High-Speed Rail Diplomacy as Connectivity for the Belt and Road Initiative and its Potential Implication for Thailand

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Abstract

The Chinese government believes that high-speed rail construction can benefit Belt and Road country transportation and regional economies. The creation of a high-speed rail system immediately benefits these national capabilities, and transportation planning contributes to economic development and helps close regional development gaps. Therefore, this article examines a case study of Chinese high-speed rail development history, current status, and impact on the regional economy. In addition, opportunities and risks of constructing a Sino-Thai high-speed rail are considered by analyzing the successful example of the Beijing-Shanghai high-speed rail, and management and policy recommendations are offered for high-speed rail construction and operation in Thailand.

Keywords: High- speed rail, Belt and Road Initiative, Thailand

Background and Review of Literature

China's rail network has advanced to a sophisticated, fast-paced state over the last decade. China has added more than 35,000 kilometres to its high-speed rail (HSR) network, ensuring that high-speed trains serve 80 per cent of the country's largest cities. By 2025, the government stated that it would make a concerted effort to extend the network's length to 75,000 kilometres. HSR is expected to have a significant impact on Chinese cities. This extensive network will significantly shorten commute times between major cities. It will also connect cities as interconnected urban-local regions and act as a catalyst for reshaping the urban-local area. With population growth, the advancement of science and technology, and technology, Chinese transportation has become increasingly comfortable, particularly HSR, which has helped China significantly. Enhancing people's comfort and convenience also stimulates economic growth.

The Belt and Road initiative (BRI) is an initialism of the "Silk Road Economic Belt" and "21th Century Maritime Silk Road" that Chinese President Xi Jinping put forward in September 2013 and October. This initiative, which begins in China and extends to Asia, Africa, and Europe, aims to borrow the ancient Silk Road's historical landmarks, maintain a healthy flag of benign growth, establish trade alliances with countries along the route effectively, and to co-create a group of shared values, destinies, and obligations of political confidence, economic cooperation, and cultural inclusion. BRI is a critical strategic measure for China's opening up and economic development, highlighting the importance of interconnection between countries, including the formidable power of path linking, smooth trade, industrial cooperation, and soft power such as policy coordination, cultural exchange, and talent exchange. The introduction of the Belt and Road Initiative (BRI) has provided new opportunities to develop China's manufacturing export trade. By strengthening connectivity policy and connected infrastructure with the countries along the road (Gholizadeh et al., 2019).

This connectivity includes linking infrastructure in countries along the route, which serves as the foundation for interoperability and the demand for cooperation while focusing on high-speed (HSR) movement of commodities, cash, technology, and personnel. The BRI is focused on developing a sizable infrastructure and transportation system that strengthens ties between China and its neighbouring countries and regions, alleviates bottlenecks in cross-border trade, promotes efficient logistics and service networks, and stimulates demand for freight transport. Much of the investment associated with the BRI is directed toward expanding rail networks both inside Asia and connecting Asia to Europe.

With the development of society, the progress of science and technology, and the improvement of technology, China's transportation is becoming more convenient; especially the high-speed rail has brought China great benefits. Xi said the key to building "the Belt and Road Initiative" is interconnection, which focuses on the linkages of infrastructure in countries along the route by focusing on the high-speed (HSR) circulation of commodities, funds, technology, and personnel. Additionally, the BRI considers high-speed rail supply to be high-speed rail diplomacy. This diplomacy represents a new face for China's diplomacy and a significant opportunity for China to establish a new worldwide profile. Nonetheless, global HSR development projects urgently require many export-oriented high-speed technology capabilities matched to the manufacturing, development, management, and service frontlines to ensure the survey, design, installation, and operation of HSR projects. Therefore, in terms of its practical implementation, the BRI involves constructing an efficient infrastructure and transportation system that enhances interconnectivity between China and its neighbouring countries and regions, eradicating cross-border trade bottlenecks, and facilitating effective logistics systems and services to promote more significant demand for the carriage of freight.

Moreover, the export of high-speed rail is called "high-speed rail diplomacy" in the contemporary era. High-speed rail is not only a new business card for China's diplomacy but also a good opportunity for China to establish a new international image. Therefore, the potential impact of high-speed rail on China's economy is revolutionary. It made China start to eliminate local protectionist thinking and rationally think about the regional economy with the urban division of labour as the core, and this ideal economic model is turning from theory to reality. Besides, in the literature concept, Yang et al., (2018) compared the spatial configurations of the Chinese national urban system in both HSR and airline networks by using the 2013 origin/destination (O/D) passenger flow data instead of commonly used scheduled data. Qin & Gao (2017) reviewed development in the construction technologies of multi-function combined bridges in China, including highway and railway bridges and multitrack railway bridges, and presented the outlook of the future expansion of long-span HSR bridges. In China, under the Belt and Road Initiative, the researchers analysed the hinterland patterns of the CHINA RAILWAY Express (CR Express) (Jiang et al., 2018). Shao et al., (2018) suggested a method for the urgent needs of transnational HSR construction in the B&R area. Researchers believe that HSR is not just a faster transport way but poses remark-

able impacts on regional issues and transform spatial structures (Vickerman, 2018). Jiang et al., (2018) mentioned that the inauguration of HSR significantly had positive impacts on regional economies, which are often considered severe factors in planning and decision-making for policymakers. According to Lin's research paper review (2017), we found that the implementation of the HSR has a hugely positive effect on local economies, which are also used as a severe strategy and decision-making consideration for policymakers (See figure 1, below).

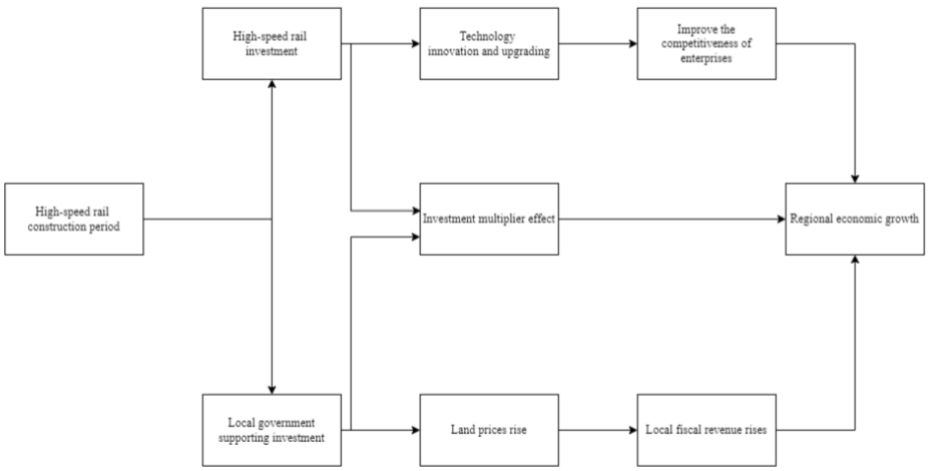

Figure 1 The Concept Effect of High-speed Rail Construction on Regional Economic
Source: Author

These issues make it essential to pay attention to the potential effects of HSR diplomacy on development in BRI participating countries. Therefore, based on the perspective of BRI, this paper taking the development of international trade as the background, expounds on the importance of the BRI to the high-speed railway (HSR) talent exchange between China and the countries along the silk road. However, there have been discussions on this subject based on international experience and a recent publication highlighting the difficulties associated with China's HSR in Thailand.

Over the years, China and Thailand have developed a close strategic relationship that encompasses the political, economic, cultural, education and defence sectors and is referred to by both the Chinese and Thai governments as the 'one family relationship' (MOFA, 2013). The HSR project in Thailand represents an important advance in China's geopolitical influence through the larger design of the Singapore–Kunming

Rail Link. Thailand considers the Chinese HSR project as only its first step to achieving its ambitious goal of becoming a land transportation hub in Indochina (Wu & Chong, 2018). China has shown strong interest in developing a high-speed rail line to connect the Bangkok–Kunming Rail Link (Hong, 2014). Based on the results of Wei's study (2021), China-Laos high-speed rail introduces the key roles that the new routes will play in enhancing trade between Thailand and China and provides valuable advice to governments and exporters on the rational use of the new routes to improve trade performance and export competitiveness. From the China-Laos high-speed rail, the Bangkok–Nong Khai high-speed railway is the first high-speed line in Thailand and is currently under construction. The project will be completed by 2023, with ticket prices starting at 80 baht plus 1.8 baht per km which can be considered a straight-line fare set with a fixed rate increase (Khwanpruk et al., 2021). However, HSR projects in Thailand should select an investment model based on the case of Japan and fare based on the case of Korea and Taiwan. Investment should start as soon as possible to benefit from increased competitiveness in ASEAN, and the world (Chantruthai et al., 2016), as Wu and Chong (2018) suggest that China can be outmanoeuvred in railway bargaining by the recipient states, depending on geopolitical positioning and the nature of their domestic political and economic conditions.

According to the survey of the existing literature regarding China's HSR and China's HSR in Thailand, there has been no systematic discussion of the actual local development effects, potential effects in Thailand, and ensuing planning and research challenges; this paper seeks to fill this gap. Accordingly, we must first assess the impact of HSR abroad and then discuss the Thailand context. Therefore, this paper addresses the following sets of questions:

1. What are the relations between the Belt and Road initiative and HSR diplomacy?
2. What are the experiences of HSR development in China?
3. What are the potential effects of HSR in Thailand?

Methodology

This article uses documentation and literature concept by reviewing existing research papers and articles. This research is primarily based on secondary data gathered from various literature sources. The author extracts statistics and information from the report's official page. Additionally, data on the Belt and Road project, high-speed rail

diplomacy, and high-speed rail experiences in China and abroad were gathered from numerous papers, journals, conferences, websites, and other internet sources. Finally, the prospective implications of HSR in Thailand are examined through data collection over the last few years.

Findings

In recent years, China's overseas high-speed rail (HSR) projects have been necessary for shaping the country's new diplomatic strategy. Through technical, financial, and economic support, the high-speed rail projects carried out in China's neighbours and other foreign countries reflect both China's short-term and long-term geo-economic and geo-strategic goals. In recent years, the HSR lines, which were initially introduced in Japan and later spread all over Europe, have become a symbol of China's technological progress and a significant source of national pride.

1. China's Belt and Road Initiative and High-Speed Rail Diplomacy

The Belt and Road Initiative (BRI) was unveiled in 2013 by China's President Xi Jinping and has been ubiquitous worldwide. This initiative would create a "Silk Road Economic Belt" across Central Asia and Europe and a "21st Century Maritime Silk Road" running through the South China Sea and the Indian Ocean to the Middle East and Europe, seemingly aimed at regional economic corridors and motivated by economic and strategic interests. A successful BRI would allow China to efficiently utilise excess savings and construction capacity, expand trade, consolidate economic and diplomatic relations with participating countries, and diversify China's import of energy and other resources through economic corridors (David, 2019). The initiative is generally prevalent in the developing world, where almost all countries face infrastructure deficiencies and a shortage of resources to overcome them. Through massive amounts of loans to participating countries to construct infrastructure in various sectors, the BRI can potentially benefit these countries by filling their infrastructure gaps and boosting economic growth. The Belt and Road Initiative (BRI) projects are mainly related to infrastructure development in the transport, energy, mining, IT and communications sectors and cover industrial parks, Special Economic Zones (SEZ), tourism and urban development. Many of the BRI branded projects are directly or indirectly related to the Belt and Road Initiative, financed by BRI funding mechanisms or officially branded under the Belt and Road Initiative.

China has shown its more remarkable ability to compete with advanced products and technologies globally through the growing demand for Chinese high-speed rail technology, which also shows the effectiveness of China's foreign policy, which actively promotes its economic priorities (Michał, 2015). China's so-called "high-speed rail diplomacy" is gaining momentum and putting high-speed rail at the core of the Belt and Road initiative to link Asia, Europe, the Middle East, and East Africa. China's connectivity and infrastructure investment would make it politically and economically more assertive in Asia. In recent years, high-speed rail building by Chinese firms has been pushed overseas. Instead, the foreign growth of Chinese infrastructure improvements can be treated as an incentive for many to improve cooperation and trade. However, high-speed rail networks are incredibly costly, especially for those with low population densities, unwilling to plunge into debt to the nation (Jeremy, 2017). Therefore, high-speed rail has become an embraced and attractive transport technology, and if nations plan to build high-speed connections, they will benefit from China's experience and cost competitiveness by China's high-speed rail diplomacy.

Since the launch in 2008 of the first 130 km section of a high-speed rail between Beijing and Tianjin, China has constructed another 16,000 km of high-speed rail, of which 6,000 km is designed to handle trains moving at speeds of up to 350 km/h. The two most essential companies responsible for developing high-speed rail technology are China CNR Corporation Limited and CSR Corporation Limited. In 2015, The central government announced its decision to merge the two companies due to the China Railway Construction Corporation Limited merger. This decision is part of Beijing's plans to create so-called national champions capable of competing on an equal footing in the global market with competitors from western countries.

In pursuing the "Go Out policy" and "Belt and Road Initiative", President Xi Jinping and Prime Minister Li Keqiang have actively promoted Chinese business worldwide. Mainly, high-speed rail projects can mobilise railway and construction SOEs, which faced a sudden and violent downturn as China's economic growth slowed, and the high-speed rail project is one means of responding to China's mounting industrial overcapacity. As a result of the substantial promotion of Chinese high-speed rail technology, Chinese high-speed rail diplomacy has been created. China's high-speed rail diplomacy is welcomed by BRI participating countries for its competitive cost-performance ratio and its great impetus to economic and social development. It describes the prosperity of China's construction of the rail network as connectivity for

Belt and Road Initiative. With Chinese leaders acting as its global salesmen, high-speed rail also acquired national significance as a symbol of China's global industrial competitiveness (Zhao, 2014). China proposes putting high-speed rail diplomacy at the forefront of the Belt and Road initiative, China's interests and a significant move forward in international transport infrastructure. China has been pushing for developing a comprehensive rail network in Southeast Asia, the critical area of the Belt and Road Initiative. China's policy banks will fill the financing gaps for infrastructure construction in developing countries as part of this diplomatic strategy. China currently conducts high-speed rail talks and supplies high-speed trains to more than 20 countries in participating countries. The high-speed rail projects are being prepared and implemented for connectivity in Southeast Asia, Central Africa, Latin America, and Europe. For example (Figure 2), we can see that rail projects in Laos and Thailand is a part of China's dream of a trans-Asian railway network from Singapore to Kunming, the capital of China's Yunnan province.

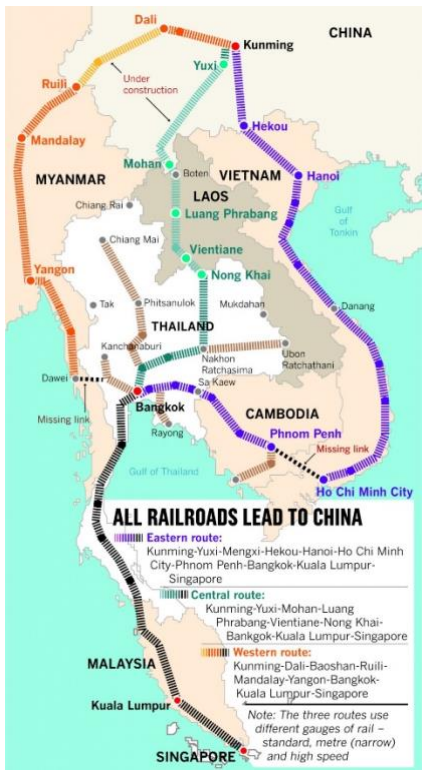

Figure 2 Completion of high-speed Southeast Asian rail link
Source: China Railway International Group Co., Ltd.

China's high-speed rail is going out

As a result of high-level Chinese leaders actively promoting China's high-speed rail expertise on the global stage, both developing and developed countries have become increasingly inclined to consider constructing or upgrading their domestic railways with the help of Chinese funds, companies and technologies. In addition, China has been pushing to develop a comprehensive rail network worldwide, involving high-speed rail for the Belt and Road Initiative. By proposing cutting-edge technology and massive, low-interest financing, China seems like the natural choice of partner (Agatha & Dragan, 2016).

In recent years, China's high-speed rail has developed very rapidly, and at the same time, it meets domestic demand. Through high-speed rail diplomacy, China was also actively seeking opportunities for overseas development. In 2014 he promoted China's high-speed rails to 12 countries, including Ethiopia, Nigeria, Angola, Kenya, the United Kingdom, the United States, Zimbabwe, Russia, Myanmar, Kazakhstan, Serbia and Thailand (Ma, 2015). This situation expresses the willingness to construct high-speed rails cooperatively and make significant contributions to China's high-speed rails overseas problem. Data from the State Export Export-Import Bank showed that at the end of January 2015, national export export-import bank loans he has 35 overseas railway construction projects, railway equipment export projects provided financial support, a total loan amount of about $ 13 billion, which supported the total mileage of up to 3,500 km of the railway construction project (Cao & Li, 2015). China's high-speed rail diplomacy has seen considerable strides in the Belt and Road Initiative background, contributing to China's more significant political and economic impact in recent years.

The overseas experiences of China's high-speed rail

BRI is part of Beijing's grand plan to win diplomatic allies across the globe by funding and building infrastructure, and the high-speed rail (HSR) diplomacy exemplifies the type of projects that BRI seeks to promote (Zhou, 2016). After China's reform and opening up, Chinese government sources stated early on China's intent to compete with established train manufacturers abroad, to take one step and look around before taking another. In Africa, China's rail diplomacy has taken the shape of performance indicators since the Tanzania-Zambia Railway Authority (TAZARA) line was established in 1970 by China. As the reform philosophy of "Crossing the River by Feeling the Stones" is a slogan, initially put forward by Chen Yun, one of the

leaders of the Chinese Communist Party. Moreover, the Chinese government is borrowed to denote a scientific method of work, indicating a steady attitude of exploration in the face of new things. This Tanzania-Zambia Railway Authority (TAZARA) was China's first step in improving its high-speed railway diplomacy after president Xi made HSR exports a top priority. The TAZARA project has been China's bridge to Africa, offering diplomatic assistance to African countries. Since then, the African continent has become one of the most important Chinese high-speed rail diplomacy targets. The 752.7 km long Ethiopia-Djibouti railway line construction further achieved China's high-speed rail diplomacy in the region. The project was started in May 2014 and completed in June 2015, attracting $4 billion of investments, 70% financed by the Chinese side (Omirbek, 2018). After absorbing and mastering foreign HSR technology, Beijing began a drive to win deals for HSR projects abroad. Between 2010 and 2011, China pursued HSR projects with many countries in Southeast and Central Asia, including Thailand, Laos, and Kazakhstan (Zoellner, 2016).

Moreover, in November 2014, a cooperation agreement for the construction of the 1400 km long Lagos-Calabar coastal railway, running through a total of 10 states and the oil-producing region in the Niger River delta, was signed between the China Civil Engineering Construction Corporation and the Federal Ministry of Transportation of Nigeria. Initially, the CCECC would invest $11.97 billion in the railway project, but the figure was reduced to $11.1 billion in 2016. Within the framework of this project, China exported $4 billion worth of railway vehicles, steel, mechanical and electrical products to Nigeria. As a result, since China has invested heavily in Africa's transportation infrastructure in its high-speed rail diplomacy framework, China led railway projects in Africa have revitalised social development and economic growth in the regional countries that have progressively expanded their political and economic cooperation.

ASEAN is another region where China has successfully implemented its railway diplomacy in recent years. For example, the 414 km long China-Laos railway line will link Boten, the northern Lao town bordering southwest China, and Vientiane, the capital of Laos, is an overseas railway project connected directly to the Chinese railway network. 70% of the total cost of the $6 billion worth China-Laos railway line, which began in December 2016 and is planned to be completed in December 2021, is financed by China, while Laos is responsible for the remaining 30% (Omirbek, 2018). As part of a more extended rail project that will link China to mainland Southeast Asia, namely, the Trans-Asian Railway (TAR) project, the China-Laos railway is expected

to be connected to the Chinese-Thailand railway. After years of delays, in December 2017, the CRCC officially launched the construction of the 253-km long railway line linking Bangkok to the northeastern Thai province of Nakhon Ratchasima, which is the first phase of the 873-km long railway line linking Thailand and Laos at the northeastern Thai city of Nong Khai with an investment of $11.36 billion. Moreover, in October 2015, the Indonesian government announced that China had won the bid to build the Jakarta-Bandung HSR line, over $5.135 billion. This announcement was yet another successful illustration of China's railway diplomacy in Southeast Asia.

Eurasia and Europe are the most attractive regions for China's railway diplomacy. China is interested in implementing several railway projects in Eurasia, such as the China-Kazakhstan, Kazan-Moscow, and China-Kyrgyzstan-Uzbekistan railway projects (Omirbek, 2018). As for Europe, the CRIG started constructing the 184-km long Serbian section of the Chinese-backed Budapest-Belgrade railway project, while the construction of a 166-km long railway section in Hungary is expected to start this year. China will provide 85% of the €1.8 billion worth Hungarian section through a preferential 18-year loan with an annual interest rate of 2.5%. Furthermore, in April 2017, China signed an agreement with Belarus, Germany, Kazakhstan, Mongolia, Poland, and Russia to deepen cooperation on intermodal rail freight services between China and Europe.

2. Experience of China's HSR Development: A case study of Beijing-Shanghai high-speed rail

After more than ten years of development, China's high-speed rail has made remarkable achievements and successfully possessed the world's advanced high-speed rail integration technology, construction technology, equipment manufacturing technology, and operation management technology. At present, China has more than 1300 high-speed trains, which is the largest in the world. China's high-speed rail enables people to enjoy faster, more convenient and more comfortable travel. It will also speed up the flow of personnel, capital and resources and speed up economic exchanges with surrounding cities. Furthermore, the formation of "economic broadband" better plays the role of radiation and diffusion of central cities, promote the development and transformation of the tourism market, more "group tour" will be replaced by "self-help Tour", which brings new opportunities to the progress of tourism.

The Beijing–Shanghai high-speed rail connects two major economic zones in the People's Republic of China. The line is one of the busiest high-speed rails

globally, transporting over 180 million passengers in 2017. The non-stop train from Beijing South to Shanghai Hongqiao was expected to take 3 hours and 58 minutes, making it the fastest scheduled train globally, compared to 9 hours and 49 minutes on the fastest trains running on the conventional parallel railway. After selecting Beijing, Jinan, Xuzhou, Nanjing and Shanghai from the 24 stations on the Beijing–Shanghai high-speed rail, Table 1 shows the time and cost from Beijing to the other four cities.

Table 1 Time and cost of different types of transportation at some stations on the Beijing–Shanghai high-speed rail

Type of transportation	Beijing to Jinan		Beijing to Xuzhou		Beijing to Nanjing		Beijing to Shanghai	
	Cost (CNY)	Time (Min)	Cost (CNY)	Time (Min)	Cost (CNY)	Time (Min)	Cost (CNY)	Time (Min)
High-speed rail	184.50	82	309.00	141	443.50	193	553.00	258
Ordinary railway	72.00	359	112.00	601	148.50	867	156.50	1145
Long-distance bus	130.00	330	213.46	542	315.85	802	403.96	1025
Self-driving	423.19	330	694.88	542	1028.18	802	1315.02	1025

Source: Sort out from 12306 China Railway and Ctrip
NOTE: Time and cost available in the table are assumed to be on January 31, 2021

It can be seen from table 1 that among the four types of transportation, the one type that takes the shortest time is the Beijing-Shanghai high-speed rail. On the other hand, however, self-driving has the highest cost. Figure 1 takes Beijing-Xuzhou as an example to visually show the time and cost comparison of the four modes of transportation.

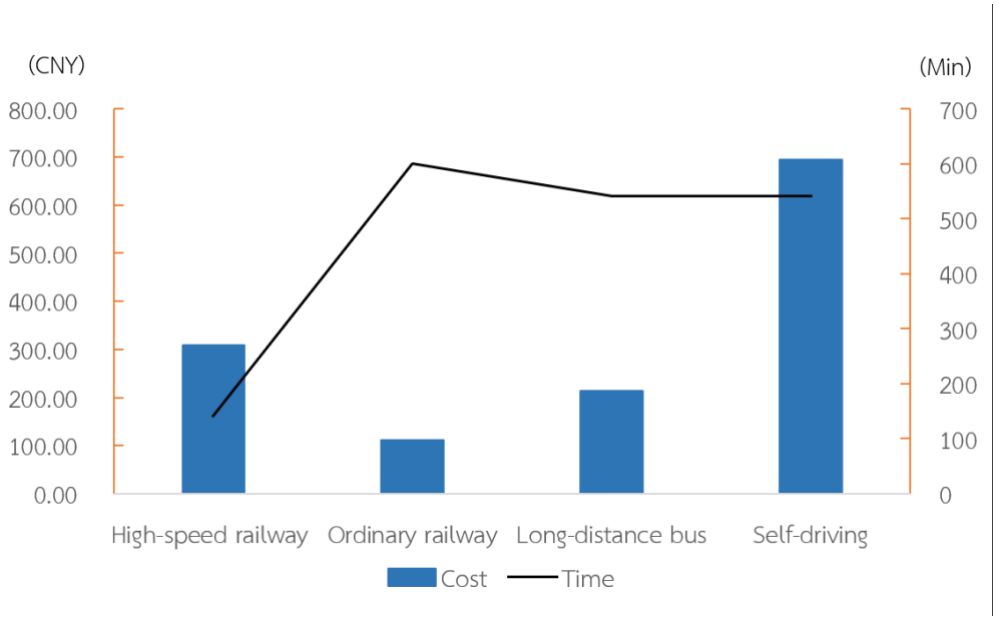

Figure 3 Cost and time of various types of transportation from Beijing to Xuzhou
Source: Sort out from 12306 China Railway and Ctrip

From Figure 3, the cost of the Beijing-Shanghai high-speed rail is less than half of self-driving, which is higher than that of the ordinary railway and long-distance bus, but the time required is significantly reduced compared with the other three types. Therefore, choosing which type of transportation is a trade-off between time and cost for passengers based on their time value. The time saved by the Beijing-Shanghai high-speed rail from Beijing to Jinan, Xuzhou, Nanjing, and Shanghai is shown in Table 2.

Table 2 High-speed rail compared with ordinary rail

	Beijing to Jinan	Beijing to Xuzhou	Beijing to Nanjing	Beijing to Shanghai
Mileage (km)	419	688	1018	1302
Time saved (hours)	4.62	7.67	11.23	14.78
Time saved (hours) / 100 km	1.10	1.11	1.10	1.14

Source: Sort out from 12306 China Railway and Ctrip

There are some differences in the actual running time of trains in different sections due to different terrain and stops. Overall, the high-speed rail can save 1.1 hours per 100 km compared with the ordinary railway. However, as the cost of high-speed rail is still high, whether the time saved by high-speed rail is cost-effective still needs further analysis.

WANG Feng-xue (2012) considered that Beijing-Shanghai high-speed rail's quantifiable contribution to the economic development along the line could reach 22.6 billion yuan per year. In addition, it influences increasing employment opportunities, improves education and health status, and promotes the development of related industries and scientific and technological progress. When the Beijing Shanghai high-speed rail was opened on June 30, 2011, the average daily passenger flow was only 132,000, which reached 178,000 and 230,000 respectively in 2012 and 2013, with significant growth. In 2019, the average daily passenger flow will reach 500,000, increasing nearly four times compared with 2011.

Table 3 GDP of cities along Beijing-Shanghai high-speed rail from 2007 to 2016 (unit: 100 million yuan)

Year / City	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Shanghai	12189	13698	15046	17166	19196	20182	21602	23568	25123	28179	195949
Beijing	9353	10488	12153	14114	16252	17879	19501	21331	23015	25669	169754
Nanjing	3284	3775	4230	5131	6146	7202	8012	8821	9721	10503	66823
Jinan	2563	3017	3351	3911	4406	4804	5230	5771	6100	6536	45689
Xuzhou	1680	2007	2390	2942	3552	4017	4436	4964	5320	5809	37116

Source: Sort out from National Bureau of Statistics of China (http://www.stats.gov.cn/)

From table 3, due to the impact of the world economic environment, although China's GDP growth rate peaked in 2007, the regional GDP of cities along the Beijing Shanghai high-speed rail showed an upward trend after opening the high-speed rail.

Table 4 that the per capita GDP of the cities along the Beijing Shanghai high-speed rail has increased significantly in the three years since the opening of the high-speed rail in 2011, and the per capita GDP of some cities has doubled in the three years. The construction of a high-speed rail will strengthen the economic ties between cities and regions along the line, accelerate the development of the market economy, optimise resource allocation, develop economies of scale, improve the overall efficiency, improve the investment environment, and increase the attraction to foreign investment. The relatively backward regions along the line will soon radiate great economic vitality and promote the rapid development of the local economy. From the perspective of accessibility, after the opening of the Beijing Shanghai high-speed rail, the accessibility of each city has been significantly improved. The flow of people and capital between cities will be persistent, and the opportunities for economic cooperation will be significantly improved.

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Source: Sort out from National Bureau of Statistics of China (http://www.stats.gov.cn/)

China is a country with a vast territory and a significant gap in regional economic development. Therefore, China's high-speed rail impact on regional development can be divided into short-term, medium, and long-term effects. The short-term effect of high-speed rail is to activate regional exchange activities and adjust the existing production factors by changing the address and implementation mode of logistics and people flow. Generally, such adjustment does not take a long time and can even be realised simultaneously with the opening and operation of high-speed rail.

Under normal conditions, the short-term effect created by the high-speed rail has intensified the frequency of regional communication and expanded the scope of the communication circle, such as the increase of shoppers and tourists, the enhancement of regional information, talents and wisdom exchange, and the increase of commuters and scholars. The second is the medium-term effect. The high-speed rail has increased the regional advantages along the line, formed comparative economic advantages, triggered new investment and industrial restructuring, and produced new benefits of development and growth. It includes the import and export of foreign growth enterprises, the import and export of foreign bulk commercial capital, the change in the land price, land use and living conditions, the increase in employment and schooling opportunities, population movement, and the development of real estate industry. The third is the long-term effect, including improving the system, legal system and policy system, promoting the development of urbanisation, the development of the same city, and the development of inter-city and urban-rural integration. Finally, forming a broader economic circle is conducive to overcoming the disadvantageous regional development

situation, such as small and medium-sized production, repeated construction, feudal economy and profound assimilation of industrial structure.

After completing China's high-speed rail, it will boost the east to take the lead and raise central and west China, and it will build the Yangtze River Delta into an essential international gateway in the Asia Pacific region. China's high-speed rail has integrated urban and rural development, supported the western development strategy, and accelerated ecological civilisation construction. In addition, China's high-speed rail also promotes poverty alleviation, pursues social benefits, and promotes the balanced development of the regional economy and society. However, China entered an era of rapid expansion of high-speed railway development with many social concerns, including the adverse environmental and social risks and impacts of high-speed rail are related to the construction and the daily operation of high-speed trains. He et al., (2015) investigated high-speed railway-related public views of Chinese residents living along the Beijing-Shanghai high-speed railway. Their research shows high public acceptance of high-speed rail due to perceived low environmental and social risk and high economic and social benefits (He et al., 2015). After the Beijing-Shanghai high-speed rail opened, it substituted the popular overnight services with the faster and more expensive bullet trains between Beijing and Shanghai with many problems, including service, staff training, construction quality and corruption. The revelations of corruption in the construction of the Beijing-to-Shanghai line have led to questions about safety and whether corrupt subcontractors cut corners to line their pockets, including fake invoices that more than a dozen companies used for construction materials and supervisors at some construction companies who lacked professional engineering licenses.

Even though high-speed rail has an important impact on the economic and social development of the regions along the line, Ma (2021) proves that the Beijing-Shanghai high-speed railway has a significant negative impact on the per capita GDP of prefecture-level cities along the line in the short term, mainly because the agglomeration effect is greater than the diffusion effect. Although therefore, China's high-speed rail can combine railway transportation with highway, waterway and air transportation to achieve seamless connection, which is significant for speeding up the Belt and Road Initiative. On the other hand, small countries along the route should actively think about dealing with the agglomeration effect caused by the construction of high-speed rail.

3. Potential Implications for Thailand

High-speed rail networks have an essential role in the Belt and Road Initiative, and they play an increasingly significant role in regional economic structure, economic and political environment, and regional competition. Therefore, the research on high-speed rail has also attracted the attention of Thai scholars and the industrial sector.

The Sino-Thai railway project is a vital interconnection project between the two countries under the Belt and Road Initiative framework. As an intersection between China and ASEAN, Thailand actively promotes domestic infrastructure construction, promoting Thailand's economic development and promoting regional connectivity. It can connect various regions of Thailand, provide new opportunities for Thailand's economic development, help Thailand's sustainable development and move forward into a high-income country. After completing the Sino-Thai railway project, a fast track from Kunming to Bangkok will be formed, connecting the railway network of ASEAN with China and even the Eurasian continent. It will facilitate the travel and mutual exchanges of people along the route, promote the market opening and integration of the areas, optimise production factors, and drive the production, trade, logistics, transportation, and transportation. As a result, Thailand will become part of the Belt and Road Initiative's transportation network, becoming an ASEAN transportation and logistics centre and enhancing its hub position. At the same time, the Sino-Thai railway project will also become the main artery connecting the Eastern Economic Corridor with China, promote the docking of Thailand with China's huge market, and provide an infrastructure guarantee for Thailand's economic development. In addition, the development of the Sino-Thai railway project has also led to the exchange of talent training. With promoting the Sino-Thai railway project, Thailand's demand for talents who understand both railway technology and Chinese has significantly increased. In 2014, China and Thailand launched education and training cooperation projects in railway-related fields. The development of the Sino-Thai high-speed rail naturally leads to cooperation in other fields, forming a "win-win" cooperation situation. However, Sino-Thai high-speed rail development attracts many potential effects on Thailand.

High-speed rail construction can create thousands of jobs, including direct and indirect manufacturing jobs and jobs in other industries, such as construction, finance, insurance and real estate, retail and wholesale trade, and services. Consequently, we can assert that the state of development of transport infrastructure is one element limiting service production integration to geographical areas that are manageable in terms of

time. By increasing the number of business travel, investments in infrastructure that cut travel times create new chances for market integration for producer services. Business travel enables functional economic zones to expand their geographical limits, increasing their market potential.

Sino-Thai high-speed rail project linked the new Silk Road from China to ASEAN countries. This initiative will develop new areas, economic zones, and communities along railway routes. For example, China built HSR to boost its economic development by connecting critical major cities and freeing up capacity on overcrowded freight corridors. As a response, Thailand's outdated railway system should be upgraded to HSR to boost economic activity in border areas. Additionally, the railway development project will position Thailand as a global manufacturing hub for foreign companies. Foreign investment will help maintain a balance of capital inflows and outflows. By utilising modern transportation and logistics, ASEAN will distribute goods and commodities throughout the region and promote a more cost-effective flow between ASEAN nations. Sino-Thai high-speed rail can also increase property value since areas surrounding stations become suddenly more accessible to a larger population, making them more desirable to developers and real estate interests. Thus, the high-speed rail project can narrow and stabilise the income disparity between poor border cities and Bangkok by allowing businesses to expand their trade and investment along the railway route.

According to China's high-speed rail construction experiences, high-speed rail construction will improve social productivity through time-saving and play a role in sharing passenger demand, ensuring stable economic development and promoting regional exchanges. From the perspective of passenger transport demand, according to the Ministry of Transport of Thailand survey results in 2008, highway transportation accounts for 86%, and railway transportation only accounts for 2%. However, highway transportation has high traffic accident rates and severe pollution, which also causes extending the time required for traffic between the two places. In contrast, high-speed rail has the advantages of large transport volume, low accident rate, less environmental pollution, time-saving and controllable. From economic development, Thailand's GDP growth rate has been less than 5% since 2014 and has gradually declined since 2018. In the third quarter of 2019, Thailand's GDP growth rate is 2.4%. The high-speed rail construction in Thailand will undoubtedly provide new impetus for economic development. From the experience of China's high-speed rail opening, the impact of the high-speed rail opening on the economic growth of cities along the line is significant.

From the perspective of regional heterogeneity, the improvement of railway opening on the accessibility of intermediate stations is more significant than cities at the end of the line. Therefore, the economic driving effect of high-speed rail opening on less developed areas and less convenient transportation areas may be more significant than Bangkok's, which is beneficial to the balanced development between regions and improved overall national economic growth.

There will also be tremendous costs and other adverse impacts following the high-speed rail development project. Thailand planned to upgrade its old railways to HSR, and the infrastructure costs include investments in construction and maintenance of the tracks, including the sidings along the line, terminals and stations at the ends of the line and along the line, as well as energy supply and line signalling systems, train controlling and traffic management systems and equipment. Although sometimes it is considered that the costs of building rail stations, which are usually singular buildings with expensive architectonic design, are above the minimum required for technical operation, these costs are part of the system. In addition, HSR investments can considerably affect the environment. In addition, rail development can affect air quality either by reducing or increasing air pollutant emissions. The economic cost of air pollution consists of the following elements: health effects, impacts on ecosystems, and biodiversity.

Conclusion and Suggestion

For Thailand, the construction of the Sino-Thai high-speed rail can improve infrastructure, strengthen Thailand's position as a transportation hub, teach the advanced technology and operational experience from China and cultivate its talents to realise the high-quality development of Thailand's railway. High-speed rail construction can promote regional connectivity, improve the investment environment, promote related industries, promote employment, promote the national economy, and enhance regional influence. For China, the construction of the Sino-Thai high-speed rail makes China's high-speed rail also accept the international market test to improve its quality and competitiveness and expand its international influence. The export of high-speed rail can solve China's domestic overcapacity, optimise the foreign trade structure and industrial structure, and help sustain the economy. In addition, Sino-Thai high-speed rail is an integral part of the Belt and Road initiative's railway network and can significantly promote the cooperation and development between China and ASEAN.

This high-speed rail can complement each other's resources and promote economic and trade development under the China-ASEAN Free Trade Area, entering a new stage of development in broader trade. Through the experiences of the development of the high-speed rail in China, we can conclude by suggesting as below:

1) Reasonable pricing according to income level, travel purpose and existing transportation mode

An individual passenger's choice of type of transportation is determined by the trade-off between travel expense and time. Individual decision-making would depend on the level of economic and social growth. As a result, high-speed rail pricing would influence the number of passengers on high-speed rail and the economic advantages of high-speed rail service by influencing individuals' most successful travel decisions. Too high pricing would reduce the number of passengers and diminish the beneficial effect of high-speed rail's opening. At once, too low pricing would decrease the revenue of high-speed rail service, although it will cause the target population to increase, resulting in a product shortage. Therefore, we need to combine the income level, the purpose of passenger travel, and the existing model of transportation to determine a reasonable high-speed rail price in Thailand to give play to the space-time benefits of high-speed rail and its driving role in the economy.

2) Making suitable high-speed rail plan

High-speed rail construction in Thailand can be done in tandem with sustainable infrastructure planning in the future. It should be remembered that the development of the high-speed rail will increase the usability of intermediate stations rather than the two ends of the railway. Established communities with less convenient transportation have a lower economic driving influence than cities with convenient transportation. The impact of economically developing areas on economic development is lower than that of economically underdeveloped areas. Economic growth support in political centre cities is slower than in other cities. As a consequence, one of the most significant functions of high-speed rail construction is to promote regional development balance through the rapid movement of individuals, products, resources, and knowledge, to promote economic growth in underdeveloped and inconvenient regions, and to offer new growth points for overall Thai economic progress.

3) Combining a high-speed rail plan with social development

Different transit service facilities can be built at different levels of social growth to satisfy social development needs. Appropriately, advanced infrastructure construction

would spur regional economic growth and create new social demand, while unnecessarily advanced transportation infrastructure construction could induce temporary economic stagnation due to a cost-benefit mismatch. As a result, careful preparation of high-speed rail rates and the current situation of natural conditions, infrastructure, and finance are based on the growth and potential development outlook of various regions and cities in Thailand.

The Sino-Thai high-speed rail might have a minimal impact on the economy without better planning to improve local development and productivity in the services sector. However, with good planning, Sino-Thai high-speed rail can fully promote Thailand's economic and urban development.

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