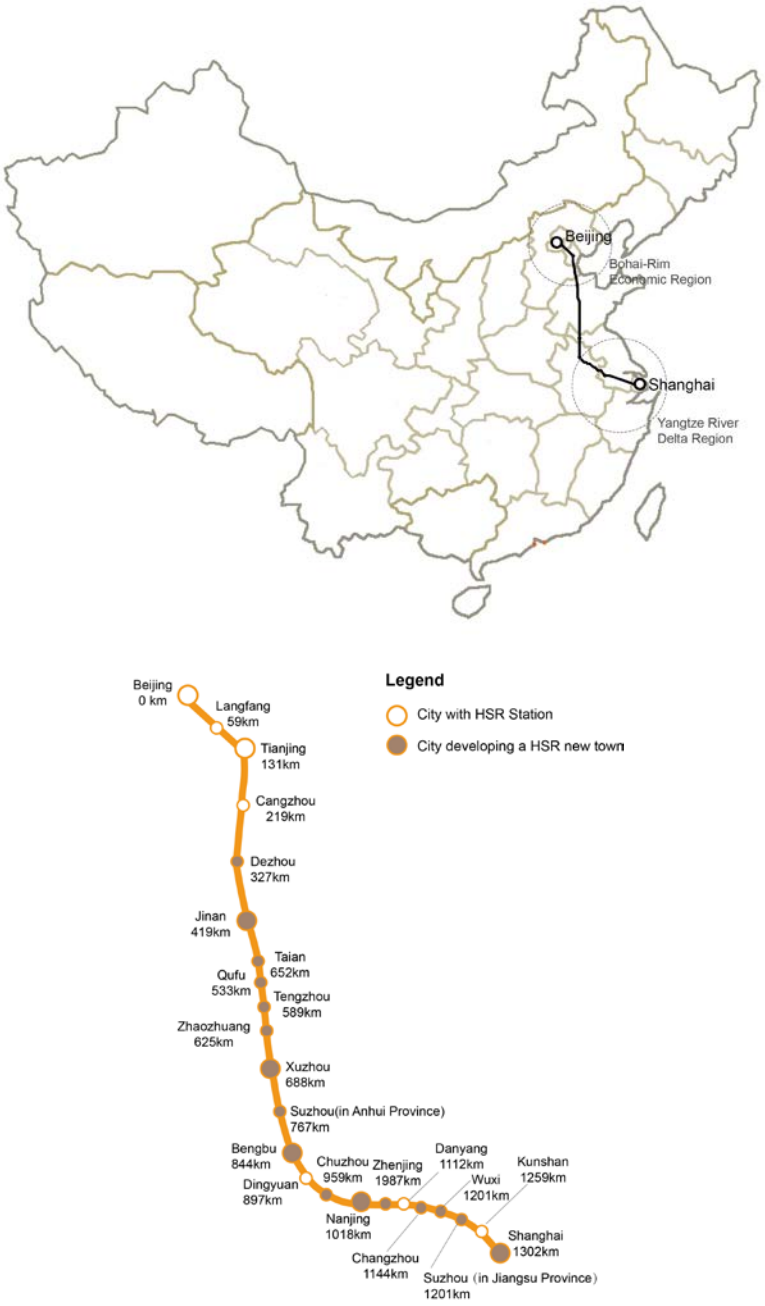

Figure 2 The line of Beijing-Shanghai HSR and distribution of Beijing-Shanghai HSR Station/HSR new town

(Drwan by authors, data source: Chinese Ministry of Railway and other open source)

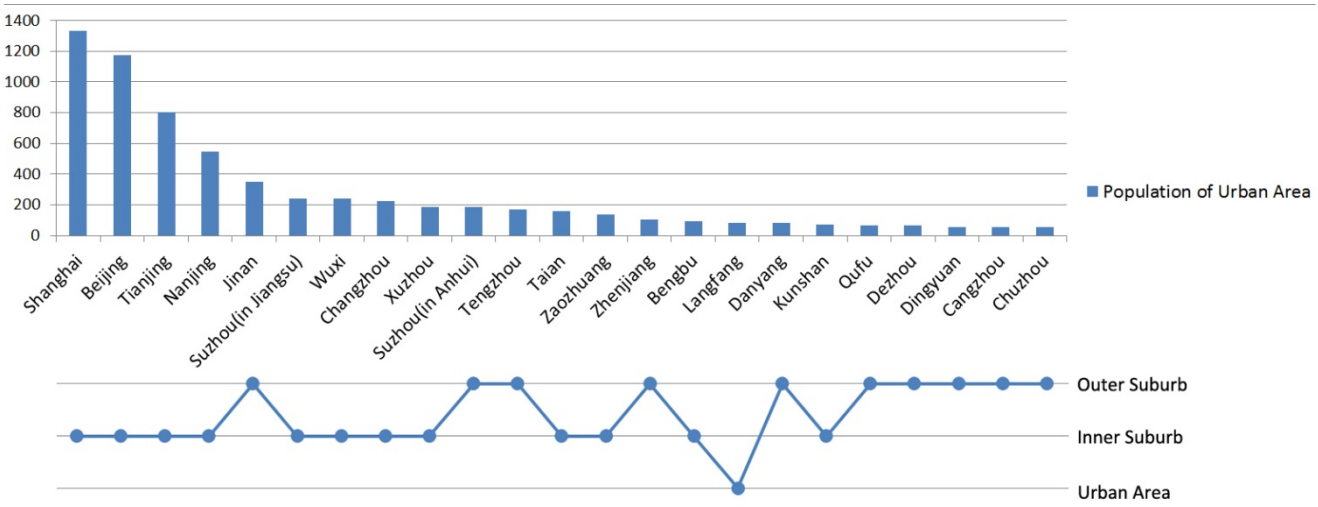

Figure 3. Size of Beijing-Shanghai HSR Cities（mesured by population size）and the location of HSR Stations

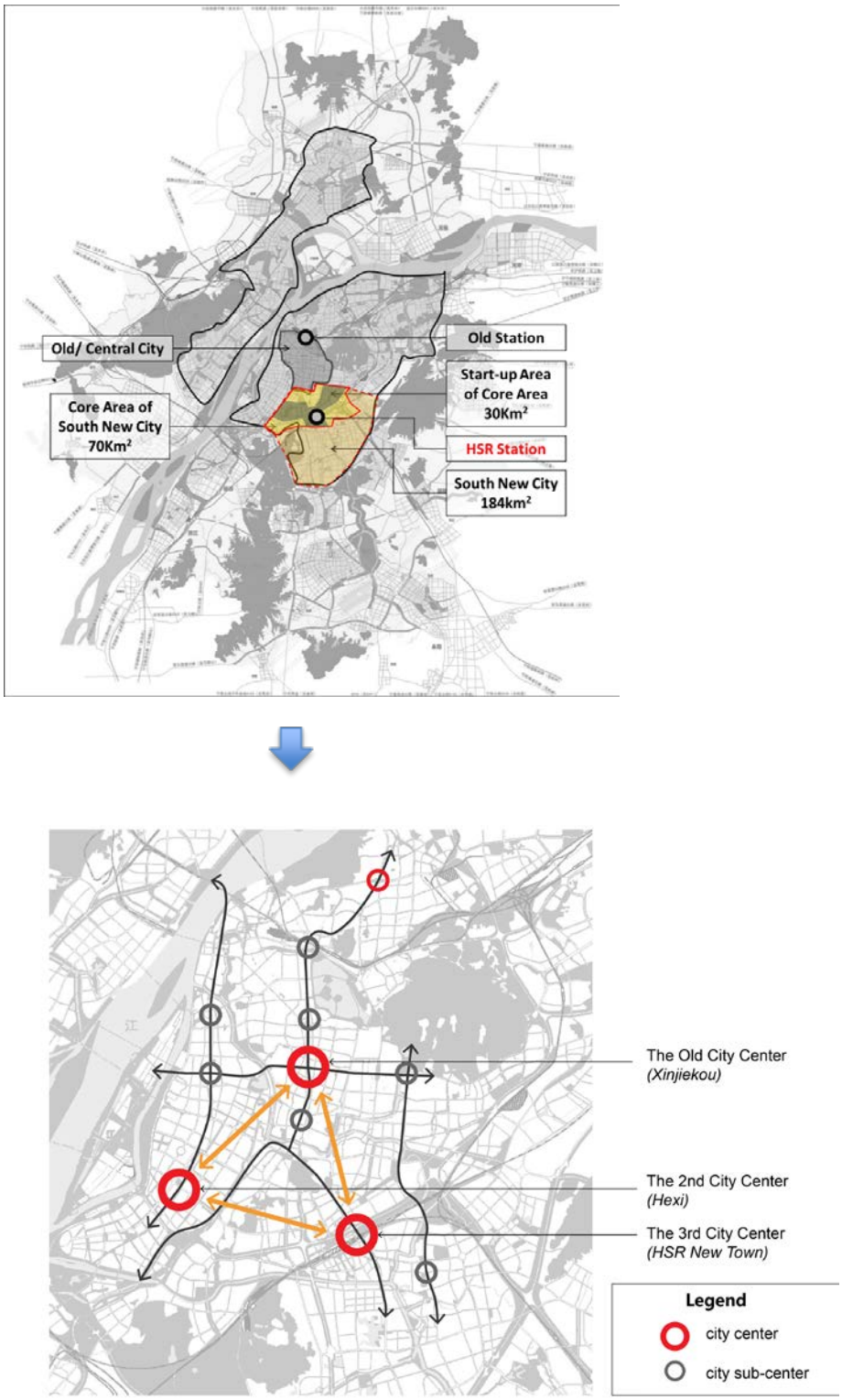

Figure 4 HSR New Town of Nanjing and Its Relation to Other Urban Centers

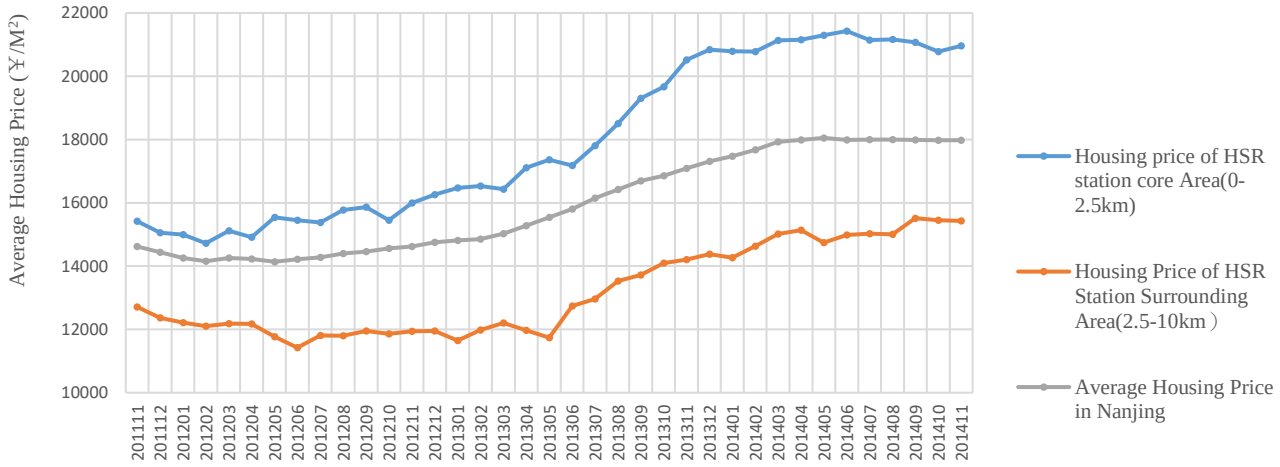

Figure 5 Housing price appreciation with respect to distance to HSR station (2011-2014)

Data Source: Anjuke.com, a Chinese website for housing information, http://nanjing.anjuke.com/market/#mode=1&hm=0&period=12

Figure 6 Land Use Plan of Suzhou City and the Change of Urban Structure

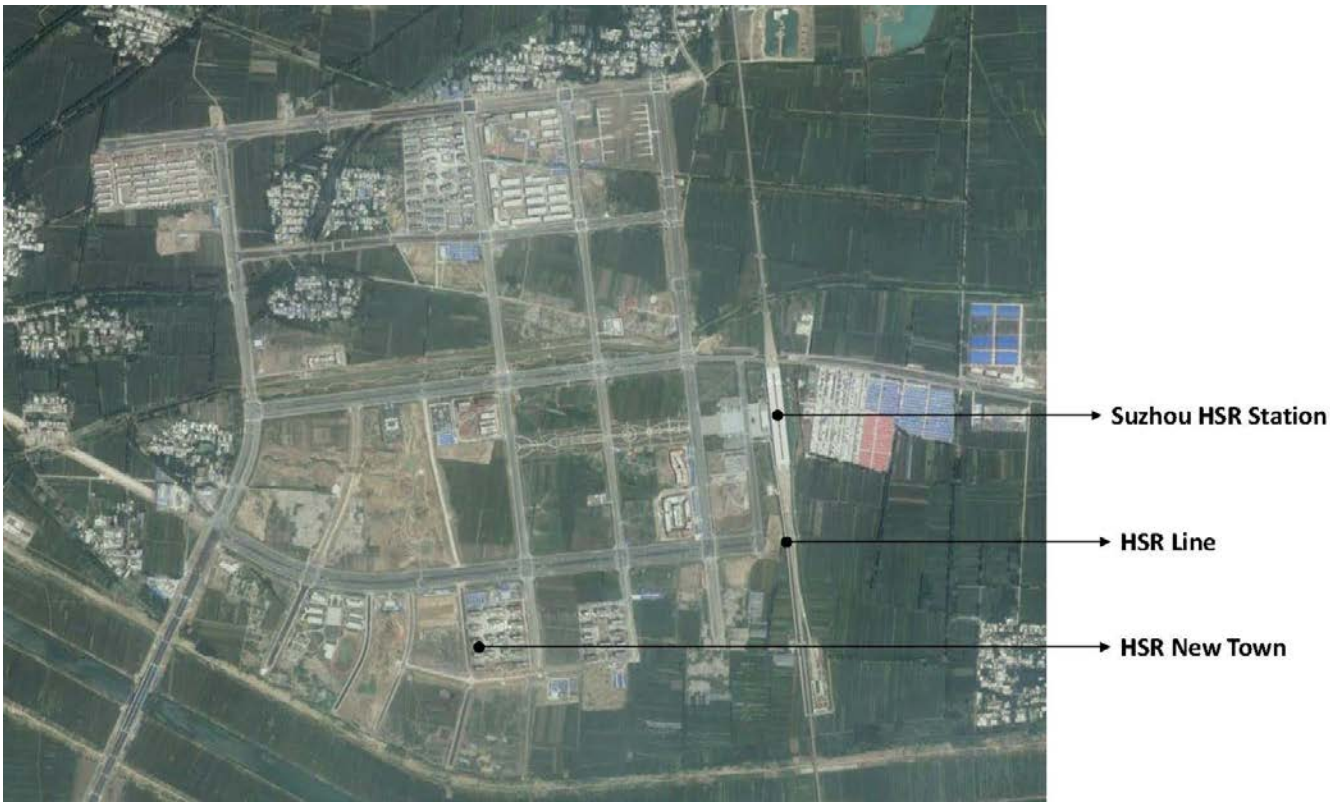

Figure 7 Status-quo land use of HSR New Town in Suzhou 2014

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