Planning Like a State: Railway Modernization in China

by

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Abstract

Railroads in China represent something special. As China enters the third decade of the 21st century, one of its hallmark achievements has been the remarkable modernization of its railway system. However, post-1949 sectoral modernization did not occur in a linear fashion. The Party-state failed to develop this critical sector, both during the 27 years of the Mao era (1949 to 1976) and the first 25 years of Deng's reform and opening (1978 to 2002). China's railway dream—sustained rapid development—only took off in the early 2000s. Against such a backdrop, my research questions are as follows: 1) Why did China's railway dream only take off in the early 2000s, despite five decades of centralized Party rule? 2) What were the obstacles to sectoral modernization, and how were they finally overcome? 3) What political and economic factors, both internal and external, most decisively shaped the evolution of China's railway system? 4) Finally, what do the distinctive patterns of railway development tell us about the broader political economy of industrial development in China? This dissertation argues that the practice of "concentrating powers to accomplish big things" was the principal reason for sustained rapid modernization, and China's accession to the World Trade Organization provided the crucial catalyst. I define "power concentration" as an institutionalized *and* centralized means

of shaping and supporting a particular approach to sectoral development to meet the broader developmental challenges of the time. Power concentration manifested as the alignment of a clear developmental approach, professionalized and institutionalized macro-economic planning agencies and strategic industrial policies with restrictive targets that focus on overall planning and top-level design. In the absence of such policy guidance and environment, railway development was meagre during the Mao era and early periods of reform and opening.

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In the end, I take great pride in my training as a "China scholar"—to pay attention to the granular details of the agency story and to strive toward conducting "solid" empirical research. I am also fortunate to be trained to "take a step back" and capture the bigger, moving picture.

Lastly, all errors and omissions are mine and mine alone.

Karl Yan
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Chapter 1

An Introduction

"Road is the precondition for prosperity."

A Chinese proverb

Let us begin with a story from a "survivor." As a senior cadre in China's railway system, he was deeply impressed by the miracles (*qiji*) and sacrifices (*xisheng*) that made modernization in this sector possible. National projects were built with the blood and sweat of railway workers. Thousands of People's Liberation Army's (PLA) Railway Corps, for example, sacrificed their lives to construct the Chengdu-Kunming Railway. More recently, the construction of a national highspeed rail (HSR) network was led by Liu Zhijun, a minister who liked to sit beside highspeed train operators in the driver's compartment. "Crazy Liu" (*liu fengzi*) often encouraged train operators to keep accelerating beyond the speed limit. The eight years of his tenure as the railway minister were known as the Big Leap Forward (*tielu kuayueshi fazhan,* BLF) in national railway development. Liu vowed to sacrifice three generations of railway workers to modernize China's iron roads.

In December 2009, in preparation for the commercial opening of the Wuhan-Guangzhou HSR Corridor, rice bags were loaded for simulation purposes. Aboard the same train, a group of high-ranking cadres from the Guangzhou Railway Group were selected to participate in the test run of the China Railway Highspeed (CRH) Model C train. All of them were members of the Chinese Communist Party (CCP). They had been chosen by their Party Committee and were asked to prepare for the ultimate sacrifice. A few left home with their last wills on the table and kissed their wives and children goodbye. According to these cadres, their careers (*shiye*) and lives (*shengming*) belonged to the Party and the people (*shuyu dang he renmin*). They had to act as role models when the national interest demanded it.

Memories of the Rongjiawan Incident of 1997, one of the deadliest train crashes in the history of the People's Republic, haunted them. On the morning of April 29, Train #324 had

crashed into Train #818, which was operated by the Guangzhou Railway Group, due to signal malfunction. Operating at a speed of 117 km/hr, Train #324 merged onto the same track as Train #818 and tailgated it. The death toll was 126 people, and 230 more were injured. Twenty-two years later, with a train posting a testing speed over 350 km/hr, the slightest error would make them new martyrs of the Chinese railway sector.

Three hours after the start of their fateful journey, the train arrived safely in Wuhan. Their hearts stood still, and they were overcome with joy. They rushed to a restaurant and celebrated with a banquet and glasses of Chinese spirits. They also toasted their colleagues who worked in the Construction Headquarters (*jianshe zhihuibu*), who had suffered acute kidney failure due to the harsh working conditions. At the headquarters, Party members were asked to engage in the "three togethers" with engineers and labourers: they would eat together, sleep together and work together (*tongchi tongzhu tonglaodong*).

The Puzzle

Railroads in China represent something special. As China enters the third decade of the 21st century, one of its hallmark achievements has been the remarkable modernization of its railway system. However, post-1949 sectoral modernization did not occur in a linear fashion. The Party-state failed to develop this critical sector, both during the 27 years of the Mao era (1949 to 1976) and the first 25 years of Deng's reform and opening (1978 to 2002). China's railway dream—sustained rapid development—only took off in the early 2000s.

This crucial sector featured prominently in Dr. Sun Yat-sen's vision of a unified and modernized China. Sun saw railroads as a signal of national strength and tried to build the integuments of a unified national system. Despite the elusiveness of such a system, two key steps were taken before 1949. First, railway construction played an important role in military organization and territorial defence (Grant, 2019). Second, it significantly shaped the development of China's agricultural sector due to agricultural commercialization along China's pre-1949 trunk lines (Koll, 2019; Rawski, 1989).

Railway modernization in the People's Republic experienced flashes of accelerated development during the Mao era (1949 to 1976), moderate and focused development during the post-Mao era (1978 to 2002) and rapid modernization after China's entry into the World Trade Organization (WTO).[1] While Maoist railway policies reflected the centralization characteristic of a command economy and Stalinist "planned transportation" (Chao, 1955), central planning flailed against two waves of radical movements: the Great Leap Forward (1958 to 1962) and the Cultural Revolution (1966 to 1976). During the first two decades of the reform and opening period, sectoral policies shifted to relatively decentralized experimentation that was designed to foster development and innovation. However, these initiatives failed to achieve the intended purpose of improving capacity deficiency. Despite unsatisfactory results, the empowerment of railway engineers and the emergence of sub-national innovation networks paved the way for China's centralized HSR modernization efforts after 2004. Indeed, rapid growth only occurred when state planners reversed the decentralizing thrust. Despite the progression toward a more open and marketized economy after China's WTO accession, Chinese leaders moved back toward centralized state control.

The development of a world-beating HSR system has been touted by some officials as one of the four new inventions, along with e-commerce, mobile payment and bike-sharing. Moreover, China's HSR industry has started to become an important source of exports and a crucial component in China's global infrastructure platform. After a nearly century-long struggle toward modernity, Sun's railway visions have been realized.

Against such a backdrop, my research questions are as follows: 1) Why did China's railway dream only take off in the early 2000s, despite five decades of centralized Party rule? 2) What were the obstacles to sectoral modernization, and how were they finally overcome? 3) What political and economic factors, both internal and external, most decisively shaped the evolution of China's railway system? 4) Finally, what do the distinctive patterns of railway development tell us about the broader political economy of industrial development in China?

[1] The post-WTO era could be further divided into two sub-periods: the BLF period (2003 to 2011) and the post-BLF period (2013 to 2019).

The Argument in Brief and Summary of Findings

The successful modernization of the Chinese railway sector, especially in network expansion and railway equipment upgrades, is indicative of the developmental capacity and adaptability of the Party-state. In the mere 15 years between 2003 and 2019, China's total railway kilometrage nearly doubled from 74,408 km to 139,000 km. Highspeed railway kilometrage, which accounts for more than two-thirds of the world's total, reached 35,000 km from scratch. Before 2004, China had lagged significantly behind in terms of railway development. The transportation bottleneck posed many challenges for China's state planners and railway policymakers. The latter had already engineered several rounds of reforms but were chagrined to see a decline in capacity deficiency.

This dissertation traces sectoral policy evolution over time. In so doing, it highlights the salience of direct central-level attention for accelerated railway development. Such policy attention and investment commitment translate into macro-economic and comprehensive planning, strong financial backing, organizational and policy support and clear and restrictive developmental targets. These features are summarized by a Chinese maxim that has been left relatively unexplained—"concentrating power to accomplish big things" (*jizhong liliang bandashi* or, in short, power concentration)—which Xi Jinping has characterized as China's institutional advantage (Hao and Huang, 2020).[2] I define "power concentration" as an institutionalized *and* centralized means of shaping and supporting a particular approach to sectoral development to meet the broader developmental challenges of the time. Understandably, power concentration has evolved from the Maoist command and control style of economic development toward one that focuses on advancing the role of the state in managing market dynamics and resource distribution. In light of differing strategies, power concentration entails a forceful intervention by the Party-state to improve infrastructure development. This role of the Party-state is not dissimilar to Justin Lin's (2012) "new structural economics."

[2] Tsai and Liao (2017) analyzed the concept through the CCP's *pishi* (written directives) system and how China's Nomenklatura system ensured those directives were executed. According to Tsai and Liao, some of the advantages included responsiveness to the people's needs and reducing bureaucratic fragmentation.

Power concentration highlights three crucial aspects of the study of political economy in China. First, institutionalized decision-making bodies—often state organs—with a clear definition and centralization of power contribute to the making of durable industrial policies. Second, state leaders' commitment to these industrial policies ensures successful implementation and insulates implementing agencies from possible distractions. Third, in the post-WTO era, state planners have carefully crafted an oligopolistic market structure that allows a more assertive state to leverage its organizational and market capacities to coordinate market-oriented state firms and to achieve its developmental objectives. If a sectoral structure becomes too concentrated, direct central attention, commitment and goal compatibility can wash out principal-agent frictions (Lampton, 1987; Lieberthal and Lampton, 1992; Heberer and Schubert, 2012; Norris, 2016). Power concentration manifests in the alignment of three developmental perspectives: clear developmental approaches, institutionalized planning agencies, and strategic industrial policies. The execution of these perspectives relies on implementing agencies' ability to coordinate (*tongchou*) both bureaucratic and corporate actors, if any. In this dissertation, the term "approach," similar to Pearson's (2005) concept of metavision, is defined as the ways in which developmental objectives can be achieved. For example, controlled competition is an approach for preserving and advancing the role of the state in its management of China's pillar industries.

To the extent that we can determine developmental challenges, there is a strong link between domestic and international factors. Although I see domestic factors as fundamental, my analysis does not ignore the international dimensions of the story. Policy decision-making in the People's Republic is primarily determined and shaped by domestic developmental considerations. However, as we will see, the external environment helps account for the intensification of domestic developmental challenges. Additionally, the formation and implementation of national strategies through power concentration are intended to address these specific challenges.

In short, two main hypotheses are tested in this dissertation. First, sectoral development accelerates in times when the Chinese state pursues power concentration. The second hypothesis suggests the inverse: sectoral development slows or stagnates in the absence of power

concentration. This stagnation can be associated with relaxing controls and pursuing gradualist policies, granting more autonomy to local authorities, experimenting with new ideas to satisfy domestic demand and to accelerate sectoral development and releasing revolutionary charges on central planning bureaucracies.

Power concentration with regards to railway development can be understood at two levels:

1. At the state level, vis-à-vis the central government, the developmental agenda of the Ministry of Railways (MOR) and the succeeding China Railway Corporation (CRC) highly reflects that of the state. A prominent centralizing feature is heavy state intervention in the planning and implementation of railway policies for national development.
2. At the sectoral level, centralization means that regional railway bureaus and non-transport units have limited autonomy over the investment in and operation of regional railways and the research and development of railway equipment.

Centralizing features include a nationalized and harmonized train schedule, strict control and approval of regional bureaus' financial decisions and centralized investment in railway equipment modernization.

On the other hand, decentralization could be understood as the dismantling of centralizing capacities found in at the state and sectoral levels and the transferring of select decision-making power downwards. At the state level, decentralization means that the MOR has more autonomy in implementing its own developmental agenda—through the contract responsibility system, for example. At the sectoral level, decentralization allows regional railway bureaus to independently invest in and operate regional lines and engage in railway equipment innovation.

Maoist and post-WTO centralizations must be contrasted. Maoist power concentration, when in place, manifested as highly centralized decision-making *and* production coordination at both state and sectoral levels. The command economy planned railway production in accordance with national industrial capacities and transportation and communication needs. For example, capacities in steel production dictated the construction of national trunk lines. By contrast, post-

WTO power concentration steered away from meticulous control over industrial management. The state only maintained its macro-economic planning functions. State planners relied on railway policymakers to coordinate action and support national strategies. In the socialist market economy, railway policymakers adopted organizational and market leverages to ensure sectoral compliance. During the crucial BLF period (2003 to 2011) in post-WTO development, the MOR played a leading role in pursuing major breakthroughs in sectoral modernization.

The railway sector encompasses a transportation (sub)sector (passenger and freight) and several non-transportation (sub)sectors (rolling stock, civil engineering, research, signal and communication, and electrification). I identify four critical junctures at which the sector was *structurally* affected. First, the establishment of the Railway Corps in the 1950s transferred some of the MOR's civil engineering capacities to the Chinese military. Second, the dismantling of the Railway Corps in the 1980s effectively allowed the central ministry to control all aspects of railway production. Third, the decision to bifurcate the non-transportation sectors from the MOR in the early 2000s fundamentally restructured the central ministry's function as a transport entity with some research capacity. The newly separated non-transportation entities, such as the China Railway Engineering Corporation and China South Rolling Stock Corporation, were placed under the ownership of the State-owned Assets Supervision and Administration Commission. Fourth, the 2013 reform abolished the central ministry. Through the separation of government and business, the MOR's administrative and regulatory capacities were transferred to the newly created National Railway Administration under the Ministry of Transport. The central ministry's business operations were transferred to the CRC, an administrative centrally-owned state enterprise (SOE) under the Ministry of Finance.

In light of differing industrial-organizational layout in different periods, the policy structure has remained the same and been characterized as "vertically integrated" (*wangyun heyi*) and "construction-operationally integrated" (*jianyun heyi*).[3] Vertical integration refers to the harmonization of national infrastructure development (railway planning, network construction

[3] For a brief period of three years in the early 2000s, the Ministry of Railways experimented with vertical separation (*wangyun fenli*) during which the central ministry's dual roles in national railway infrastructure development and transport service provision were separated, as the latter role was transferred to some newly created passenger and freight firms.

and development) and transport service provision under the control of the MOR and its reincarnation, the CRC. The integration of railway construction (civil engineering and rolling stock manufacturing) and railway operation (transportation services) means that the former must comply with the planning and development of the latter. Under this policy structure, state directives are channelled through the MOR and the CRC, which serve as sectoral coordinators. Sectoral coordinators, also as the regulator and sole buyer in the railway market, effectively transformed market-oriented, non-transport SOEs into mere contractors.[4]

Non-transport entities played important roles in the modernization process— first as work units and subsidiaries of the central ministry, then as market-oriented SOEs. However, their actions were choreographed. To win contracts and be profitable, these SOEs actively complied with policy and technical specifications outlined by the MOR and the CRC. Recalcitrant firms were punished, sometimes heavily, as the central ministry could suspend the procurement of services. While highspeed train innovation and regional development germinated under decentralized and market-oriented settings in the late 1990s, such modernization efforts only blossomed through power concentration after 2004.

Empirical and Theoretical Implications

The present research is important and relevant for theoretical and empirical reasons. The theoretical framework of this dissertation engages scholars who have examined China's economic development and modernization, the developmental state and the professionalization of the Chinese bureaucracy.

This study posits that China's post-WTO railway reform and aspects of centralized sectoral planning and state-guided industrial development signal a rational state that can be purposeful and selective in implementing a clear developmental approach that focuses on building the sinews of a comprehensive national transportation network. Such a network was able to reduce spatial contradictions during the Third Front Movement and increase transportation capacity in the post-WTO era. While coordination took place at the state level, I

[4] Throughout the dissertation, SOE refers to centrally-owned state enterprises (*yangqi*). Locally-owned state enterprises will be referred to as state firms (*guoqi*).

also want to highlight the role of subcentral actors such as SOEs and local governments, which compete for state resources and policy allocation. The organization, mitigation, negotiation and even suppression of subnational actors' interests take place at the ministerial level through the MOR or the CRC. Therefore, it is more accurate to describe this state-industrial relationship as power concentration, which emphasizes the facilitative role of the state and the executive function of sectoral coordinators. In post-WTO China, top leaders provide policy support, and national planning agencies provide financial and organizational support to sectoral coordinators. The latter has been charged with executing "coordinated development" by working closely with market-oriented SOEs. Indeed, the relationship between the state and the market is not dyadic; instead, the two are complementary.

Empirically, this dissertation examines a strategic sector that has not been extensively studied by political scientists or China scholars. While a body of literature concerning the "going global" of China's railway sector has been growing (Camba, 2020; Kratz and Paclicevic, 2017, 2018 and 2019; Tjia, 2020; Wu and Chong, 2018; Yan K, 2019), a limited number of scholars have examined sectoral evolution. Watershed works in this regard include Koll's (2019) examination of sectoral development from the late 19th century to the end of the Cultural Revolution, Wu and Nash's (2000) analysis of sectoral reform in the early reform and opening period, Yu's (2015) examination of the 2013 reform and Tjia's (2016) work on railway development since the reform and opening. However, there is a gap in the story of post-1949 railway development that the above mentioned scholars have tried to tell: key actors and factors behind the rapid modernization process—or lack thereof—have been overlooked. This project takes on the ambitious task of filling such a lacuna.

Second, the existing literature has examined the railway sector independent of China's broader socio-economic development. In an attempt to fill this gap, Koll's (2019) study on the Chinese railway sector provided "a lens through which to view the transformation of Chinese society and economy in the transition from empire to the People's Republic" (Koll, 2019: 1). However, the relationship between railway reform and post-Mao modernization and developmental efforts has not been extensively studied. Additionally, many scholars have highlighted the uniqueness of the railway system; they claim that the management and operation

of the transport and non-transport sectors have been atypical of superministerial reforms. Against this shared understanding, I argue that the reform experiences of the railway system and the central railway ministry are archetypal of the post-Mao developmental narrative. As a result, any examination of railway reform cannot be performed independently from the overarching developmental story of post-Mao China. Significant national development and reform themes that emerged in the latter half of the 20th and early 21st centuries had a direct impact on railway policymaking. This macro-historical narrative on sectoral development can serve as a lens through which to view the rapid transformation of the Chinese economy since reform and opening.

Dissertation Outline

This dissertation consists of eight chapters, inclusive of the introduction and conclusion. Chapter Two positions my study within theories of China's economic transition, the developmental state and bureaucratic politics. It begins with a review of the existing literature. The chapter then explains power concentration in detail and provides a bird's-eye view of my arguments. It details the conceptual approach to addressing key changes in the political-economic agency in this story.

Chapter Three begins with a brief comparative historical account of railway development as a *couronnement de l'oeuvre* in Europe and North America. The prevailing norm of building a modernized system is through centralized means. In the case of pre-1949 China, railway development was slow and meagre, as it was plagued by foreign intervention and military conflicts. The former led to a fragmentation of railway standards, and the latter brought considerable destruction to China's railway infrastructure. Then, the chapter explores sectoral development during the Mao era. Planned transportation and one-man management were pursued in times when central planning was the preferred style of managing the national economy. The First Five-Year Plan and Third Front Movement showed flashes of successful network expansion, as sectoral development was highly prioritized and centrally managed.

Chapter Four focuses on sectoral development in the post-Mao era (1978 to 2002), beginning with Deng Xiaoping's railway recentralization in 1975. In post-Mao sectoral development, state planners and railway policymakers engineered several rounds of reforms that could be broadly characterized as decentralization, deregulation and marketization. Despite these reform efforts to increase transportation capacity, the problem worsened as growth in transportation capacity failed to draw level with China's economic growth. Transportation bottlenecks forced the central government to limit and idle forces of production. The striking features of this period were a lack of central commitment and a national plan to improve sectoral performance. As a result, the central ministry was forced to develop on the cheap.

Chapter Five analyzes the factors and actors behind rapid sectoral modernization in post-WTO China. The chapter posits China's entry into the WTO as the critical juncture that resulted in greater centralization. The BLF emerged as the sectoral approach to development and gained the support of the State Council and top Chinese leaders. In 2004, railway policymakers and state planners converged on a multi-year program that heretofore guided China's railway development. The National Development and Reform Commission (NDRC) integrated the multi-year program with national planning. The initiatives included rapid network expansion and upgrades, railway equipment modernization, the dismantling of regional bureaus' sub-branches, and the creation of new national champions in the freight and rolling stock sectors, such as the China Railway Container Transport Corporation, the China North Rolling Stock Corporation and the China South Rolling Stock Corporation.

Chapter Six examines the development of China's HSR industry and offers a detailed account of highspeed train modernization. Such an account is a compelling narrative on the shifting of national priorities and the role of the state's planning agencies. The building of a comprehensive HSR industry is the most important legacy of the BLF. More critically, the chapter identifies new roles and responsibilities granted to the NDRC and the MOR as a result of post-WTO power concentration. It traces the process of highspeed train modernization, which has closely followed Wen Jiabao's principle of "import, digest, absorb and re-innovate."

Chapter Seven shows that power concentration in the railway sector, especially in HSR export, has continued under the Xi Jinping-led Party and government administrations. Power

concentration in the international market was triggered by the need to serve the Belt and Road Initiative through the coordination of domestic and international situations. Against this backdrop, state planners have deplored decentralized and cut-throat competition between railway actors. Through the creation of the China Railway International Corporation, the NDRC replicated the monopolistic domestic railway structure to end the decentralized style of HSR export, which became a priority of the state. The Jakarta-Bandung HSR project illustrates the choreography of different actors in China's globalizing HSR industry.

Chapter Eight concludes the dissertation by summarizing the answers to the research questions and restating the theoretical findings. The main story is as follows: railway development in the early 2000s occurred as a result of power concentration, which was introduced as a means of assuaging intensified developmental challenges. In the absence of power concentration, railway development slowed. Building on the theoretical and empirical work of this study, the chapter ends with three proposals for future research.

Chapter 2

Concentrating Powers to Accomplish Big Things: A Theoretical Framework

"China can become the strongest country in the world by building 3.5 million li of railroads."
Sun Yat-sen, speech at a welcoming ceremony of China Railway Association

Introduction

The principal research question of this dissertation is why did sustained rapid sectoral modernization only occur after five decades of the Party-state's centralized rule. The proposed argument was "concentrating power to accomplish big things, " which had been China's "magic trick" (*fabao*) to success (Hao and Huang, 2020). This chapter pursues two goals. First, the literature review section briefly surveys three sets of literature: China's post-Mao economic reform and industrial development, the developmental state and bureaucratic politics. Second, this chapter details the conceptual approach of this study.

In the introductory chapter, I argued that sectoral development was archetypal of China's broader developmental experience. However, reforms to the railway sector could also be considered atypical of the reform patterns found in other superministries and centrally-owned state enterprises (SOEs). In other strategic sectors, such as the civil aviation sector, the state established "controlled competition" between three competing SOEs operating under the management of the state investor, the State-owned Assets Supervision and Administration Commission (SASAC), and the national-level regulator, the Civil Aviation Administration of China (CAAC) (Pearson, 2005). This regulatory structure has not been applied in the railway transport sector, where a statist monopoly has been maintained to provide transport services and guide infrastructure development. "Controlled competition" was only introduced in the non-transport sector, which remained under the management of the Ministry of Railways (MOR) and its reincarnation, the China Railway Corporation (CRC).

Literature Review

Economic Modernization and Industrial Development in China

This body of research shows that the Party-state has remained in control of the transition process from a planned economy to a market-oriented one. One aspect of the debate, which is useful in terms of understanding power concentration in railway development, centres around the teleology of post-Mao reforms. In essence, did post-Mao state planners have a clear sense of how to improve the livelihood of the Chinese people and, at the same time, stay in power?

While scholars agree on the goal of China's post-Mao reforms, they contest over how post-Mao economic reforms have been pursued. For some scholars, China's transition out of the planned economy was an "open-ended" process of experiments driven by different actors (Fewsmith, 1994; Jefferson and Rawski, 1994; Lin, 1989; Naughton, 2007; Shirk, 1989). Others argued that the transition was a teleological one: toward a marketized economy in a linear fashion (Steinfeld, 1998) or controlled competition (Pearson, 2005; Pei, 2006; Yeo, 2012).

In Shirk's seminal work, *The Political Logic of Economic Reform in China* (1993: 10), she asserts that the domestic institutional setting—including authority relationships, leadership incentives, the bargaining arena, and enfranchised participants and their decisions—determines the policy content of China's reform efforts. To Shirk, political dynamics and interactions between domestic actors shape economic decision-making.

Shirk's understanding of the drivers of economic reform has been shared in the literature. According to Fewsmith (1994) and Naughton (2007), the central government plays a vital role in determining the course of reform. Fewsmith (1994: 6) argues that the traditions of the Chinese Communist Party (CCP), such as the propensity toward total victory and one-man leadership, and the "structure of power" motivate economic reforms and engender political conflicts. Lai (2000), Lieberthal (2003) and Vogel (2011) share a similar understanding as the politics of reform have been predominantly driven by intra-Party disagreements. In addition to bureaucratic causes, So and Chu (2012) argue that China's initial reform has been driven by situational needs, not by theoretical or ideological factors.

Naughton, on the other hand, downplays the importance of intra-Party conflict and, instead, focuses on the actions of the central government. Naughton (2007: 9) argues that the post-Mao economic reform agenda, especially in its second phase in 1984, has succeeded due to the central government's decision "to keep the size of the overall central government material allocation plan fixed in the absolute terms." Brandt and Rawski (2008) and Steinfeld (1998) present a similar argument that the central government has played an indispensable role through the implementation of urban, rural and pricing reforms and incentives or constraints that shaped subcentral actors' behaviours. Ang (2016: 240) argues that development has been midwifed by "a set of conditions that empowered primarily local state but also market actors to pursue development adaptively." And those conditions, crafted by post-Mao reformers, fostered the coevolution of state institutions and the market.

Ideas also play a salient role in shaping reform paths. Eaton (2016) argues that the Tiananmen Incident has given birth to the strategy of creating large enterprise groups. Indeed, Chinese leaders debated on the question of "just how does a communist ruling party 'ride the tiger' of a marketizing economy" and stay in control (Eaton, 2016: 52). As a result, the idea of state capitalism influenced the creation of an oligopolistic market structure (Eaton, 2013; Yeo, 2012).

By the end of the 1990s and early 2000s, two metavisions concerning SOE reform had emerged: tiered economy and controlled competition. Three major ownership tiers gradually took shape, as the Party-state established a political pecking order in its management of the Chinese economy (Huang YS, 2008). Controlled competition was introduced to regulate the top tier as the central government placed SOEs under the dual regulation of SASAC and quasi-independent regulators (Pearson, 2005). The number of SOEs operating under each strategic sector was reduced to three to five. This unified regulatory pattern has been conveyed through concepts such as hard and soft regulation (Yeo, 2007), selective withdrawal (Pei, 2006), tiered economy (Pearson, 2011), and a strategic value framework (Hsueh, 2011).

In addition to those emerging metavisions, a "Beijing Consensus" was gradually developed in the 2000s and 2010s (Shih, 2018). A statist consensus on "new structural economics" also took shape. Scholars of the statist consensus see "economic development as a

dynamic process entails structural changes, involving industrial upgrading and corresponding improvements in 'hard' (tangible) and 'soft' (intangible) infrastructure at each level" (Shih, 2018). This particular understanding of development ultimately requires a more assertive state that can astutely formulate infrastructure development for future market development (Shih, 2018). According to Justin Lin, the provision of rail transport and communications is a part of "the core legitimate domain of the government" (Lin JYF, 2012: 187).

This body of literature above primarily focused on endogenous factors in China's economic and SOE reforms. Dissatisfied with much of the work, Moore (2002: 41, 43) positions his study on the Chinese shipbuilding and textile industries in the literature concerning international political economy. Indeed, Moore's analysis sheds light on the impacts of exogenous factors on domestic policy and industrial reforms. Additional scholars such as Deng and Moore (2003), Friedberg (2018), Hsueh (2011 and 2015), Kim (2009), Liang (2007), Nolan (2014), Yeo (2012) and Yu (2015) have also analyzed the effects of exogenous factors on domestic and regulatory reforms. Several scholars identify the 1997 Asian financial crisis and China's accession to the World Trade Organization (WTO) as critical junctures at which the international has influenced the domestic (Liew, 1999; Liou, 2009; McNally, 2012; Pearson, 2005; Wang Hongying, 1999). After joining the WTO, state planners devised a strategy of "going global" for Chinese SOEs, which received financial support from China's state banks and sovereign wealth funds. The purpose of this round of outward internationalization was to capitalize on the opportunities of globalization and economic integration and fuse Chinese SOEs with the global production system (Nolan, 2015; Schortgen, 2009).

Moreover, reform measures were introduced to reduce China's vulnerability against the backdrop of further integration. China's entry into the free trade world allowed both central and local governments to engage in selective industrial promotion. A new configuration of the central-local dynamic was established to promote growth and industrial upgrades (Zhu TB, 2003: 143). Breznitz and Murphree (2011: 2-3) argue that China has thrived in "second-generation, production and process innovation" due to the fragmented nature of the global production system. And the emergence and resilience of the Chinese innovation system (or the "Red Queen run") resulted from the domestic mediation of global production. Indeed, a state's integration

into the international political economy does not necessarily lead to the withering away of sovereignty; in fact, it can adopt a wide range of tools to exploit the global market (Chin, 2010; Harwit, 2007; Pauly, 1995; Weiss, 2014).

The literature concerning economic modernization is informative in three aspects. First, the Chinese Party-state has the full capacity to implement top-down policies through its management of different incentive systems and can be purposeful and selective in guiding economic development (Yeo, 2009; Zhu TB, 2015; Norris, 2016). Second, post-Mao development transitioned from an "open-ended process" in the 1980s and 1990s to one particularly focused on advancing and preserving the role of the state in light of a burgeoning market-oriented economy (Beeson, 2014; Brandt and Thun, 2010; Eaton, 2016; Huang YS, 2008; Liou, 2015). Third, exogenous forces may help states strengthen their control over political and economic actions. However, two questions emerged from this brief survey. First, do developmental approaches matter? If they do, what roles do developmental approaches play in shaping industrial development?

The Developmental States

There is a rich literature on the developmental state that addresses the issue of developmental vision, the domestic and international origins of such thinking (such as Johnson, 1982 and Doner, Ritchie and Slater, 2005; Zhu TB, 2015), its diffusion and application (Beeson, 2004; Heilmann and Shih, 2014), adaptability and continuity (Stubbs, 2009; Wong, 2004 and 2011), institutional support (Baark, 2016; Caldentey, 2008; Chu, 2016; Evans, 1995; Singh and Ovadia, 2018; Xia, 2000) and the role of strategic industrial policies (Amsden, 1989; Deyo, 1987; Johnson, 1982; Wade, 1990). Many scholars see China's post-Mao strategies, such as catch-up development (Wong, 2004), strengthening the role of local governments (Stubbs, 2009), creating incentives to pursue economic growth (Knight, 2014) and implementing export-oriented industrial policies (Baek, 2007), as reflective of a developmental state.

Several scholars have suggested that the international diffusion of developmental ideas from Japan or other Asian contexts have played an important role in influencing Chinese senior leaders' approach to developing the Chinese economy in the reform and opening period, though

the details are still lacking in the literature (Chin, 2020). Since its integration into the global economy, China has been feeling "the pressure for international convergence in economic policy" (Wong, 2004: 353). In the 1980s and early 1990s, Deng Xiaoping showed an acute awareness of Japan's modernization experiences. In several speeches, Deng praised the Japanese government's planning capacities and its investment in education and infrastructure. In the 1990s, perhaps to deal with the aftershock of the Tiananmen Incident, Deng Xiaoping looked intently at Singapore's developmental experience for answers concerning economic development *and* social stability. Deng believed that China could do better than Singapore in terms of instilling social order (*Selected Works of Deng Xiaoping: Vol 3*, 1993: 378-379). In the 1990s, both Jiang Zemin and Li Peng looked for inspiration from Singapore (Eaton, 2016; Overholt, 2018). Chinese leaders also "drew eclectically from the examples set by ASEAN countries as well as Japan and South Korea in placing state-owned enterprise groups at the centre of their vision of Chinese capitalism" (Eaton 2016: 43). To this point, Overholt (2018: 14) was "convinced that [Zhu Rongji] has a better comprehension of South Korea's developmental structure and policies than any Western experts on South Korea."

This dissertation focuses on two aspects of the developmental state in the Chinese context, namely developmental institutions and strategic industrial policies. In his examination of the biotechnology sector in Singapore, South Korea and Taiwan, Wong (2011) posits that the coordinative capacity of the developmental state in those three economies has weakened because "contention among seemingly irreconcilable political interest over regulating the biotech sector has undermined the once coherent developmental state" (Wong, 2011: 14). Indeed, private enterprises became the main drivers behind those economies' bet on the biotech sector. In the Chinese context, while those three economies developed beyond the postwar role of mitigating risks, China's bet on railway modernization was guided by a more assertive state with a statist monopoly as the main driver, not market-oriented SOEs or small and medium private enterprises.

Concerning developmental institutions, China's macro-economic planning agencies such as the State Planning Commission (SPC) and the State Economic Commission (SEC), and their reincarnations as the State Development Planning Commission (SDPC) and the State Economic and Trade Commission (SETC), and then the National Development and Reform Commission

(NDRC) were crucial to the launching of national developmental programs (Baark, 2016; Beeson, 2017; Heilmann and Shih, 2014; Singh and Ovadia, 2018).

Before the creation of the NDRC, the SETC, under Zhu Rongji, was once seen as the Chinese version of the Japanese Ministry of International Trade and Industry (MITI) (Beeson, 2017). Before the creation of the SETC, its predecessor, the SEC, had worked toward replicating Japan's industrial experiences to facilitate China's development. The commission had also created a special government-business relationship that allowed the former to retain control over the latter (Heilmann and Shih, 2014). However, in 2003, the Hu Jintao-Wen Jiabao administration decided to merge the units left in the SETC with the SDPC to create a new supra-institutional body responsible for national strategic planning—the NDRC.

The newly created NDRC was designed to facilitate the "profound shift from sectoral (interest group-driven and capture-prone) to cross-sectoral (more detached and insulated) policy coordination" (Heilmann and Shih, 2014: 13). Many scholars have highlighted the importance of the NDRC as a super-ministerial entity or a mini-state council, which has strong connections to decision-makers in the State Council and the Politburo. The NDRC's role as a "leading pilot agency" was strengthened in 2008 and 2018 (Singh and Ovadia, 2018).in 2008, China's economic stimulus packages in light of the global financial crisis allowed the NDRC to increase its influence on (cross)sectoral policymaking. In 2018, the State Council announced a restructuring program that weakened NDRC, prima facie. Despite some shifting of authorities such as price supervision and anti-monopoly law enforcement, the NDRC's core functions as a macro-economic manager and medium- and long-term planner were not eroded. The off-loading of those micro-economic responsibilities could be viewed as a way to concentrate the commission's attention in coordinating the domestic and international situations.

The literature also suggests that China has moved toward, or returned to, a cross-sectoral implementation of strategic industrial policies. Under the Hu-Wen administration, the Chinese state renewed its emphasis on "active state guidance and multi-year programs in economic, social and technological development" (Heilmann and Shih, 2014: 20). This emphasis on planning was duly reflected in the state's management of a national program in science and technology innovation. In 2006, the State Council published a *National Outline 2006–2020 for*

the Development of Science and Technology in the Medium- and Long-Term. The outline includes both general developmental principles and strategic goals. The NDRC, together with the Ministry of Finance, played important roles as implementing agencies (Serger and Breidne, 2007). Around the same period, several medium- and long-term plans in railway development (2004), energy-saving (2004), food security (2008) and education (2010) were issued as the state had increased its macro-economic planning capacity.

The connection between strategic industrial development and the strengthening of a state's planning and coordination capacities can be conceptualized as "coordinated development" (Chin, 2010; Thun, 2006). Such a style of development can be achieved through means of bureaucratic reorganization, centralization of institutional powers and closer coordination with local actors (Chin 2010). And an important aspect is the improved input from the key enterprises at the local level up-to state planners, in the formulation of sectoral development plans (Thun 2006). The core of coordinated development seems to improve two-way communication between the state and industries, but within a national developmental dynamic that is ultimately top-down.

This body of literature is informative in two aspects. First, the post-2003 Party-state consists of a supra-institutional planning agency capable of coordinating and supervising macro-economic planning and strategic industrialization. Second, the recentralization of industrial planning signals a renewed commitment toward coordinated development, a breakthrough of the Hu-Wen administration. Therefore, building upon the idea of coordinated development, I posit that it is more accurate to use power concentration to capture a nuanced state-industrial relationship. Power concentration, in addition to central-level commitment, 1) focuses on the professionalization and institutionalization of China's national planning agencies, 2) highlights the *macro-economic* management role of the state and 3) gives agency to sectoral policymakers in policy formulation *and* implementation as they are able to leverage the MOR and the CRC's political clout and economic powers to lobby favourable policies (upward) and ensure desirable sectoral compliance (downward).

Bureaucratic Politics

A growing body of literature has also focused on bureaucratic politics as a crucial motivator of economic reform. Scholars of "fragmented authoritarianism" have examined the role of bureaucratic bargaining in policy implementation and assert that the Chinese system cannot be viewed as monolithic (Lieberthal and Lampton, 1992). The conceptual thinking of Lampton, Lieberthal, Mertha and Oksenberg uncovers the role of local governments, SOEs and policy entrepreneurs in shaping China's reform process. Beeson (2014), Brandt and Rawski (2008), Breslin (1996), Breznitz and Murphree (2011) and Howell (2006) have also highlighted the polymorphous nature of decision-making in China—both SOEs and local governments have gained more policy autonomy vis-à-vis the central government as the latter continues to decentralize and deregulate.

According to Lampton (1987: 17), in the context of bureaucratic politics, the central government has five mechanisms to overcome implementation problems:

1. Party discipline,
2. Persistent efforts to imbue leaders at all level with an integrated ideology that will make subordinates more responsive to central demands,
3. The use of market forces,
4. Interagency forums such as commissions, "technical committees," and "work meetings,"
5. Leadership commitment, attention and solidarity.

Writing in the late 1980s, Lampton, Lieberthal and Oksenberg took a snapshot of research at that particular moment when the Party-state tried to decentralize much of the decision-making. This situation led to Clark's argument that the role of the Party was to "provide policy guidance and supervision over implementation" while staying outside of the state's routine administration (Clark, 1987: 28). However, the Party-state has recentralized, re-concentrated and adapted beyond Clark's dyadic characterization, returning to complex and "interlocking institutions and power relationships that perform vital ideological, political, administrative, economic, and coercive functions" (Chin, 2010: 6). Unlike in the early 1950s and

early 1960s, the state continued to pursue market-oriented economic reforms in the 1990s and the 2000s (Chin, 2010: 16).

During the Mao era, the evolution of the Party-state's bureaucracy oscillated between two extreme positions: "Red" and "Expert." Party and administrative institutions were subjected to revolutionary thrusts, radical movements and wild reorganizations (Harding, 1981; Hoffmann, 1971; Perry and Heilmann, 2011; Walder, 2016). While bureaucracies had been rationalized and consolidated in the early years of the People's Republic, Mao introduced radical elements to break down bureaucratization and ossification and resisted specialization and professionalism (Whyte, 1973). The "Great Helmsman" ordered the bureaucracy to study radicalism during the Great Leap Forward but also wanted it to be dismantled to prevent revisionism (Harding, 1981; Whyte, 1973). Despite post-Mao leaders' efforts to sever the Party-state from its revolutionary-making tendencies, Perry and Heilmann (2011: 6) see post-Mao Chinese governance to be deeply footed "in the fertile soil of the Maoist past" and remains symbolic of the "Maoist stamp that conceives of policymaking as a process of ceaseless change, tension management, continual experimentation, and ad-hoc adjustment" (Perry and Heilmann, 2011: 4).

Perhaps Perry and Heilmann were right concerning the path dependency of Chinese governance, but post-Mao reforms to governmental administrations could not be viewed as insignificant. Deng Xiaoping took a liberal approach and pursued "organizational rationalization and political institutionalization" (Harding, 1984: 6). Class struggle was displaced with a focus on development and economic modernization. As a result, the post-Mao bureaucracy was decentralized, downsized, institutionalized, professionalized, rationalized and retrenched (Burns, 2003; Falkenheim, 1989; Harding, 1984; Zhu QW, 2000).

Deng Xiaoping reformed both Party organization and cadre management and the function of the central government. Concerning cadre management, the CCP transitioned from a revolutionary group to a technocratic one (Brodsgaard, 2002 and 2012). Structural reforms were introduced to make the cadre population younger, more revolutionary, knowledgeable and

professional.[5] Regulations on cadre selection, training and evaluation were institutionalized by the central government. The goal of these reforms was to build a professional civil service (Zhu QW, 2000).

The function of the central government and its ministries underwent significant changes as well. The State Council was reformed and restructured four times (in 1982, 1988, 1993 and 1998) before taking on the role of a macro-economic manager in 2003. Those reforms tackled problems associated with organizational overlapping, unclear jurisdictions, government-business relations and budget deficits (Brodsgaard, 2012; Burns, 1993a and 2003; Duckett, 2001). Some of the more specific initiatives included corporatizing central ministries, allowing bureaucracies to engage in business activities, downsizing the State Council, merging overlapping responsibilities and creating new macro-economic planners (Brodsgaard, 2012; Burns, 1993b; Duckett, 2001; Heilmann and Shih, 2014; Pearson, 2005; Serger and Breidne, 2007).

This literature is informative in two aspects. First, senior Chinese leaders redefined and refined the jurisdiction and authority of the state's planning and economic management organs through over two decades of gradual reforms. Second, the gradual professionalization and institutionalization of the Party-state's planning capacities led to the creation of potent central commissions such as the NDRC and the SASAC. They were created to manage the state-industrial relationship with a clear focus on macro-economic management and medium- and long-term planning.

Power concentration and the Main Argument

The three sets of literature that I briefly surveyed highlighted three aspects concerning the Party-state's handling of national economic development:

[5] More revolutionary means adherence to core Marxist principles and the basic principles and basic lines of the CCP, service to the people, and a sense of selflessness.

1. China's developmental course gradually took shape in the early 2000s, when two metavisions concerning the state's management of the economy emerged after two decades of reform.
2. Organizational and bureaucratic reforms have been ongoing. However, the 2003 State Council reform was a critical juncture at which the state finalized its role in macro-managing the national economy.
3. As a result, the Party-state created new developmental institutions and strategic industrial practices to implement the two metavisions through an emphasis on "coordinated development."

The convergence of the above three aspects of Chinese political economy occurred in 2003, when the Hu-Wen administration reformed the core responsibilities of the State Council and China's planning organs. The reform was a significant move toward the institutionalization of the Party-state's planning capacities and policy coordination. Wen Jiabao regularly highlighted the principle of "no project approval without planning" (*meiyou guihua bupi xiangmu*) and the need to "pay greater attention to top-level design and overall planning" (Heilmann and Shih, 2014: 14).

The Main Argument

"Time and again, policymakers have intervened to make critical decisions to speed up, slow down or change the direction of reform" (Fewsmith, 1994: 6). The purpose of this dissertation is to figure out *when* and *how* decisions have been made to accelerate or slow sectoral development.

This dissertation argues that power concentration is the principal reason for sustained rapid railway modernization in the post-WTO period (2003 to 2019) and moderate growth during the First Five-Year Plan (FYP, 1953 to 1957) and the Third Front Movement (1964 to 1980). In the absence of power concentration, railway development was paltry. Power concentration was defined, per the introductory chapter, as institutionalized and centralized means in shaping and supporting the sectoral approach to development. Power concentration has evolved from the

Maoist styles of command and control toward one that focuses on coordinating market dynamics and resource distribution.

Power concentration manifests as central and top leaders' commitment to macro-economic planning, providing strong financial, organizational and policy support, and setting clear and restrictive developmental targets. In post-WTO China, institutionalized macro-economic planners formulate strategic industrial policies, and railway policymakers coordinate market-oriented SOEs and subcentral actors to implement those policies. The state commits to those industrial policies by insulating implementing agencies from bureaucratic fragmentation, corporate negotiation and societal backlash. In the post-2003 developmental narrative, power is concentrated in the hands of the NDRC and sectoral coordinators: the MOR and the CRC. In order to flesh out the main argument, the dissertation analyzes the following three aspects of national/macro and sectoral development.

1. The first is to identify the presence or absence of a developmental approach during the Mao era (1949 to 1976), the post-Mao era (1978 to 2002), and the post-WTO era (2003 to 2019).
2. The second is to evaluate the Party-state's planning institutions during those three eras.
3. The third is to examine industrial policy and its implementation in sectoral development. Specific attention is being paid to medium- and long-term national planning with mandatory or restrictive development targets.

The Mao Era

Maoist autarky focused on breaking down geographical barriers for balanced development and highly prioritized the development of national defence and heavy industrial capacities. The developmental objectives were rapid modernization and industrialization. However, developmental approaches constantly shifted between coordinated development and political mobilization. In the early years of the People's Republic, China learned how to engineer central planning from the Soviet Union. The First FYP (1953 to 1957) was drafted with help from Soviet experts in Moscow. However, the Great Leap Forward (GLF, 1958 to 1962) and the Cultural

Revolution (1966 to 1976) dismantled China's centralizing capacities as Maoist radicals paralyzed the state's abilities to implement coordinated development.[6]

As a result, sectoral development experienced great achievements and destruction during the Mao era. In the early 1950s, after three years of economic recovery, railway production made remarkable achievements under the guidance of the First FYP and central planning. Five-Year Plans during the Mao era became a salient tool to coordinate cross-sectoral development and implement industrial policies. Railway development was conducted under a "highly concentrated" (*gaodu jizhong*), "greatly coordinated" (*da liandongji*) and "semi-militarized" (*ban junshihua*) central ministry. The GLF led to the creation of autonomous and regional industrial systems, and it soon dismantled the MOR's centralizing capacities such as planned transport and the one-man management system. The breaking down of central control resulted in a slowdown in sectoral development. In the recovery period after the GLF, the MOR focused on railway equipment modernization and restoring centralized decision-making. But then the Cultural Revolution (1966 to 1976) emasculated the ministry's centralizing capacities and plagued the railway system with factional strife. Railway transportation and modernization stagnated and only improved for a brief moment in 1975 when Deng Xiaoping temporarily returned to lead the State Council. Deng recentralized the system for an abbreviated period before he was sent-down again at the instigation of the Gang of Four.

Interestingly, concurrent with the Cultural Revolution, the Third Front Movement (1964 to 1980) emerged as a strategic developmental program designed to reduce geopolitical pressures. The movement received broad support and policy commitment from central and regional/provincial leaders. To be specific, several central and military organs devised a detailed plan dedicated to promoting the rapid completion of the Railway Third Front. Two regional supra-institutional organs, the Southwest and Northwest Third Front Construction Commissions, were established to centralize decision-making and policy implementation. The Railway Corps

[6] Though the Great Leap Forward officially ended in 1962 at the Lushan Conference. The MOR's centralizing capacities were restored in late 1960.

of the People's Liberation Army (PLA) also played a key role in the process. As a result, railway construction continued during the Third Front Movement unscathed.

The Post-Mao Era

The post-Mao Chinese leaders did not have an alternative approach when they initially set out to reform the Chinese economy. In the late 1970s and early 1980s, Deng Xiaoping visited Japan and the US and consulted the World Bank in search of "magic potions" to restart the Chinese economy. While Deng understood the need to improve the livelihood of ordinary Chinese citizens, the achievement of those developmental goals was done experimentally and gradually—crossing the river by groping the stones. The Party-state rebuilt and reformed its bureaucracy and planning agencies by professionalizing and institutionalizing them. Those reforms were situationally driven to meet the demands of a growing market-oriented economy.

The central ministry's reform experience during the 1980s and 1990s signalled a lack of vision and central commitment. Decentralization, deregulation and marketization became the hallmarks of sectoral development. The central government fiscally starved the MOR through national budget and tax reforms. In the process, Deng Xiaoping disbanded the PLA's Railway Corps in the early 1980s and merged it with the MOR's engineering bureaus. In 1985, Deng allowed the MOR to enter into a contract responsibility system vis-à-vis the central government. As a result, the central ministry was forced to diversify its fundraising capacities by cooperating with local government and foreign banks for technical and monetary assistance. Moreover, the MOR decided to maintain a minimalist approach in railway investment. As a result, network expansion and upgrades solely focused on ameliorating regional capacity deficiencies in coastal areas of China and improving coal transportation.

In the 1990s, two more rounds of decentralization and deregulation were implemented to grant the MOR and its regional bureaus and non-transport units more autonomy. In the late 1990s, the MOR decided to bifurcate the non-transport units and push for vertical separation. Despite hopeful wishes, railway policymakers were culpable for their inability to solve capacity deficiencies. Those decentralizing features contributed to the formation of transportation bottlenecks as sectoral development failed to keep pace with economic growth. Despite

suboptimal growth, the chief engineer responsibility system and sub-national innovation networks laid the foundations for rapid industrial upgrades in the post-WTO era.

The Post-WTO Era

The Asian financial crisis in 1997 and China's entry into the WTO in 2001 presented the Party-state with a new sense of national vulnerability. Top leaders, such as Jiang Zemin, believed that rapid technological advancement, the free flow of global capital and intense international competition could slow down the Party-state's pursuit of the "Two Centenaries," which called for an improvement in the livelihood of the Chinese people and the establishment of a strong nation. In light of new geoeconomic challenges, the Chinese state recentralized the strategic sectors, such as the civil aviation, energy and telecommunications sectors. In addition to a new round of governmental restructuring in 2003, two crucial economic metavisions emerged: a tiered economy and controlled competition (Pearson, 2005). The central government also forged national champions to strengthen the competitiveness of China's strategic sectors, such as the aerospace, automotive, pharmaceutical and power equipment industries (see Nolan, 2001: 18, for a complete list). The strengthening of the central government's macro-economic planning capacities was designed to withstand international competition after China's WTO accession (Nolan, 2014). Unlike Maoist centralization, post-WTO recentralization explicitly focused on advancing the role of the state *and* the market in the management of China's strategic industries. Post-WTO recentralization tried to achieve national developmental objectives through some means of market competition.

WTO accession added stress to the railway sector, which had already been struggling. As a result, the State Council halted marketized reforms that were afoot and recentralized and placed the MOR under its direct attention. The State Council's financial and organizational support insulated the central ministry from implementation problems. Sectoral power concentration manifested in the emergence of a national Big Leap Forward (BLF) as the new sectoral approach to development and the Medium- and Long Term Railway Program (MLTRP) as the strategic industrial policy. The formation of the BLF and the MLTRP was symbiotically caused by the need to build national champions to reduce China's geoeconomic vulnerability as well as the need to instill "comprehensive guidance and coordination of China's industrial and technological

upgrading" (Heilmann and Shih, 2014: 13). The State Council approved the MLTRP in 2004, and the NDRC integrated the plan with national programs, such as FYPs and other (cross)sectoral multi-year programs. The MLTRP, once approved, was rarely altered. Rapid railway network expansion and upgrades and railway equipment modernization through power concentration and technology leapfrogging became the marked features during the BLF period (2003 to 2011) and post-BLF period (2013 to 2019). As a result, China's railway development in the post-WTO era was at unprecedented levels.

Highspeed Rail Development as a Case Study

The marked feature of China's rapid railway modernization is its highspeed rail (HSR) industry, which is also an illustrative example of power concentration. The decision to build a national HSR network consisting of four horizontal and four vertical closed corridors is a part of the national plan to solve capacity deficiency. Separating passenger transport from the existing lines can create additional track space to increase freight transport and support the growing economy. The move toward HSR modernization has been a carefully calibrated one, with the explicit intention of achieving rapid modernization and indigenous re-innovation. The process of China's HSR modernization is similar to what Keller and Pauly (2007) and Brandt and Rawski (2019) have found in China's build-up of its semiconductor, electricity and telecommunications sectors. Senior Chinese leaders implemented a strategy to "catch-up" with the West through technology leapfrogging (Keller and Pauly, 2007: 52).

Simultaneous to that leap, China has tried to increase its geopolitical and geoeconomic influence through infrastructure financing. Against this backdrop, the "China standards" in HSR development (*zhongguo biaozhun*) became a means to show China's technological competence. The concerted efforts in exporting China's HSR industry were aimed at establishing China as a global rule-maker as well as solving the problem of domestic industrial overcapacity. In the process, the Party-state replicated the domestic state-industrial relationship and applied it to HSR export. Senior state leaders, such as Xi Jinping and Li Keqiang, acted as "global salesmen" and created opportunities for domestic firms to penetrate the global market. Both Xi and Li established bilateral developmental projects with foreign countries (Kratz and Pavlicevic, 2016). The NDRC then moved to settle framework agreements with those countries. Finally, the CRC

implemented those framework agreements through its international arm—the China Railway International Corporation. This hierarchy allowed the NDRC to interface with- and manage the CRIC to implement the state's agenda, without the need to go one level down and negotiate with several non-transport SOEs, such as the CRRC Corporation, the China Railway Engineering Corporation and the China Railway Construction Corporation.[7]

Conclusion

In shaping the concept of power concentration, I drew eclectically from three sets of literature: 1) China's post-Mao reform and industrial development, 2) the developmental state and 3) bureaucratic politics. The first set posited that, in the early 2000s, post-Mao leaders reached a statist consensus on economic development in addition to the emergence of two metavisions of China's post-WTO development. Developmental institutions and strategic industrial practices were informative on the role of macro-economic planners. Bureaucratic politics traced the process through which the Party-state's planning agencies became professionalized and institutionalized.

Concentrating power to accomplish big things was defined as an institutionalized *and* centralized means of shaping and supporting an approach to sectoral development to meet the broader developmental challenges of the time. The concept emphasized the culminating effects of developmental approaches, institutionalized planning agencies and strategic industrial policies on railway development. Different from coordinated development, power concentration highlighted the agency of the MOR, the actual implementing agent responsible for sectoral and cross-sectoral coordination during the implementation phase. The proposed argument was that power concentration facilitated flashes of accelerated development during the First FYP and the Third Front Movement and sustained rapid sectoral modernization in the post-WTO era.

The next chapter will analyze sectoral development in the Mao era, starting with the emergence of the MOR. A brief overview of early railway development in the nineteenth and

[7] In December 2014, the NDRC announced the merger between CSR and CNR to create the CRRC Corporation.

early twentieth century, both the international and domestic dimensions, will be offered to set up the background story—that a centralized bureaucracy is a precondition for railway modernization. China's pre-1949 railway sector was strategically important to national unification and military mobilization. China's railroads played a crucial role during the Second Sino-Japanese War, the second phase of the Chinese Civil War and the founding of the People's Republic. After 1949, the CCP pushed through several rounds of massive railway infrastructure projects to strengthen national defence and unity and extend the nascent regime's political reach. Under the management of the MOR, also known as the "big brother" of the People's Republic (*tie laoda*), railway development and network expansions were driven by Mao's need to reduce spatial contradictions and integrate economic development with national defence.

Chapter 3

(De)centralizing Railway Development Before 1975

"Building socialism and developing our national economy must be planned."
Li Fuchun, in the drafting of the third Five-Year Plan, February 20, 1963

Introduction

To a certain extent, China was forced dragging and kicking into modernization after the First Opium War in 1840. As the Qing dynasty exhaled its last dying breath, it left a fragmented national railway system due to railway colonization. Against this backdrop, Sun Yat-sen called for a nationalized railway network, as he believed that a modernized and integrated network could unite the nascent republic. Sun's vision did not come to fruition during his time, but the dream of building a strong nation with a comprehensive railway network persisted. Indeed, railroads played an indispensable role in both the nationalists' and the communists' struggle for national strength and security. In his vision of a self-sufficient, industrialized, modernized and regionally balanced Chinese state, Mao Zedong wove national defence with economic development.

During the Mao era, power concentration—when pursued—manifested as direct central attention to rapid industrial and infrastructure development, institutionalized planning and policy implementation and a well-defined industrial policy. Together, these three factors promoted orderly production and accelerated development. Flashes of success were achieved during the First Five-Year Plan (FYP, 1953 to 1957) and the Third Front Movement (1964 to 1980). However, sectoral modernization during the Mao era also underwent considerable destruction. During the Great Leap Forward (GLF, 1958 to 1962) and the Cultural Revolution (1966 to 1976), sectoral development was brought down to its knees, as Mao's mass mobilization and revolutionary movements dismantled certain tenets of power concentration. Though the Third Front Movement and the Cultural Revolution temporally overlapped, power concentration allowed projects under the Third Front Movement to continue unscathed.

Sectoral development during the Mao era, which can be characterized as highly centralized, greatly coordinated and semi-militarized, did not lack direct central attention. Top leaders such as Mao Zedong, Zhou Enlai and Deng Xiaoping became personally attached to ensuring orderly production and the establishment of a national railway network. For example, Mao made a strategic move to preserve a special task force for war: the People's Liberation Army's (PLA) Railway Corps. Additional examples of direct central involvement include Deng's successful restoration of the Ministry of Railways' (MOR) centralizing capacities in 1961 and Zhou's failed attempt to salvage orderly production against a deluge of revolutionary attacks on the MOR in 1967.

The developmental approach of the Maoist economy oscillated from coordinated development or integrated industrialization to mass political movements. Integrated industrialization was mainly reflected in the aspiration to coordinate production "within the [industrial] unit as well as the integrated industrial structure" (Hoffmann, 1971: 25). The first generation of Chinese leaders engineered China's central planning and industrialization capacities under Soviet tutelage. The Soviet model prioritized the development of capital-intensive heavy industries and nationalized manufacturing and infrastructure development, placing them under central planning and one-man management. During the GLF and the Cultural Revolution, Mao jettisoned the Soviet model of integrated industrialization and pursued mass mobilization and revolutionary movements to achieve rapid development. Modernization through political movements proved to be destructive to both the national economy and the railway sector.

China's developmental institutions also emerged under Soviet tutelage. The Central Finance and Economic Affairs Commission (CFEAC), led by Chairman Chen Yun and Vice Chairman Li Fuchun, was responsible for the drafting of the First FYP (1953 to 1957). In the process, Zhou Enlai, Chen Yun and Li Fuchun visited Moscow and sought advice from Stalin and Soviet experts. To replicate the Soviet model, the CFEAC gradually separated into three potent planning commissions: the State Planning Commission (SPC), the State Economic Commission (SEC) and the State Construction Commission (SCC). These commissions, along

with the PLA, played important roles in the macro- and micro-economic planning of the Chinese economy during the Mao era.[8]

Central planning dictated mandatory targets that were carefully calibrated across all economic sectors. For example, in the First FYP (1953 to 1957), the central government planned steel production—1.35 million tons in 1955 and 4.12 million tons in 1957—in accordance with the national output in shipbuilding and locomotive, automobile and tractor manufacturing. For example, the production rate of steel was partially based on an annual increase of 3,000 km in railroads. The First FYP set national coal production capacity at 63.53 million tons in 1955 and 113 million tons in 1957 to meet the country's electricity usage, which was planned at 7.2 billion kilowatts per year.

The Second FYP (1958 to 1962) focused on shifting China's nascent industrial capacities to the interior. For example, steel manufacturing capacities in Inner Mongolia and central China would be relocated to the northwestern areas after the completion of the Lanzhou-Xinjiang Railway. Postal communication had to be linked with the expansion of railroads in the frontier regions. The national transportation and communications networks all had to be connected to national trunk lines.

Revolutionary movements against the bureaucracy severely disrupted the daily operation of China's planning institutions. Influenced by the Hungarian Revolution in 1956, Mao called out cadres in the state and manufacturing sectors, as he thought they had become too bureaucratized. Mao believed that they were culpable for the ongoing strikes and political contentions in 1956 and 1957. The Anti-Rightist Campaign (1957 to 1959) and the GLF (1958 to 1962) severely weakened the central government's planning capacities. To this effect, Li Fuchun, the Chairman of the SPC, bitterly said that the country had suffered in the absence of planning (Bo, 1992 and 1993: 1193).

[8] While the SPC was responsible for medium- and long-term planning, such as drafting the FYPs, and the SEC was responsible for annual planning. Both departments, led by Li Fuchun and Bo Yibo, respectively, worked together to draft the Second and Third FYPs. During the Cultural Revolution, both Li and Bo were removed from their duties, and both the SPC and the SEC became obsolete.

While planning was restored for the drafting of the Third Front Movement and the Third FYP, the SPC was under attack from Mao, as the "Great Helmsman" had grown increasingly unsatisfied with the commission's work. In 1965, Mao asked Yu Qiuli to head a "mini-SPC," which severely weakened the commission's daily operations. During the Cultural Revolution, factional strife weakened the commission to the point that Mao did not know who was in charge. The SEC was eventually dismantled during the Cultural Revolution and merged into the SPC.

Despite bureaucratic weakening and an ongoing revolutionary binge, top leaders continued to prioritize industrial and infrastructure projects that had been planned under the Third Front Movement. To overcome bureaucratic overlap and fragmentation and institutionalize the implementation of the Third Front Movement, the Politburo and the State Council established two coordinating supra-institutional bodies in 1965: the Southwest and Northwest Third Front Construction Commissions. These headquarters were responsible for overseeing and supervising project implementation at both the central and local levels. Additionally, a Railway Third Front Construction Headquarters was established to centralize decision-making in railway construction on September 10, 1964.

During the Mao era, the implementation of industrial policies was channelled through annual planning and FYPs. As a result, cycles of centralization and decentralization informed the state's industrial policy concerning railway development. In the early years of the People's Republic, centralized management was established in the sector. The "one-man management system" (*yizhang zhi*), which had matured during the second phase of the Chinese Civil War in northeast China, was adopted as a national policy to ensure both military and civilian usage of the railway system. "Planned transport" became a marked feature during much of the 1950s, as senior state and military leaders heavily guided national network expansion. The civilian ministry of railways served the developmental agenda of both the State Council and the Central Military Commission (CMC) of the PLA. However, military usage took precedence during the Korean War and the Second Taiwan Strait Crisis. For example, in the First FYP, Chinese leaders, including the military, planned the construction of four major trunk lines between Lanzhou and Urumqi, Baoji and Chengdu, Yingtan and Xiamen and Ji'ning and Erenhot. These lines were completed in 1965, 1957, 1956 and 1956, respectively.

Planned transport did not last very long. The GLF resulted in the decentralization of decision-making power from the central ministry to its regional bureaus. Decentralization was designed to support the establishment of autonomous regional industrial systems. During the Cultural Revolution, the rebel faction's attacks on railway policymakers paralyzed sectoral production and development. In light of the national movement, the Railway Third Front became the dominant sectoral policy as China's top leaders worked to ensure the completion of major trunk lines between Guiyang and Kunming (1966), Chongqing and Guiyang (1965), Chengdu and Kunming (1970), Xiangyang and Chongqing (1970 and 1979) and Zhuzhou and Guiding (1975). In the Third FYP, the central planners established a restrictive timetable for the completion of the Guiyang-Kunming Railway, the Chengdu-Kunming Railway and a procession of new railway projects.

The current chapter is divided into seven sections, including the introductory and concluding sections. The following sections survey railway development in early industrialized countries and China. From the experience of Western countries and Japan, the presence of a strong central bureaucracy is a precondition for railway modernization. The weak Qing government, however, had to combine "Western managerial styles with indigenous business practices" due to railway colonization (Koll, 2019: 20). During the Republican era, railroads were seen as engines of national strength and struggles for sovereignty. Though the Kuomintang (KMT) left a fragmented and war-torn national network, the bureaucratic structure of the Republic's railway system became the hallmark of subsequent management. After the founding of the People's Republic (1949), sectoral planning and development transitioned from planned development in the First FYP to decentralization during the GLF, then recentralization from 1962 to 1966. The Cultural Revolution ultimately led to the demise of orderly and centralized sectoral development, except for infrastructure projects planned under the Third Front Movement.

Railway Development Before the People's Republic

Outside of China, the construction of railroads accompanied rapid industrialization and early capitalist development and was regarded as "the engine of 'progress' [and] a promise of

imminent Utopia" (Schivelbush, 1986: Forward; Bowman, 1995; Casson, 2009). Despite the close relationship between industrialization and steam locomotion, each country's railway system emerged from different national needs and was managed in different ways.

The modern steam-powered railway originated in England and was considered "one of the first modernizing industries" (Bowman, 1995: 567). Before the opening of the Stockton and Darlington Railway on September 27, 1825, railways were powered by horses. The world's first intercity railway line opened in 1830 between the industrial cities of Liverpool and Manchester. Britain's railway system was promoted with international trade in mind, connecting settlements, ports and trading hubs (Casson, 2009). Due to the political legacy of "locat[ing] sovereign in elite individuals," Britain's railway policy was a minimalist one that promoted "small-scale entrepreneurial capitalism" (Bowman, 1995: 569). Much of the railway network in England was completed between 1825 and 1914.

The construction of a comprehensive railway network was also inseparable from nation-making and the development of a modern nation-state. In North America, railway companies became powerful institutions and established a close relationship with the state (Sexton, 2017). In Germany and France, railroads provided the crucial element for the emergence of a united country and the consolidation of a centralized bureaucracy. For example, in 1842, the French government passed legislation calling for a railway line to connect the country's periphery with Paris, as the centralized French bureaucracy wanted to build the "most centralized rail network in the world" (Bowman, 1995: 569; de Block, 2011).

In addition to nation-building, the German economist Friedrich List argued that a comprehensive railway network could become a signal of national strength. List's idea of a modern railroad system suitable for war was operationalized by Helmuth von Moltke and the General Staff, an insulated military decision-making body with expertise and connections with the civilian railway sector.

Japan's railway development began as early as 1872, when the Tokyo-Yokohama Railway opened for commercial operation. During the Meiji period (1868 to 1912), Japan adopted and localized Western (mostly British) technologies and became a leading locomotive

manufacturer worldwide. Japan was then able to move away from its reliance on Western support by training a group of Japanese engineers (Ike, 1955). The nationalization of Japan's railway system took place in 1907, when the Japanese government purchased a significant number of railroads from private firms. This idea was promoted by Inouye Masaru, the head of the Railroad Bureau, who believed that railroads should focus on facilitating national defence and industrial upgrades (Ike, 1955: 225). The Japanese military also supported nationalization, as it felt that the movement of troops across Japan had been a problem during the Russo-Japanese War in 1904. In 1939, the Japanese government proposed a national plan to boost transportation capacity on the Tokaido and Sanyo Railways by constructing a wide-gauge track that could accommodate trains operating at a higher speed. The Pacific War forced the Japanese government to abandon the already proposed *dangan ressha* (bullet train project). As the land had already been procured, the *dangan ressha* laid the foundation for the world-famous Tokaido Shinkansen in 1964 (Nipon.com, 2014).

Despite the different purposes of railway development, a majority of countries converged on the idea of national planning that featured governmental intervention. For example, the Belgian, Canadian, French and German railway systems were planned and managed by the state. Japan and Britain reversed earlier experiences of decentralization and privatization during the 1900s and the Second World War, respectively. In the US, railway consolidation took place during the late 1890s, when several banks engineered a wave of mergers and reorganization. Through a process called "Morganization," J.P. Morgan intervened to unify small, unprofitable and bankrupt competing companies into regional conglomerates.

Striving Toward Self-Strengthening: Origins of Railway Development in China

According to Chang Kia-Ngau, the Minister of Railways between 1935 and 1937, railway construction during the late Qing could be divided into three phases: 1) the first 195 miles between 1866 and 1894, 2) China's scramble for concessions between 1895 and 1903, and 3) nationalization between 1904 and 1911 (Chang, 1943: Chapters 1 to 3). By the end of 1911, the national kilometrage had reached 9,400 km. Due to foreign influence and the lack of political and particularly military leverage, the Qing railway system was a fragmented one with several sets of technical specifications. Though lacking a coherent strategy, the Qing government nonetheless

attempted to take full control of the railway sector through rounds of reclamation, negotiation and nationalization.

Lin Zexu was arguably the first person to introduce railroads to imperial China. In 1839, one year before the First Opium War, Lin published *Records of Four Continents* (*sizhou zhi*), which contained information on railway construction in foreign countries. Later scholar-officials such as Wei Yuan and Xu Jishe also wrote about modern science and railway technology. In 1859, Hong Rengan, Prince Gan of the Taiping Rebellion, proposed *A New Guide to Government* (*zizheng xinpian*), in which he clearly articulated the importance of railway construction for regime stability and nation-building (Gov.cn, 2006). However, the ruling Manchus thought of modern railway systems as "strange skills and wicked crafts" (*qiji yinqiao*; Gov.cn, 2006). The Manchu rulers, like the majority of the Chinese peasantry, believed that railway construction would lead to foreign encroachment, loss of arable land, disturbance of ancestral tombs and the disruption of the flow of *fengshui* (Chang, 1943: 24-25). Moreover, the lack of engineering knowledge and systematic education also restricted railway development (Koll, 2019: 23). In 1876, the first railway line in China—the Woosung Road—was secretly constructed by the British firm Jardine, Matheson & Co. without approval from the ruling Manchus.

Three great debates occurred in the late 19th century as the Qing government attempted to make sense of railway modernization. The first debate occurred between the Westernist Faction and the Conservative Faction among high-level scholar-officials. The former strenuously lobbied for railway construction. As intellectual descendants of Lin Zexu, Marquis Li Hongzhang and Guo Songtao advocated for the idea of learning foreign technology to combat foreigners (Wang and Li JL, 1993: 5). Li argued that railroads could help with national defence and military mobilization (Li WY, 2005: 11). Liu Ming's proposal to connect Qingjiang and Beijing via railroads galvanized fierce recriminations from the conservatives (Yang YG, 1997: 13). Led by Wang Jiabi and Zhou Derun, the conservatives gained royal support; the Qing government announced on February 14, 1881 that railway construction was too costly for the country and that it would not consider any foreign loans (Yin, 2005: 38-39). Despite considerable opposition, Li was able to construct the Kaiping Colliery Tramway, which linked Tangshan and Xugezhuang.

Initially powered by horses, then steam engines, the standard-gauge railway was the first railway line built by the Chinese, albeit designed by the British.

The second great debate occurred during the Sino-French War and the First Sino-Japanese War between 1884 and 1885. It revolved around the question of necessity and funding. Two incidents affected the outcome of the debate and the eventual victory of the Westernists. First, before his death, Marquis Zuo Zongtang bitterly wrote to Empress Dowager Cixi and suggested that "railways must be built" (*tielu yi fangzao ye*) between Tongzhou and Zhenjiang (Wang and Li, 1993: 8; Yin, 2005; 41). Cixi was taken aback by Zuo's strong message and paid great attention to his dying wish. Second, the country's humiliating defeat in the First Sino-Japanese War in 1885 fundamentally changed "the political calculus in favour of railway development" (Koll, 2019: 29). Increasing national strength and competing against colonial powers such as Japan became priorities for the Qing government, which began to pursue industrial development (Koll, 2019: 29). Thus, a wave of railway construction started in 1886 with the establishment of Imperial Chinese Railways (*tielu zong gongsi*) in January 1887. The Chinese tycoon Sheng Huaixuan was appointed to overlook the firm. The Qing government approved three railway lines: the Kaiping Colliery Tramway's extension line, the Tianjin-Tanggu Railway and the Taiwan Railway (Yang YG, 1997: Chapter 1).

The third great debate occurred after Li Hongzhang's proposal to extend the Tianjin-Tanggu Railway to Tongzhou in 1888. The conservatives fervently opposed the proposal, as they believed that Tongzhou was in close proximity to Beijing and could pose a significant threat to national security, as foreign powers could march into Beijing "as fast as the speed of wind and lighting" (*fengchi dianzou*) upon landing in Tanggu (Yin, 2005: 48). The Guangxu Emperor's tutor, Weng Tonghe, argued that railway construction in the frontier region should take precedence over the heartland (*xian bianchui hou fudi*; Xie, 2004). The scale eventually tilted in favour of the Westernists, as Zhang Zhidong, one of Empress Dowager Cixi's most trusted scholar-officials, proffered a detailed and well-argued petition advocating for the extension. Thus, on May 5, 1889, the Qing government announced that railroads were "important to self-strengthening and thus must be centrally coordinated" (Yang YG, 1997: 23). This statement from the Manchu rulers signalled their official endorsement of railway construction under central

planning. Despite the call to centrally coordinate railway development, the Qing lacked the competent central authority (Koll, 2019: 50).

In October 1909, three years before the collapse of the Qing dynasty, China's first self-designed and self-constructed Beijing(Fengtai)-Zhangjiakou Railway began to operate. The chief engineer was Zhan Tianyou, a Yale University graduate with a degree in civil engineering. The decision to build the Beijing-Zhangjiakou Railway was due to economic (trade), military and political reasons by helping to consolidate the Manchus' control over the frontier region (Inner Mongolia) via Zhangjiakou, one of the largest fur-trading hubs in the world (Zhao YZ, 2017). The Manchus decided to allocate 5 million taels of silver for the project. The money came from proceeds from other Chinese freight lines, such as the Beijing-Shenyang Railway (Yang YG, 1997: 69). In May 1905, the Qing government established the Beijing-Zhangjiakou Railway Bureau and Railway Engineering Bureau. The 178.5 km-long railway line took four years and approximately 6.93 million taels of silver to complete (Yang YG, 1997: 71). This project was remarkable, because it stood out as uniquely Chinese compared to other domestic trunk lines, which were regarded as remnants of colonialism and national shame.

Railway development under the fragmented Qing government was intimately entangled with competing foreign powers and resulted in railway colonization. By the end of 1911, only 20% of the national railway network had been managed by the Qing government. By contrast, 41% of the national network involved direct foreign involvement, and another 39% was constructed with loans from foreign governments (Gov.cn, 2006). China's experience with Western powers led to both positive and negative consequences. On the one hand, Western powers helped modernize China's industrial development and fostered a sense of Chinese nationalism. On the other hand, the national railway network was a fragmented one with different designs and technical specifications. For example, the French Kunming-Haiphong Railway (1910) adopted a metre-gauge system, whereas the Russian Eastern China Railway (1903) and the German Qingdao-Ji'nan Railway (1904) adopted the wide-gauge system and broad-gauge system, respectively.

On May 9, 1911, the Qing government announced its decision to nationalize domestic trunk lines. This was designed to improve the stagnant pace of construction, as only 642 km of

railroads had been constructed since 1903. Nationalization immediately provoked waves of protests in Sichuan. The Railway Rights Protection Movement ensued as Sichuanese students and merchants flooded Chengdu and Chongqing. Bloodshed eventually occurred, as troops were ordered to fire at the protesters, and more soldiers were marshalled into Sichuan from the neighbouring province of Hubei. This round of mobilization left Wuchang largely undefended. It indirectly led to the Wuchang Uprising, sparking the Xinhai revolutionary movements and in turn leading to the demise of 2,000 years of imperial history.

Fighting for National Strength and Sovereignty: The Republican Era

Sun Yat-sen had an intimate understanding of the relationship between railway construction and national strength. After the transition of power from Nanking to Beijing in early 1912, Yuan Shikai appointed Sun as the Director of National Railway Planning to oversee railway development in China. Sun's belief that national reconstruction could be achieved through infrastructure development influenced both the KMT and the Chinese Communist Party (CCP). Indeed, as an independent strategic sector to secure national interests from foreign powers, sectoral development could improve political and socio-economic problems as well as help China to ascend the international hierarchy (Koll, 2019: 54, 185).

Sun believed that, if China could construct 3.5 million *li* of railways, it would become the most powerful country in the world. Sun dedicated himself to completing approximately 100,000 km of railroads within the next decade (Wang and Li, 1993: 40). In August 1919, he published "The International Development of China" in *Jianshe* magazine. In his vision, China had to modernize its railway system, as it was "the first in importance" among some of the "most urgent need[s] of the Nation" (Sun YS, 1922). Though Sun's thinking on the use of foreign capital without subjecting China to foreign influence was idealistic, he left a blueprint for the construction of a comprehensive railway network, intended to be operated by the Chinese, according to the following four principles (Sun YS, 1922):

1. The most remunerative field must be selected to attract foreign capital.
2. The most urgent needs of the nation must be met.
3. The lines of least resistance must be followed.

4. The most suitable position must be chosen.

In light of Sun's push for a comprehensive national railway network, the Beiyang government led by Yuan Shikai continued the Qing legacy and nationalized private railways. Under the slogan of "unifying the state and the private" (*guo min yiti*), Yuan quickly dissolved provincial railway companies, nationalized all railways that had been under construction and heightened his attack on private railway firms after suppressing the Second Revolution (Yang YG, 1997: 87; Li WY, 2005: 48).

Through nationalization, the Beiyang government tried to standardize railway technology, railway transportation and railway accounting. In May 1917, the Railway Technology Standard Commission was established under the Ministry of Communications, and Zhan Tianyou was appointed as the first Commissioner. In 1922, the commission published a master document aimed at producing a unified set of national railway standards. The Beiyang government also established the Railway Transport Division under the Ministry of Communications in 1917 to harmonize transport specifications and train schedules. In 1919 and 1920, the division implemented three regulations on railway transportation: *Regulation on Passenger Transportation of the National Railway*, *Regulation on Freight Transportation of the National Railway* and *Categorization of Freight*.

Apart from nationalization, Yuan Shikai inherited the Qing practice of making railway concessions in exchange for foreign loans. As a result, between 1912 and 1918, foreign powers raced to seize railway concessions in China (Yang YG, 1997: 89). Before the outbreak of the First World War, European powers such as Britain, Belgium, France and Germany had actively constructed railroads in China. After the European powers shifted their focus to the Great War, the US, Japan and Russia emerged as new actors in China's railway development (Wang and Li, 1993: Chapter Two). China, under the Beiyang government, became a playground for great power competition.

Between 1912 and 1928, the increasingly weak and fragmented Beiyang government only constructed approximately 3,900 km of railroads (Li WY, 2005: 49). Foreign intervention, embezzlement of foreign capital, domestic warfare and debt problems were some of the primary

reasons underlying the slow progress. After the death of Yuan Shikai on June 6, 1916, the Beiyang government became fragmented by the emergence of armed conflicts between different warlords such as Duan Qirui, Wu Peifu, Cao Kun and Zhang Zuolin.

Peace finally arrived in 1928, when the Nanking-based KMT reunified the country—in reality, approximately one-third of the country—after two years of a hard-fought military campaign known as the Northern Expedition. The Nanking government re-established the Ministry of Railways to oversee railway construction on October 23, 1928. Chiang Kai-shek appointed Sun Yat-sen's eldest son, Sun Ke, to serve as the first railway minister.

Sun Ke committed himself to realizing his father's dream and, at the same time, advocated for centralized management and independent accounting. Sun planned 32,000 km of new railroads over the next ten years (Wang and Li, 1993:81). However, this plan proved to be too ambitious, as the Nanking government did not have the monetary resources to support any large-scale infrastructure projects. Furthermore, foreign governments and bankers were also hesitant to provide loans to the Nanking government, as much of the Chinese territories were engulfed in military conflicts.

Between 1928 and 1949, the KMT failed to improve China's railway system despite a centralized ministry and several large-scale developmental plans. Though 17,000 km of railway lines had been constructed by 1949, nearly half of these were built by the Japanese invaders. Manchuria greatly benefitted from Japan's infrastructure projects, as 5,300 km of railroads were ceded to the KMT government at the end of the Second Sino-Japanese War. The KMT's construction efforts were restricted to the southwestern regions of China. Chiang Kai-shek believed that railway development could foster industrialization and ensure access to China's frontier regions and their natural resources (Koll, 2019: 186).

The KMT appreciated the relationship between railway construction and military operations. During the first year of the Second Sino-Japanese War in 1937, the Chinese railway system helped transport over 200 million armed forces and over 700,000 tons of military supplies (Li WY, 2005: 61). Before the fall of Guangzhou and Wuhan in 1938, the Guangzhou-Hankou Railway, Beijing-Hankou Railway and Guangzhou-Kowloon Railway had been the main arteries

supporting China's war efforts against Japan. Railway lines also became central to several military struggles, as both the Japanese and the Chinese focused on disrupting the transportation of troops and military supplies by destroying existing railway networks.

After the end of the Second Sino-Japanese War in 1945, the Nationalist government announced its *Post-War Railway Construction Plan*, which proposed the construction of 13,923 km of new railway lines in the subsequent five years. However, Chiang abrogated the plan as his Republican government shifted its focus to fighting the second stage of the Chinese Civil War between 1946 and 1950. As a result, neither the KMT nor the CCP could improve China's railway system on any significant scale until the latter took full control of mainland China.

The lack of progress during the Republican era (1912 to 1948) was mainly attributable to three reasons. First, the semi-colonial and semi-feudal Chinese society was plunged into persistent military conflicts. Such destructive events paralyzed more than half of the national system, and only approximately 10,000 km of railway lines remained operational in late 1949 (Yang YG, 1997: 128). Second, the problem of fragmentation continued to haunt the Nationalist government. Foreign powers such as Britain, France, Germany, Japan, Russia, Belgium and the US constructed railways according to their own technological and gauge standards.

Lastly, the Nationalist government lacked a centralized coordinating system to regulate railway production. Other than lines constructed and operated by foreign powers, regional railway bureaus were much more powerful than the Nanking government. Railway Road Management Bureaus were established according to "geographical scope covered by major lines" and were located in the transportation hubs of major and subordinate railway lines (Koll, 2019: 59). Under vastly different management styles, regional bureaus implemented widely disparate regulations. However, the regional bureaus shared the common goal of extending the legitimacy of the KMT party-state (Koll, 2019: 187).

The Founding of the Railway Corps and the Ministry of Railways

During the second phase of the Chinese Civil War (1946 to 1950), the CCP first experienced the importance of railway transport for military mobilization in the battlefields of northeast China. To ensure the movement of military supply and troops, Lin Biao and the CCP's armed forces took charge of the civilian railway system and placed it under centralized military control in 1945. The one-man management system and the accountability system germinated under the PLA and Soviet tutelage. After the creation of the civilian MOR, the PLA maintained its influence in railway planning, construction and repair. Indeed, railway production was heavily centralized, and railway repairs and maintenance were greatly influenced by the PLA's war plans. Sectoral development explicitly focused on providing logistical support for national unification and the Korean War.

In 1945, Lin Biao was sent to the northeast in preparation for a military takeover from the KMT. His first task was to suppress the PLA's factional competition over railway containers and clear up the clogged railway system. These were urgent tasks, as Lin had failed to mobilize troops, military and Party cadres to Fuxin and Shenyang. On December 19, 1945, Lin appointed Hong Xuezhi as the Commanding Officer of Railways (*tielu siling*) to streamline the regional system and centralize railway operations. In Lin's telegram to various headquarters, he placed all regional railway bureaus and Road Protection Squads (*hulu dui*) under Hong's authority. Lin also gave Hong the power to "immediately execute" (*dangdi yuyi qiangjue*) all recalcitrant actors (Xu and Xie, 2012).

After the completion of railway centralization, Hong became the Deputy Commanding Officer of the West Liaoning Military Region in February 1946. In June 1946, the Railway Command Headquarters (*tiedao silingbu*) of the Northeast Democratic United Army was established. Su Jin was appointed as its first commanding officer. In December 1946, the headquarters was renamed the Road Protection Corps Command Headquarters (*hulujun siling bu*), while Su remained its commander. Located in Harbin, two of the main goals of the Road Protection Corps were to maintain railway transportation in the liberated areas of northeast China and, at the same time, destroy enemy railway lines to demobilize the KMT.

By the end of 1946, local railway troops had begun to integrate into the Road Protection Corps, including a Hui People's Regiment (*huimin zhidui*). By January 1947, the total number of staff and soldiers of the Road Protection Corps had reached approximately 8,500 people (Han HQ, 2018). By late 1947, as Lin prepared to end the war in the northeast, since his forces had already beleaguered KMT troops in Changchun, Shenyang and Jinzhou, Mao Zedong asked the Railway Protection Corps to "halt railroad destruction or only engage in strategic destruction" (Han HQ, 2018). On July 5, 1947, the Northeast Bureau of the CCP and the CMC's Northeast Division jointly decided to create a new railway force. The Northeast Bureau instructed regional railway bureaus in the northeast to transfer a total of 1,200 railway engineers and staff members to the Road Protection Corps, which increased its size with an additional 8,500 staff members and troops (Sohu.com, 2006). These moves culminated in the creation of the Northeast PLA's Railway Column (*tiedao zongdui*), with Huang Yifeng as the Commanding Officer. The Railway Column played an important role in military mobilization during the Liaoshen Campaign and the Pingjin Campaign—two of the three military campaigns that decisively secured the CCP's final victory in 1949.

As early as November 1948, the Politburo planned to "cross the Yangtze River and liberate the entire country." In an attempt to secure military transportation, Zhou Enlai met with Teng Daiyuan and asked Teng to "work on the railway sector" (*zuohao tielu gongzuo*; Liao and Zhang, 2003). On January 10, 1949, the Politburo and the CMC announced the decision to establish a railway ministry under the PLA. Both bodies jointly appointed Teng as its minister and Lü Zhengcao and Wu Jingtian as vice ministers. On April 10, 1948, the PLA's MOR announced the decision to ensure military transportation and strictly obey (*yange zunshou*) transportation orders from the highest military decision-making body within the CCP (MOR Archive Centre, 1999: 29).

According to Zhou Enlai, Teng's appointment was the first transition of a PLA general into a position that would eventually be civilianized (Liao and Zhang, 2003). The civilian Ministry of Communications of the North China People's Government and the Ministry of Railways of the Northeast China People's Government contributed to the creation of the PLA's MOR. The management of this ministry was semi-militarized, because it had to ensure both

military and civilian use of railway transportation, though the military's use of the system took precedence (Baokan Huicui, 2018). The purpose of establishing a separate ministry was to coordinate railway construction and repair, centralize the management of railway transportation in liberated areas and strengthen the military's control over the movement of goods and people in support of the war effort. Immediately after its creation, the PLA's MOR began to prepare for the safe crossing of the Yangtze River and the liberation of the entire country (Liao and Zhang, 2003).

On February 20, 1949, the PLA's MOR relocated its headquarters from Shijiazhuang to Beijing. The CCP established a Party committee in the MOR to strengthen the presence and control of the Party over the sector; Teng Daiyuan was appointed as the Party secretary. After the move to Beijing, Teng began to centralize and harmonize the KMT's fragmented regional management centres (MOR Archive Centre,1999: 26). A top-down political institution was instilled in the ministry and the sector by nationalizing northeast China's railway management system, which was managed through centralized means. Teng, Lü Zhengcao and Wu Jingtian cemented the four-level command system and established six more regional railway bureaus in Pingjin, Zhengzhou, Ji'nan, Shanghai, Taiyuan and Hengyang (MOR Archive Centre, 1999: 26).[9] In May 1949, the MOR established a political department (*zhengzhibu*)—an important and common department in military units—responsible for performing moral persuasion (*sixiang gongzuo*) to ensure "herding."[10] As a result, the nascent MOR created a control system that highlighted both centralization and regional management, ensuring regional compliance through Party apparatuses and military-style operations.

On May 16, 1949, the CMC announced the decision to rename the Railway Column to the PLA's Railway Corps (*tiedao bingtuan*) and placed it under the leadership of the MOR. Teng Daiyuan was cross-appointed as the Railway Corps' Commanding Officer and Commissar. Teng's assistant, Lü Zhengcao, was cross-appointed as the deputy commanding officer. These moves marked the transition of a regionally focused railway military unit to a national one, with

[9] This system of railway government would be dismantled by Liu Zhijun in the early 21st century for further centralization.
[10] "Herding" here refers to the idea that Party leadership, through the use of moral persuasion, encourages cadres moving toward a desired common goal and direction (Yan K, 2020).

an important mission to ensure the smooth transportation of military supplies and the mobilization of troops across the country. The Railway Corps prioritized and engaged in the protection, maintenance, repair and construction of railroads, especially in war-torn regions and conflict zones. They were also committed to following the Field Army onto battlefields (*yezhanjun dadao nali tielu jiu xiudao nali*; Teng, 2016). The repair of the Lianyungang-Lanzhou Railway, Guangzhou-Wuhan Railway and Hengyang-Liuzhou Railway were notable projects that helped national unification efforts.

After the founding of the People's Republic, the PLA's MOR was reincarnated as a civilian ministry under the newly established central government. Teng Daiyuan, Lü Zhengcao and Wu Jingtian remained in their respective positions in the civilianized MOR and the Railway Corps, which also made the transition to a military unit nested under a civilian ministry. In light of the ongoing civil war, the MOR, now an administrative entity, assumed control of the national railway system and worked with the PLA to ensure military transportation. Lü assumed the position of CMC's commanding officer in Transportation. This dual appointment signalled the strong relationship between the civilian ministry and the Chinese military: the former must serve the latter.

By the end of 1949, the MOR had assumed control and repaired all major trunk lines in the country (Baokan Huicui, 2018). As for the Railway Corps, in early 1950, a decision was made by the CFEAC to transition it into the MOR's engineering teams (Teng, 2016). The commission submitted a report to corporatize (*qiyehua jianshe*) the Railway Corps to the Government Administration Council and the CMC on April 22, 1950. On May 26 of the same year, the Railway Corps' Party Committee held an expanded meeting in Beijing and discussed the CFEAC's report. Meeting participants agreed to push back against the merger. They argued that the Railway Corps should be kept and expanded to meet the needs of the ongoing war. After the meeting, Teng Daiyuan and the Railway Corps' Party Committee held another meeting to draft a report for the CMC. In the report, Teng argued that technocrats and core forces had to be maintained for military needs and highlighted that the Railway Corps was an "indispensable force in military combat" (Teng, 2016). Teng believed that the Railway Corps should maintain its unit designation, quota and military status and that its day-to-day operation should fall under

the leadership of the CMC. On the other hand, the Railway Corps' engineering- and construction-related responsibilities could remain under the MOR.

On June 10, 1950, the CMC approved the report and submitted a reform plan to Mao Zedong for final approval. On September 18, 1950, Mao signed the CMC's plan to officially make the Railway Corps part of the PLA. The decision called to "strengthen the Railway Corps' organization and leadership … so it could become a modern and national military force" (Teng, 2016). The plan bifurcated the activities of the Railway Corps. On the one hand, its operation—such as cadre management, dispatch and training—and organization had to follow military protocols. On the other hand, the MOR maintained its coordinating capacity to manage the Railway Corps' railway engineering and construction-related activities.

On October 9, 1950, the Railway Corps was dispatched to the Korean War, which accentuated the need for a specialized force to ensure military transportation. To bolster railway repair and construction, the CMC transferred ten divisions of combatants to the MOR, which were immediately integrated into the Railway Corps by the central ministry. While some were sent to the frontlines in Korea, the remainder stayed in China to facilitate the recovery of national trunk lines. In the eyes of state leaders such as Zhou Enlai, the military function of the railway system had to be highlighted and maintained.

During the Korean War, Zhou Enlai wrote to Teng Daiyuan and the PLA's Minister of Logistics, Yang Lisan, on November 4, 1950, asking them to centralize all military transportation. Zhou indicated that the CFEAC, which was responsible for approving the transportation of military supplies and troops, could help facilitate the centralization process. Zhou also requested Chen Yun and Bo Yibo to prioritize military transportation, which had to take precedence over other financial and economic matters, in their management of the national economy. Zhou made himself available to decide on important issues that Chen and Bo could not (Lü, 2007: 414). On December 29, 1950, Zhou commented on the CMC's *Guideline for Militarizing Railway Transportation in the Northeast* and dictated that all transportation in the region—military, commercial and civil—must be approved by the PLA under the centralized leadership of Liu Juying and Yu Guangsheng (Lü, 2007: 415).

The Railway Corps' outstanding performance in the Korean War prodded the CMC to formally re-establish this special force under the PLA. On September 9, 1953, the CMC announced the decision to transition the Railway Corps from a civilian-managed military unit to one under the leadership of the PLA. This transition marked the official inclusion of the Railway Corps into China's military system and received support from Mao Zedong and Zhu De. On December 25, 1953, Mao autographed the Railway Corps' newspaper periodical "*tie dao bing*." On January 1, 1954, Zhu wrote an inscription to the newspaper: "fighting for the building of a standard and modern Railway Corps" (Sohu.com, 2006).

On February 28, 1954, Mao Zedong signed and announced the decision to appoint Wang Zhen as the new Commanding Officer and Commissar of the Railway Corps. The appointment of Wang completed the transfer of the Railway Corps' ownership from the MOR to the PLA. On March 5, the Command Headquarters of the Railway Corps was officially established in Beijing, consisting of several military and railway organs such as the Political Department, Engineering Department and Military Law Department.

In late January 1956, Wang Zhen and Teng Daiyuan signed an agreement called the *Railway Corps' Mission and the National Vision in Railway Construction for the Next 15 Years*. According to the agreement, the Railway Corps was responsible for the construction of 63 new railway lines (up to 23,313 km long), which would account for 42% of the country's new lines. The Railway Corps was also responsible for repairing seven railway lines, up to 965 km in length. The signing of the agreement marked the beginning of a strategic, equal and interlaced relationship between the MOR—a civilian ministry—and the Railway Corps, a military organization. The Railway Corps continued to play an important supportive role in domestic infrastructure development and the Party-state's military campaigns, such as the Sino-Indian War and the Vietnam War.

Learning from the Soviet Union and the Great Leap Forward

To build socialism and strengthen the nascent regime's centralizing capacities, the Soviet Union became an indispensable source of guidance, as Mao eventually conceded that China had to "lean to one side" and learn from the "Soviet Big Brother" (*lao dage*). During his visit to Moscow on February 24, 1950, Mao and Stalin agreed on the Sino-Soviet Treaty of Friendship, Alliance and Mutual Assistance. The Soviet Union pledged both financial and technical support to its Chinese ally.

The Soviet Union's industrialization experience and assistance were crucial to the People's Republic, as the latter needed to learn "about centralized economic planning, management of large-scale enterprises, together with the acquisition of technical knowledge and skills" (Bernstein, 2010: 12). As a result, the CCP engineered a nation-wide movement to learn and adopt Soviet styles of industrialization and modernization. Together with the Anshan Iron and Steel Company, which symbolized the birth of socialist industrialization in China, the Sino-Soviet jointly managed Changchun Railway became the forerunner of the movement and an exemplar for the rest of the country.

Sectoral learning from the Soviet Union began as early as 1949, when the central ministry mobilized its staff members and workers to "learn the advanced experiences of the Soviet Union in the construction of the people's railway" (Li WY, 2005: 69). Minister Teng Daiyuan also intensively studied the Soviet Union's management of the Changchun Railway. Between April 1949 and June 1950, the MOR published several regulations to establish a centralized operation and dispatch system, harmonize pricing for passenger and freight transportation and regulate the provision of transportation services to the military. In June 1950, Teng published the *Railway Technical Administration Rules and Regulations* and unitarily applied it to the entire Chinese system (Tjia, 2015).

Lü Zhengcao replicated the Soviet model of the one-man management system in China. The Chinese version of this system mandated that, under the leadership and coordination of the railway minister, each vice-minister should be responsible for one area of railway production, ranging from rolling stocks to transportation and civil engineering. Moreover, Lü promoted a

variant of the one-man management system, the accountability system (*fuze zhi*), as a national strategy (Lü, 2007: 418). Rolling stock teams of the "Mao Zedong Model," "Eight Eight Four Model," and "Iron Bull Model" became the "three flags" (*sanmian qizhi*) of the accountability system, which were later promoted as exemplars for broad adoption and imitation (Liao and Zhang, 2003). Both management styles were the marked features of northeastern China's railway system. Early sectoral policymakers regarded the experiences of centralization in the northeast as reflecting the spirit of the "ownership of the working class" and the "socialist corporate management system" (MOR Archive Centre, 1999: 30).

Sino-Soviet cooperation on railway projects officially began with the signing of the *Agreement Concerning Changchun Railway, Port Arthur, and Dalian* in 1950. Under the agreement, China and the Soviet Union would manage the railway together until 1952, when the Soviets would completely transfer all rights and properties to the People's Republic. The Soviets were able to fuse their railway administrative and technical experiences with the Chinese through training programs and joint operations. The Soviet styles of "economic calculation system" and "planned transport" were incorporated into the Chinese system as a result (*China Railways*: 26; Chao, 1956: 45).

In August 1951, the MOR published a document titled *Decision to Strengthen the Study of Soviet Union's Advanced Experiences in Railway Construction*. After the sectoral push for centralization and "planned transport," learning from the Soviet Union soon became a national movement. In June 1952, at one of the MOR's planning meetings (*quanlu jihua huiyi*), Li Fuchun further instructed the central ministry to focus on learning from the Soviet Union and establishing a new management institution. By the end of 1952, the Soviet Union had sent over 1,300 specialists to work on China's trunk lines and received and trained over 40,000 Chinese railway engineers and technicians and CCP cadres (Chao, 1956: 43).

The Soviet Union's planning mechanisms and Stalin's "go slow" attitude heavily influenced China's central planners, especially after November 1952, when learning from the Soviet Union became a national movement. Soviet experts and central planners taught the Chinese how to make medium- and long-term plans and establish the integuments of China's planned and command economy. The SPC was established in 1952 and became responsible for

medium- and long-term economic planning and integrating national development into FYPs. In 1956, the SEC was created to complement the SPC, focusing on the annual and short-term implementation of SPC's medium- and long-term planning.

In the drafting of the First FYP, Li Fuchun led a series of planning meetings in 1952 before his Moscow visit with several state ministries, such as the railway ministry, to jointly decide on several restrictive production targets for the next five years. These targets culminated in the formulation of China's First FYP. In August 1952, Zhou Enlai, Chen Yun and Li Fuchun visited Moscow and presented a draft of China's First FYP to Stalin. The Soviet leader, worried that the Chinese could not keep up the high growth rate with limited funding, told Zhou, Chen and Li that the annual rate of industrial growth should be set at a maximum of 14–15%, not the original 20% (Bo, 1992 and 1993: 287).

On Stalin's advice, the Soviet Union's central planners worked with Li Fuchun and improved on what they thought of as bold but rudimentary economic planning. Between 1952 and 1953, to finalize China's First FYP, Li spent ten months in Moscow consulting Soviet experts and attending lectures given by the Soviet Planning Committee (Gosplan). Additionally, Li often exchanged views with Soviet experts on the industrial economy (Kong, 2010). Indeed, the Chinese delegation was much more interested in fostering industrial modernization than agricultural development. As a result, the 156 Projects, which emphasized the development of heavy industries, became a hallmark of the First FYP and Sino–Soviet cooperation.

In February 1953, Mao Zedong asserted that China must carefully study the advanced knowledge of the Soviet Union to overcome the country's lack of experience in nation-building. Mao believed that China "must learn the advanced science and technologies of the Soviet Union and ride the high tide of learning from the Soviet Union in the building of [China]" (*Mao Zedong's Collected Works after the Founding of the PRC*, 1990: 45-46). In April, Mao initiated a new study program to teach senior and mid-level cadres about economic development in the Soviet Union. The *People's Daily* sent a signal to the entire country, indicating that "Stalinism and Stalin's path to socialism were to be adopted" (Kong, 2010: 187).

The MOR soon followed Mao's learning program by more actively and aggressively promoting the experiences related to the Changchun Railway to the entire country (Wu SY, 2015). In 1953, the MOR published its goals for the First FYP (1953 to 1957) and asserted that the sector had to "gradually upgrade railway technology and expand the railway network … and meet the needs of agriculture production, commodity exchange, national defence, and people's material and cultural needs" (Li WY, 2005: 113). Naturally, guidelines for modernizing the national railway system were based on "learning, implementing and promoting experiences from the Changchun Railway" (Lü, 2007: 420). On June 16, 1953, the MOR held a meeting on the implementation of Soviet experiences for the next three to five years. In November 1953, with an article in the *People's Railway*, Teng Daiyuan asked the entire system to learn from the Soviet Union and the Changchun Railway. In a work meeting in March 1954, the MOR repeated its call for gradual and planned technological reform patterned on the advanced standards of the Soviet's railway system (Li WY, 2005: 113).

In addition to learning from the "Soviet Big Brother," the SEC's annual planning and the SPC's long-term planning of railway production focused on supporting the establishment of new industrial and national defence bases during the First FYP (1953 to 1957). In 1954, Mao asked the MOR to postpone the construction of the Xiangtan-Shaoshan Railway and instead prioritize a trunk line between Yingtan and Xiamen (Yi, 2019). The MOR and the Railway Corps started the construction work in February 1955. After its completion in December 1957, the line was immediately placed under the military management of the Railway Corps (Yi, 2019). At the same time, Mao ordered the PLA's Air Force to move into Xiamen. Between December 1957 and August 1958 (the outbreak of the Second Taiwan Strait Crisis), the Yingtan-Xiamen Railway facilitated the mobilization of the PLA's fighter jets, heavy artillery and warships to Binhai, the coastal city across from Jinmen.

Toward the end of the First FYP in 1956, senior leaders began preparing for a new wave of industrial mobilization. However, Liu Shaoqi, Zhou Enlai and Chen Yun were reserved about further economic acceleration, as both Liu and Zhou had been concerned about China's increasingly unbalanced economy as a result of the First FYP. According to Liu and Zhou, too much emphasis had been placed on the development of heavy industries and not enough in light

industries and agricultural development. In 1956, the newly created SEC was asked to amend this imbalance by reducing capital investment in infrastructure and heavy industries and redirect China's resources toward the development of light industries and agriculture (Bo, 1992 and 1993: 554-556).

However, Mao Zedong, who had been encouraged by Zhou's report on the drafting of the Second FYP, was not pleased with the decision to curb bold advances (*fan maojin*) in pursuing rapid development in the heavy industries and agriculture collectivization. In his report from September 16, 1956, Zhou predicted that achievements of the First FYP would exceed what was initially planned. Indeed, by the end of the First FYP in 1957, 4,861 km of new railway lines had been constructed—approximately 20% more than the original target. Moreover, an additional 900 km of tracks were recovered (Leung, 1980: 101). Thus, the total kilometrage of the Chinese railway network reached 28,993 km.

These achievements, compounded by Stalin's death and changes in Soviet politics, gave Mao the incentive to accelerate economic development and pursue greater industrial and agricultural success. Mao, perhaps conceited, had been planning his "bold advances" (*maojin*) as early as January 1956, when he was reputed to have praised a *People's Daily* editorial and especially liked the phrase "mountains must bow, and rivers must make way" (*gaoshan yeyao ditou heshui yeyao ranglu*).

At the Preparatory Meeting for the Eighth National Party Congress on August 30, 1956, Mao Zedong famously asserted that China should be "kicked out" of the Earth if it could not catch up to the US in 50 to 60 years (*cong diqiu shang kaichu qiuji*; *Selected Works of Mao Zedong: Volume 5*: 296). Under Mao's influence and in combination with Zhou Enlai's earlier *Report on the Issue of Intellectuals* in 1956, the MOR published its agenda for catching up to the West. In the *Guideline for Railway Scientific and Technological Development between 1956 and 1967,* the central ministry argued that railway technology should catch up to that of developed countries in 12 years. At the same time, the MOR, along with the rest of China, started to critically reflect on the Soviet Union's experiences and sought developmental experiences from elsewhere (Li WY, 2005).

Provoked by Khrushchev's plan to catch up with the US in 15 years, Mao confidently told Chinese international students in Moscow that the People's Republic would "surpass Britain after three more FYPs" (*Long Live Mao Zedong Thoughts*, 1968: 3(120)). Inspired by Mao's speech in Moscow, the *People's Daily* published a New Year's editorial in 1958 titled "Riding the Winds and Breaking the Waves," which provided a concrete timeline for China's ambitious plan to surpass Britain and catch up to the US. The Hangzhou and the Nanning Conferences were thus organized as attacks on those who had spoken against bold advances. In Nanning, Mao reproached his colleagues for failing the 600 million people of China by opposing bold advances (*fan maojin*; *Long Live Mao Zedong Thoughts, 1968*: 4(3)). Shortly after, Mao moved to jettison the Soviet model and sought an independent and self-sufficient path to industrialization and modernization.

The Second Plenum of the Eighth National Party Congress presaged the launch of the GLF (1958 to 1962), which officially began with an editorial in the *People's Daily* titled "Uphold the Red Flag of the General Line Across the Country" in May 1958. In the editorial, Mao Zedong galvanized the entire nation by asking the Chinese people to "go all out, aim high, and build socialism with greater, faster, better and more economical results" (Gov.cn, 2008a). The GLF quickly spread across the entire country as Mao tried to prove to his European comrades that the Chinese approach to achieving socialism was the correct one.

Under enormous pressure to improve transportation capacity and volume, the railway sector showed its commitment to the movement by "building more roads, producing more rolling stock, and increasing transportation volume and speed" (Guancha.cn, 2013). As the MOR's conservative plan had failed to meet the new demands of the GLF, leaders of the central ministry began to revise economic targets for the Second, Third and Fourth FYPs. Under the influence of Maoist revolutionary slogans such as "one day is worth 20 years," the central ministry increased construction targets for the 15 years represented by these FYPs by 50% from the original 80,000 km to 120,000 km.

In addition to network expansion, the new target aimed to egregiously increase freight volume by 250% from around 300 million tons per year in 1957 to 800 million tons per year by 1959. The target for 1972 was decided at three billion tons per year. These newly increased

targets were then distributed to regional railway bureaus. Under the principle of "coal transportation as the core" (*meiyun weigang*), each regional bureau was required to transport 100,000 tons of steel and another 100,000 tons of coal on a daily basis (Li WY, 2005: 78). Such a drastic increase in targets forced the central ministry and its regional bureaus to exaggerate the daily loading capacity (*fang weixing*) from 30,000 to 50,000 trains (Guancha.cn, 2013). As the MOR heavily focused on the transportation of minerals and coal, China's unbalanced economy worsened as agricultural products failed to reach designated areas on time.

The MOR implemented several strategies to improve transportation capacity during the GLF. First, turn-around times for passenger and freight trains were reduced to address the issue of rolling stock shortage. Second, the MOR demanded faster operating speeds and heavier loads (Koll, 2019: 261). Third, backyard railroads, heavy and light rails and all kinds of rolling stocks were encouraged (Li WY, 2005:77). During this period, automobiles were converted into locomotives, railroads were constructed from cast iron, and old locomotives were retrieved from retirement. Ironically, railway transportation did increase as a result of various tactics. Between 1958 and 1960, the MOR transported 1.4 billion passengers and 1.5 billion tons of goods—a sharp increase relative to the First FYP (Guancha.cn, 2013).

Furthermore, many decision-making powers were decentralized to regional bureaus to stimulate regional growth in transportation capacity. This move was designed to support the central government's call to create "autonomous and complete industrial systems" in provinces, municipalities and autonomous regions (MOR Archive Centre, 1999: 66). The MOR dismantled all sub-branches (*tielu fenju*) and realigned regional bureaus with the geographical boundaries of provinces and autonomous regions. Therefore, each province and autonomous region would have a railway bureau to facilitate freight and passenger transportation needed for industrial development and upgrades (MOR Archive Centre, 1999: 66). Railway bureaus and engineering bureaus were also merged into a single entity (*gong guan heyi*). The MOR placed all of its regional bureaus under the dual leadership of the MOR and local Party committees.

Additionally, the MOR introduced a dual-track decision-making system. Local production reports and plans had to be simultaneously submitted to the central ministry and respective municipal and provincial governments. The latter would then balance railway

production with other municipal and provincial economic and industrial outputs before submitting a regional report to the SPC and SEC. Against the backdrop of fostering autonomous industrial systems, regional reports trumped the central ministry's planning decisions. Indeed, the SPC and SEC adjusted their planning according to regional reports, not reports from the MOR. As a result, railway production and construction had to be horizontally organized at the regional level (*kuaikuai lingdao weizhu*; MOR Archive Centre, 1999: 66). This process severely fragmented the once centralized decision-making process and the national system.

Soviet and Changchun Railway models, including the one-man management system, were displaced by the Party secretary system (*shuji zhi*) to accommodate the Maoist revolutionary approach of "politics in the lead" and mass mobilization. Under the new system, production managers (e.g. professional experts) were stripped of their power as Party secretaries (the Red) stepped out of their supervisory roles and handled daily production. Members of the Party Committee became responsible for different parts of the production system (*fenpian baogan*), which led to a fragmentation of rolling stock manufacturing. Responding to mass movements, Party secretaries in rolling stock plants shifted some production capacity toward steel production, smelting and machining. As a result, regional railway bureaus had to maintain and repair steam locomotives themselves. Lacking the industrial capacity to do so, regional bureaus continued to use damaged locomotives for railway production.

Additionally, safety and technology concerns were disregarded due to the need to rapidly increase transportation capacity. In May 1958, the MOR eliminated as many as 2,209 technical and safety standards and regulations (MOR Archive Centre, 1999: 67). Railway accidents frequently occurred during the GLF, as maximum tonnage had been increased despite safety concerns. For example, freight tonnage was increased from 2,700 tons to 3,600 tons without any testing on existing trunk lines such as the Beijing-Guangzhou Railway, the Shenyang-Shanhaiguan Railway and the Harbin-Dalian Railway (Guancha.cn, 2013). Such disastrous events, combined with the withdrawal of Soviet experts in 1960, stalled railway development and technology upgrades (Leung, 1980: 104). By the end of the Second FYP, the MOR was only able to complete 4,000 km of new lines and repaired approximately 1,000 km of older tracks (Leung, 1980: 101).

Permanent revolution, mass mobilization and universal collectivization were the main characteristics of the GLF. According to Mao, "the configuration of narrow specialization, individual motivation and operation and centralized decision making produces alienation and anarchy of production" (Hoffmann, 1971: 25). Moreover, Mao believed that autonomous and complete industrial systems at the regional and provincial levels could stimulate local production and growth. National planning and the SPC became practically obsolete during the GLF as production targets were continuously changed.

Economic Readjustment and the Third Front Movement

The recovery work from the GLF was led by Deng Xiaoping, who worked to recentralize decision-making and national planning. As early as the 1960 Beidaihe meetings, Li Fuchun and Bo Yibo called for economic readjustments and a return to national planning. By the end of August 1960, Li had raised the principle of "adjustment, consolidation, substantiation and enhancement" (*tiaozheng gonggu chongshi tigao*) as a means to restore planning and control economic statistics in 1961. One of the salient themes of this readjustment program was reducing investment in infrastructure and heavy industries and focusing on the development of agriculture and light industries. Li's program resulted in a 58.5% reduction in the proportion of heavy industry output against the national total and another 30% reduction in the total number of infrastructure projects. The state's economic planning institutions regained power during this period of readjustment, as Zhou Enlai, Liu Shaoqi and Deng became committed to supporting the SPC and the SEC's efforts in making sound planning decisions and pursuing a reasonable pace of economic development (Bo, 1992 and 1993: 887-899).

Sectoral readjustment also focused on recentralizing decision-making. On January 24, 1961, Deng Xiaoping requested Lü Zhengcao to establish a political department within three days (Lü, 2007: 431). This move consolidated the MOR's status as a ministry of national importance and strengthened its semi-militarized style of management. The latter featured three central tenets: a highly centralized command structure (*gaodu jizhong de zhihui*), mandatory transportation orders (*yunshu mingling wei zhunsheng*) and a rigorous hierarchy system (*yan'ge*

de dengji zhidu; SD20LY19). For example, regional bureaus had to abide by transportation commands from the central ministry. Disruptions had to be reported via telegram to the central dispatch system in order for the central dispatch system to reorganize national and regional grids and adjust train schedules. This centralized style of management was extended to all aspects of railway production and labour and cadre management, including personal living arrangements while on duty. For example, each work unit had to prepare an *Item Placement Guideline* to regulate the placement of personal and work items everywhere from bedside to workstations (SD20LY19).

On January 26, 1961, the Politburo commented on Lü's report, asserting that "railroads are the arteries of the national economy, it is a highly centralized and semi-militarized sector, and therefore all power must be centralized in the hands of the MOR" (MOR Archive Centre, 1999: 76). In subsequent meetings, Deng directed the central ministry to re-establish safety and technical standards that had been abandoned during the GLF. From March onwards, the MOR began to streamline its regional bureaus by eliminating newly established bureaus in provincial capitals, including Nanjing, Hangzhou, Changsha, Guiyang and Xi'ning (MOR Archive Centre, 1999: 77). Some of the sub-branches were also restored. At the same time, new regulations concerning railway production, rolling stock manufacturing, civil engineering accounting and civil engineering supervision were established. By the end of 1962, the MOR had re-established the one-man management system and strengthened its administrative control mechanism (*xingzheng zhihui xitong*) on railway production. To overcome fragmented production, the MOR recentralized approval authority for infrastructure projects and the national network.

Under the national readjustment program, which reduced budget allocation for railway construction, the central ministry decided to reduce the construction of national trunk lines. Instead, project approval focused on the development of dedicated routes for coal transportation and the completion of unfinished national trunk lines such as the Lanzhou-Urumqi Railway. The MOR also decided to increase transportation capacity by replacing steam engines with diesel- or electricity-powered locomotives.

As early as 1956, the MOR had published a document titled *Guideline for Railway Technological Development for the Next Twelve Years*, which called for a gradual modernization

of the rolling stock sector by replacing steam engines with diesel and electrified locomotives. The onset of the GLF halted the MOR's multi-year program focusing on technological upgrades. In 1962, the MOR decided to restart this program but prioritized the research and development of diesel locomotives. Dalian, Sifang and Qishuyan rolling stock plants were tasked with these experiments.

In August 1963, the State Council established a leadership group to oversee the process. Notable members include Lü Zhengcao from the MOR, Chai Shufan from the SEC and Zhang Youxuan from the State Science and Technology Commission. In their report to Bo Yibo, the Chairman of the SEC, the leadership group sought permission to import four diesel trains from West Germany and 16 additional diesel trains from either Japan or West Germany in the future. The price of each locomotive was approximately 50,000 USD. The purpose of importing advanced technologies was to study the traction system and structure of the locomotives for indigenous innovation (Lü, 2007: 459). By 1965, through the concerted efforts of multiple ministries, Chinese rolling stock plants had manufactured 48 diesel trains.

The domestic development of electric locomotives was unsuccessful due to a combination of three factors: 1) technological insufficiencies in the 1960s, 2) national policy priority in the development of diesel trains and 3) the onset of the Cultural Revolution, which paralyzed decision-making on technological upgrades (MOR Archive Centre, 1999: 92). Between 1958 and 1965, Zhuzhou Rolling Stock Plant only manufactured five electric locomotives, all of which had severe technical defects and grave safety concerns. The major investment of resources for the development of electric locomotives only took place in the mid-1980s.

In the mid-1960s, China's railway construction started to focus on serving the Third Front Movement. The "third front" referred to the vast geographical areas west of the Beijing-Guangzhou Railway.[11] This massive industrial plan emerged from the Sino-Soviet split and China's fear of a military invasion from both the Soviet Union and the US. Indeed, Mao and the CCP were preparing for a possible Third World War. These perceived threats to China's national

[11] The First Front refers to China's coastal areas, whereas the Second Front refers to provinces on the Beijing-Guangzhou Railway Line.

security persisted throughout the 1960s and the Cultural Revolution (1966 to 1976). As a result, the Third Front Movement was implemented to reduce intensifying geopolitical tensions and bolster national defence.

The movement aimed to establish a large-scale industrial network in China's interior, which would be linked through major transport and industrial capacities (Naughton, 1988). It also focused on shifting industrial capacities such as steel production and military weaponry to the "big rear area" (*da houfang*). Such a defensive posture was aimed at reducing geopolitical pressures. On April 25, 1964, the CMC presented a report to Mao on the integration of economic planning and national defence. The report highlighted the overconcentration of industrial and military capacities in the coastal regions as a significant weakness of the Chinese economy. Indeed, 39 large cities with a population of over 500,000 and approximately 60% and 52% of industrial and national defence capacities, respectively, were located in coastal areas, which lacked appropriate air defence capabilities (Bo, 1991 and 1993: 1197). Moreover, major dams and transportation hubs clustered around the same regions. Uneven development isolated the northwestern and southwestern parts of China.

After reading the report, Mao asked the CMC, the SEC and the SPC to reconsider the planning of the Third FYP to strengthen agriculture, national defence and basic industries. To extend the nascent regime's legitimacy and strengthen national defence, Mao decided to overcome geographical barriers and reduce spatial contradiction by integrating isolated regions into the national railway network (Grant, 2019). On June 6, 1964, Mao suggested two changes to the Third FYP. First, the new plan had to consider the possibility of a war. Second, each province, especially those in the third front, had to have weapon-making capabilities. Mao called for the creation of two bases: a military and industrial base in Chongqing and an iron and steel production base in Panzhihua. The "Great Helmsman" joked that he would donate his remuneration to support those projects (Bo Yibo, 1992 and 1993: 1197-1200).

At the annual Beidaihe Meetings in August 1964, Li Fuchun, Luo Ruiqing and Bo Yibo presented their revisions to Mao. The report detailed how to prioritize industrial development and deployment in the wake of a sudden military invasion (Bo Yibo, 1992 and 1993: 1200). Mao supported the report and asked for the relocation of additional industries, universities and

research institutes to the third front. In contrast with the "Big Third Front (*da sanxian*)," Mao instructed the railway sector to fight its own "Small Third Front" (*tielu sanxian* or *xiao sanxian*) and expand the national railway network into interior China. Mao asked the MOR to accelerate the construction of the Chengdu-Kunming Railway, the Chongqing-Guiyang Railway and the Guiyang-Kunming Railway. He told meeting attendants at Beidaihe that he "could not sleep properly before the completion of the Chengdu-Kunming Railway" (Lü, 2007: 443).

On September 4, 1964, Zhou Enlai asked Li Fuchun, Bo Yibo and Lü Zhengcao to visit Sichuan, Guizhou and Yunnan to study the feasibility of establishing a comprehensive railway network between these provinces by 1969. Six days later, the Railway Third Front Construction Headquarters (*jianshe zhihui bu*) was established to oversee the "Railway Third Front." Li Jingquan, the General Secretary of the CCP's Southwest Bureau and Commissar of the Chengdu Military Region, was cross-appointed as the headquarters' Chief Commander. Lü was appointed the Chief Commander and Commissar of the Construction Site Command Headquarters (*gongdi zhihuibu*). Guo Weicheng of the Railway Corps and Liu Jianzhang of the MOR were selected to be Lü's assistants. Both Guo and Liu would eventually serve as ministers of railways in the 1980s. The establishment of the two headquarters—a continuation of the one-man management system—was designed to centralize decision-making and hold regional leaders accountable for their actions and decisions (MOR Archive Centre, 1999: 85).

Under Zhou Enlai's orders, five divisions of the Railway Corps, along with MOR's Chengdu and Kunming Railway Bureaus, several engineering bureaus and survey and design institutes across the country, began to mobilize toward the southwest. Within a month, more than 300,000 railway troops, engineers, workers and staff members arrived at various junctures of these three trunk lines. Between late 1964 and 1980, the two headquarters mobilized more than 200 railway experts and divided them into 41 technology task teams (*jishu gongguan xiaozu*; Li WY, 2005: 122). Moreover, more than five million civilians (4.45 million of whom were rural militia) participated in the movement, along with approximately 660,000 soldiers from the Railway Corps and 480,000 researchers from the MOR's local research institutes (Ke, 2018).

Concurrent with MOR's construction plans, the SPC, SEC and SCC were tasked with the establishment of new manufacturing facilities, the relocation of existing manufacturing plants and the securing of equipment and raw materials for large-scale relocation projects.

In February 1965, the Politburo and the State Council made three new institutional arrangements concerning the implementation of the Third Front Movement. First, the Party-state placed the construction of Panzhihua's industrial base, Chongqing's weaponry base and railway construction under the centralized leadership (*jizhong lingdao*) of relevant central ministries. Second, projects established by the central government had to be managed by the corresponding central ministries. All materials had to be centrally procured under the supervision and regulation of the SEC and the SCC. Finally, a new Southwest Third Front Construction Commission was established. Li Jingquan was cross-appointed as the Chairman of the commission, and Peng Dehuai, Cheng Zihua and Yan Xiufeng were appointed as Li's assistants. The core task of the commission was threefold (China.com.cn, 2012):

1. Lead and supervise all central-level projects and troubleshoot accordingly.
2. Lead and supervise the procurement of construction materials, food and accommodation needed for the construction efforts.
3. Lead and supervise all provincial and municipal projects.

In March 1965, the SPC published its *Report on the Guidelines for the Third National Five-Year Plan (1965 to 1970)*. Terms such as "struggle" (*douzheng*) and "war" (*zhanzheng*) were integrated into the Third FYP, as the commission argued that the plan had to help China prepare for a large-scale and early war (*cong zhunbei dada zaoda chufa*; Li WY, 2005: 122). Thus, the primary focus of the Third FYP was to strengthen China's national defence capabilities and "concentrate power to promote the establishment of basic industries and transportation capabilities in the Third Front" (Li WY, 2005: 122). Combined with the need to establish new industrial hubs in southwestern China, central planners committed a whopping 40.8 billion CNY to the development of heavy industries, an additional 10.33 billion CNY to transportation (with a 1.7 billion CNY special fund for railway construction in southwestern and northwestern China) and 8.7 billion CNY to national defence. These planned expenditures accounted for more than 60% of the central budget.

In 1965, the MOR decided to centralize financial, material and human resources and direct them toward the completion of the Railway Third Front. With the publication of *Decision to Rigorously Control Railway Construction*, the MOR decided to discontinue the planning and development of new railway lines except for those that fell under the Third Front Movement. With the full support of the Politburo, the State Council and the railway ministry, the Chongqing-Guiyang Railway and Guiyang-Kunming Railway were completed in 1965 and 1966, respectively. The Chengdu-Kunming Railway was completed in 1970. At times, Deng Xiaoping was personally responsible for project oversight. Though construction had been delayed by the advent of the Cultural Revolution, central directives and military control quickly restored order and resumed construction.

Sichuan, Guizhou and Yunnan also established Supporting Committees and Secretariats (*zhiyuan weiyuanhui*) to coordinate support efforts. Under the centralized leadership of the Southwest Third Front Construction Commission and Railway Third Front Construction Headquarters, state ministries and military units were marshalled toward coordinated development. During the construction of the Chengdu-Kunming Railway, the Ministries of Coal Industry, Metallurgical Industry and Geology sent work and engineering teams to tackle geological issues concerning railway construction. The CMC's Logistics Department provided the necessary equipment for survey and designs and signal and communication (MOR Archive Centre, 1999: 86).

The Cultural Revolution and Military Control

The Cultural Revolution proved to be a gruesome decade for sectoral development. The central ministry soon came under attack by revolutionaries and the rebel faction (*zaofan pai*). Both groups "rejected and destroyed the operational standards that had been adapted from the Changchun railway" and the Soviet Union (Lü, 2007: 420). Indeed, the centralizing features of the one-man management system and the accountability system were caricatured as means of "control, block and intimidation" (*guan ka ya*). Furthermore, the conventional signalling system

between Harbin and Manzhouli was egregiously overhauled, with a red light to mean "go" and a green light to mean "stop" (Lü, 2007: 420).

On August 18, 1966, Mao Zedong met with the Red Guards in their first public rally at Tiananmen Square. Between August 1966 and February 1967, Red Guards across the country joined the revolutionary binge, ecstatically participating in the "great revolutionary networking" (*da chuanlian*). The railway sector was burdened with transporting more than 50 million Red Guards, students and teachers in this short six-month span (MOR Archive Centre, 1999: 100). The rapid increase in the number of passengers became an obstacle for the central ministry, as it struggled to meet its production targets. For example, in August, the MOR achieved only 77% of its infrastructure investment plan. In October, the central ministry failed to meet its coal transportation target by 259,000 carriages; this significantly affected industrial output in Guangdong, Shanghai and Hunan (MOR Archive Centre, 1999: 101). Furthermore, only 39% and 51% of trains from the Beijing Railway Bureau and the Shanghai Railway Bureau, respectively, arrived at their destinations on time.

During this challenging period, Minister Lü Zhengcao was under direct attack and faced possible imprisonment. Fueled by the revolutionary slogan of "kicking the Party committee out of the revolutionary movement" (*tikai dangwei nao geming*), the rebel faction attacked Lü and other high-ranking cadre members. Such attacks virtually paralyzed the central ministry's decision-making apparatus and forced the entire railway system into a state of chaos (Li WY, 2005: 79-80). The situation worsened as railway staff members and workers left their posts to actively participate in "struggle sessions" and the broader revolutionary movement.

Supporters of central planning, such as Zhou Enlai, tried to curb rampant disruptions to railway production. On September 2, 1966, the Politburo and the State Council notified the railway sector that revolutionary activities had to be managed and planned, while dedicated leadership groups needed to be created to ensure transportation and production safety. Moreover, the Politburo and the State Council called for a restriction of revolutionary movements at the central level, leaving regional bureaus and sub-branches untouched (Lü, 2007: 497). The Politburo's *Notice on Focusing on Revolutions while Promoting Production* on September 14, 1966 reaffirmed the above principles.

Zhou Enlai became personally responsible for overseeing railway production. However, his efforts to salvage the sector were stymied by Lin Biao, who moved to spread the revolutionary movement across the country. Between December 4 and 6, 1966, Lin dismantled the aforementioned restrictions on the scope of revolutionary movements. As a result, more than 3,000 railway workers across the country moved to Beijing and occupied the central ministry. This paralyzed the central command and dispatch system and resulted in severe coal shortages in Shanghai and parts of eastern China (MOR Archive Centre, 1999: 103). One month later, on January 21, 1967, the rebel faction within the MOR seized control of the ministry and its official seals. This seizure of power marked the full paralysis of the central ministry, as Lü Zhengcao could no longer issue administrative directives and transportation commands to restore orderly production without the seals.

In an effort to restore the operations of the central ministry, Zhou Enlai implored the rebel faction to allow the "capitalist roaders" in the central ministry to return to work under the supervision of the rebels. When his appeal did not work, Zhou ordered military protection for the central dispatch facilities in February 1967.

Efforts to restore orderly production at the local level also failed as the revolutionary movement swept across the entire railway system. Though the decline of railway production and increase in the number of accidents precipitated military control, the collision between Passenger Train 282 and Freight Train 020 at Ang'angxi Station became the straw that broke the camel's back. The accident took place on March 5, 1967 and resulted in six hours of delay and damages to a locomotive and eight freight carriages. Four days later, on March 9, Mao Zedong requested Lin Biao and Zhou Enlai to put an end to the local anarchy (Yu, 2007). Between late March and May 1967, Lin and Zhou placed ten of the 18 railway bureaus and 27 of the 51 sub-branches under military control.

On May 31, 1967, Mao Zedong approved the Politburo, State Council, CMC and Central Cultural Revolution Leading Group's plan to place the central ministry and the entire railway system under military control. Three additional events factored into Mao's decision. First, conflicts between the MOR's capitalist roaders and the rebels had escalated and erupted in May, upon which the entire system was plunged into a state of anarchy (*yunshu gongzuo shang de*

wuzhengfu zhuyi; MOR Archive Centre, 1999: 103-104). Second, the rebel faction had clashed with the Military Management Committee of the Chengdu Railway Bureau. The former eventually seized control of the intersection between Chengdu South Station and Baijia Station. Third, violence amongst different groups of rebel factions paralyzed major transportation hubs such as Zhengzhou and Xuzhou. During these violent clashes, locomotives were detonated, and railway production and service provision were halted (Yu, 2007). These and some 15 additional incidents at the time, Mao approved *Decision to Place the Ministry of Railways under Military Control (Pilot Version;* Yu, 2007). By July, the PLA had seized control of the central ministry, its regional bureaus, sub-branches, major transportation hubs and railway stations. The central ministry quickly established several provisional leadership groups to oversee its daily operation.

However, military control did not halt direct attacks on high-ranking central ministry cadres. Lü Zhengcao, Wu Jingtian and Liu Jianzhang became prisoners of the rebel factions. Lü, in particular, was charged and imprisoned in July 1967 as a part of the Northeast Treasonous Clique. Between 1967 and 1968, high-ranking cadres, especially railway engineers, were either deposed from their leadership positions or falsely imprisoned. At the same time, revolutionary movements and violent confrontations shifted from decision-making centres to areas along national trunk lines. As a result, Zhou Enlai ordered the National Defence Army of the PLA to protect China's economic arteries.

Under military control, centralized decision-making within the MOR was transferred from its Party branch to the Military Management Committee, which continued to exercise unified leadership. The militarization of the MOR meant a shift in priorities, as the military was concerned with protecting unobstructed railway transportation and securing railroad equipment and fixed assets from destruction (Koll, 2019: 272). Despite military control, sectoral production capacity was in steady decline, and the number of railway accidents gradually increased. In 1968, the volume of freight transportation was only 84.7% that of 1965, while the number of major accidents was five times that of 1965 (MOR Archive Centre, 1999: 108). Between 1965 and 1969, sectoral development "saw a seven-fold increase in heavy train accidents, with 964 accidents in 1969 alone" (Koll, 2019: 269).

In November 1969, the Military Management Committee began to streamline the central ministry and decentralize some of its powers to local stations. The military also dismantled all 26 departments of the central ministry and replaced them with four teams. The new management system was highly reflective of PLA's internal structure: political work, production, logistics and office administration (MOR Archive Centre, 1999: 111). As a result of this structural reform, the central ministry only retained 280 out of 1,960 staff members. The rest were sent to either study at Party schools or engage in manual labour (Koll, 2019: 272). Additional decentralization efforts utterly failed, as the central ministry had to recentralize once more before its temporary demise in 1970 (Li WY, 2005: 87).

In 1970, the MOR merged with the Ministry of Communications and the Ministry of Post and Telecommunication. The new Ministry of Transport was established on July 1 and placed under the collective leadership of Zhou Enlai, Li Xiannian and Su Yu. Since the merger, the railway system slowly recovered from the damages during the initial periods of the Cultural Revolution. The tide soon turned in 1974 as the Gang of Four directly targeted Zhou. Leaders of the rebel factions mobilized railway workers and held struggle sessions against those who had been producing for the wrong line (*wei cuowu luxian shengchan*). The national system was again paralyzed by political convulsions. In the first five months of 1974, freight services were behind by 21 million tons. In June, large transportation hubs such as Changsha, Xuzhou, Guiyang and Baotou became clogged. In early 1975, Xuzhou was once again in trouble, practically paralyzing the Beijing-Shanghai Railway and Lianyungang-Lanzhou Railway.

Central planning agencies were also under attack during the Cultural Revolution. Li Fuchun and Bo Yibo were stripped of their respective positions at the SPC and the SEC. The Politburo also dismantled the SEC and merged it with the SPC. The latter, however, was already under the control of a revolutionary committee (*geming weiyuanhui*), with Yu Qiuli as its director.

Despite a decade of disaster and mismanagement, the railway sector managed to accomplish several notable national projects during the Third and Fourth FYPs (1966 to 1975). Indeed, two contradictory phenomena occurred during the Cultural Revolution. In railway transportation, the rebels and the central planners violently clashed. The rebels gained the upper

hand and paralyzed passenger and freight transport as a result. However, railway construction in the Third Front continued without much interruption.

Despite the presence of a tempestuous revolutionary movement, top leaders, including Lin Biao, continued to support the Third Front Movement. The possibility of war was communicated to CCP members at the Ninth National Party Congress in 1969. In his speech, Lin argued that China had to remain alert to a possible invasion from American imperialists and Soviet revisionists and remain prepared for early and large-scale conventional or nuclear warfare. In light of war preparations and the ongoing Vietnam War, rolling stock and signal and telecommunication manufacturing capacities were also diversified. The central ministry decided to relocate parts of the Sifang, Shenyang, Dalian, Qishuyan, Qiqihar, Mudanjiang and Changchun rolling stock manufacturing capacities westwards. The goal was to establish new rolling stock and signal and telecommunication plants in Meishan, Guiyang, Luoyang and Tianshui (MOR Archive Centre, 1999: 109-110). In terms of industrial upgrades, the Fourth FYP (1971 to 1975) called for the electrification of national trunk lines (Leung, 1980: 106). In 1975, the electrification of the Baoji-Chengdu Railway was completed, making it the first electrified trunk line in China.

Several major railway networks and network extensions were completed on time against overwhelming odds. In fact, 14 national trunk lines covering a total of 5,912.8 km were constructed between 1966 and 1978 (MOR Archive Centre, 1999: 361–363). The reach of the national railway network was extended into both frontier and interior regions (Leung, 1980: 106). Notable lines, other than the three national Third Front projects, include the Hankou-Danjiang Railway (1966), Tongliang-Ranghulu Railway (1966), Beijing-Yuanping Railway (1972), Yueshan-Zhicheng Railway (1975) and Yangpingguan-Ankang Railway (1976). The addition of these trunk lines facilitated inter-regional communication and the movement of people and goods across the country.

Conclusion

Rapid railway development occurred first in industrialized countries with stable national governments and centralized bureaucracies. More importantly, the norm concerning accelerated and substantial railway development tends to converge on national planning. Railway development was also intertwined with nation-building, as network expansion allowed national governments to extend their scope of power. A comprehensive national railway could facilitate a centralization process in which the peripheries could be brought closer to the powerful centre. Seemingly, such capital-intensive and long-term infrastructure projects were only possible with a national plan and high capital stock, which the Qing government and Republican China both lacked (Yin, 2005: Chapter 1).

Railway development during the Mao era received broad support from national leaders such as Mao Zedong, Zhou Enlai and Deng Xiaoping. The “Great Helmsman” personally intervened to ensure the orderly construction of the Yingtan-Xiamen Railway and the Chengdu-Kunming Railway. In the 1960s, Deng and Zhou were directly responsible for restoring the MOR’s centralizing capacities, establishing a political department in 1961 and calling for military protection of the railway ministry in 1967, respectively. Despite Zhou’s efforts to restore orderly production, Mao’s revolutionary movement engulfed and paralyzed the railway system.

The Maoist developmental approach, institutionalized planning and strategic industrial policy were only aligned and stabilized during the First FYP (1953 to 1957) and Third Front Movement (1964 to 1980). During these two periods, the developmental approach focused on rapid modernization and industrialization through central planning. Developmental institutions such as the SPC and the Southwest Third Front Construction Commission remained potent in coordinating national development, and sectoral strategies were well-defined in both the First FYP and the Third FYP. Power concentration insulated the Southwest Third Front Construction Commission from fragmenting and decentralizing thrusts that were marked features of the Cultural Revolution (1966 to 1976).

Chinese central planners wove sectoral development into overall national economic planning. They specified the output of railway production and the sequence of railway

construction relative to the state's broader developmental agenda. The Soviet model of "planned transport" played a salient role, allowing the state to directly manage sectoral production and train operation. The sectoral one-man management system and accountability system, which were suspended during the GLF and restored in 1962, helped further consolidate the centralizing capacity of the MOR. The characteristics of a highly concentrated, greatly coordinated and semi-militarized central ministry were also heightened to meet the developmental agenda of the state.

The same centralizing features and planning institutions were severely compromised by Mao's revolutionary movements when mass political mobilizations became the dominant developmental approach. Mao introduced the GLF (1958 to 1962) to radicalize production and decentralize planning and industrial development. With the implementation of regional autonomous industrial systems, the SPC and the MOR were forced to decentralize national and railway planning and investment to provincial and municipal authorities. The advent of the Cultural Revolution (1966 to 1976) once again paralyzed national planning and railway production. The SEC was dismantled, and the SPC was made obsolete and placed under the authority of a revolutionary committee. Passenger and freight transport became problematic, as the MOR's decision-making capacities were upended by the revolutionary movement. Factional strife and regional fragmentation contributed to the breakdown of a national and centralized railway system. In the absence of power concentration, aspects of railway production—if not railway production in its entirety—struggled during these political convulsions.

Chapter 4

Decentralizing Railway Development in the Reform and Opening

"Let the railway sector be entrepreneurial."

Deng Xiaoping, commenting on railway decentralization, 1986

Introduction

Reform and opening began in 1978 as an open-ended process. At the Third Plenum of the Eleventh National Party Congress in December 1978, the operational guidelines of the Chinese Communist Party (CCP) shifted from class struggle to economic development. According to the new leadership, an urgent task was to develop China's forces of production and socialism through the Four Modernizations in agriculture, industry, national defence and science and technology. In 1987, Secretary General Zhao Ziyang identified the establishment of "a socialist political system with a high degree of democracy and a complete set of laws" as the long-term objective of China's political and economic reform (Falkenheim, 1989: 5). This announcement was made in light of a decade-long domestic restructuring and opening to the outside, which had "dramatically relaxed [the state's] repressive political controls, abandoning a revolutionary and mobilizational style of leadership and a more *laissez-faire* posture" (Falkenheim, 1989:3). While state planners had an idea of what they wanted and did not want to achieve, they did not know how to achieve those goals.

Sectoral development during the first 25 years of reform and opening did not lack direct central attention, prima facie. Instead of strengthening the Ministry of Railways' (MOR) centralizing capacities, top leaders continued to decentralize and weaken the central ministry. Deng Xiaoping first emasculated the Railway Corps in 1982, then fiscally starved the MOR through a round of national budget reforms in 1985. As a result, Ding Guan'gen sought Deng Xiaoping's approval to decentralize the ministry from the central government. In the early 1990s, China's economic Czar, Zhu Rongji, provided policy support to the sector but withheld further financial support. In his conversations with Li Senmao and Han Zhubin, the ministers of railways

in the early 1990s, Zhu asked them to devise solutions to capacity deficiency problems. Still, Zhu failed to provide any guidance on how to proceed. Financial commitment from top-level leaders only came after the Asian financial crisis in 1997. Growing geoeconomic pressures forced state planners to stimulate domestic consumption through infrastructure development. Against this backdrop, Jiang Zemin personally intervened to establish the Qinghai-Tibet Railway in 2000.

In addition to limited central support, the lack of power concentration in this era also manifested in the lack of a developmental approach, weak national planning institutions and limited strategic industrial policymaking. Indeed, China's developmental approach had been evolving. Guided by "development as the hard rule" and driven by situational needs, state planners implemented a series of strategies to improve the livelihoods of the Chinese people and increase "the power of the party and nation-state" (Steinfeld, 2010: 67). Domestic reforms focused on reinventing the CCP and making the Chinese economy more efficient. Maoist collectivization and integrated industrial development were jettisoned. Economic reforms focused on relaxing controls and introducing gradualist policies. Central ministries and local authorities gained the autonomy to experiment with the nascent market economy. Early decentralizing strategies included the introduction of a household responsibility system in the agricultural sector and the creation of township, village and household enterprises at the grassroots level.

Existential social, political and economic crises propelled China's new post-Mao leaders to engage in an international search for "magic potions" that could help the Chinese economy achieve rapid growth (Vogel, 2011). Since the reform and opening, state planners actively studied the developmental experiences of Japan, South Korea, Singapore, Eastern Europe and developed market economies (China Railways Yearbook, 1999; Fu, 2017a; Overholt, 2018; Vogel, 2011). Part of this learning was designed to integrate China into the global production system (Chin, 2010; So, 2002; Steinfeld, 2010), as the country worked with multilateral financial institutions in its search for appropriate developmental strategies and financial and technical support. Deng Xiaoping shared his developmental goal to quadruple the national income level by 2000 with the World Bank. The latter suggested a focus on fostering industrial production and balanced development across all sectors (Vogel, 2011: 361). The World Bank and several other

multinational development banks and foreign governments helped China modernize its industries through technical and financial assistance programs.

The central government sought to strike a balance between reforming centrally-owned state enterprises (SOEs) and supporting rural development and industrialization. Under the consecutive premierships of Zhao Ziyang, Li Peng, Zhu Rongji and Wen Jiabao, China's state firms underwent successive rounds of market-oriented restructuring and reform. The goal from the late 1980s onwards was to create more market-oriented SOEs and state firms. The reform process could be divided into three phases: 1) saving socialism in the 1980s, 2) "grasping the big and letting go of the small" (*zhuada fangxiao*) in the 1990s and 3) building national champions in the 2000s.

Bureaucratization, professionalization and institutionalization became norms of government restructuring, including redefining the roles of China's planning institutions. New standards of cadre selection were introduced to make Chinese leaders more professional and technocratic. Indeed, early reforms to the Party-state focused on dismantling institutions and practices deemed obstacles to market reforms. Reforms also reduced the role of the state in the economy and strengthened its facilitative role in guiding economic development and supporting market-oriented growth. With the burgeoning Chinese market economy, the State Planning Commission (SPC) appeared obsolete. Therefore, the SPC focused on decentralizing much of its planning capacities, as the commission had previously enjoyed a heavy centralization of power. Starting in 1993, the SPC began to shift its focus to macro-economic planning. The SPC's power to micromanage the national economy was taken away by the State Council, as it could no longer "decide the location of state firms' toilets," according to Zheng Xinli (Bai and Zhao, 2013). Deng Xiaoping's speeches during his Southern Tours could be viewed as suggestive of such a change, as he asserted that the core question concerning China's economic development was not between planning and marketization.

The State Economic Commission (SEC) was recreated in 1982, when the State Council decided to separate production and enterprise management from the SPC and integrate these tasks into the SEC. The newly appointed chairman, Yuan Baohua, was tasked with re-staffing the commission. Notable recruits included Ma Hong and Zhu Rongji. In addition to enterprise and

production management, the SEC was responsible for government procurement, metallurgy and industrial and energy planning (He YM, 2003). The SEC's role in micro-managing state production was streamlined in 1993. The creation of the State Economic Trade Commission (SETC) shifted the focus of state planning organs to industrial restructuring by focusing on "big things, macro-economics and policy frameworks" (*zhua dashi zhua hongguan zhua zhengce*) (Ziguangge, 1998).

In terms of railway development, China's state planners and railway policymakers "have continuously faced two immense strategic challenges" since the 1980s (PPIAF and WB, 2017: 398). The first challenge concerned infrastructure capacity and quality, while the second concerned market reforms—namely, building a modern enterprise capable of adapting and thriving in the market economy (PPIAF and WB, 2017: 398). Limited financial support for railway infrastructure forced the MOR to adopt an industrial policy characterized as development on the cheap.

The central government's decentralizing features forced the railway sector to explore and experiment with different ways to make itself more efficient. This reform process can be characterized as decentralization, deregulation and marketization. In 1992, 1993 and 1994, the Minister of Railways, Han Zhubin, pushed to decentralize administrative power to the MOR's regional bureaus and deregulate investment and planning power. At the same time, the MOR corporatized some of its regional bureaus to navigate China's marketized economy. In 1998, another round of decentralization occurred as regional bureaus gained more financial and planning autonomy. In the early 2000s, the new railway minister, Fu Zhihuan, bifurcated and released the non-transport sector from the MOR by introducing vertical separation. Such open-ended reform initiatives were "consistent with lessons learned from railway reform in the developed market economies" (Churchill and Thum, 2005: 22). Despite two decades of reform, the railway sector largely failed to achieve rapid modernization. The aforementioned reform initiatives also resulted in a shortage of transportation capacity.

The present chapter is divided into six sections, including the introduction and conclusion. The second section surveys the 1975 recentralization and the restoration of stability and orderly production in the railway sector during the post-Cultural Revolution period. The next

section explores the dismantling of the People's Liberation Army's Railway Corps and its transition into the central ministry's engineering bureaus. The fourth and fifth sections explore the three rounds of reform that took place during the 1980s and 1990s. Sectoral reforms were aimed at improving administrative and network efficiencies with limited capital investment from the state. However, transportation capacity failed to keep pace with the growing economy, and network expansion did not see much progress until 1995.

The 1975 Recentralization and Post-Cultural Revolution Recovery

After the death of Lin Biao, the Gang of Four initiated a campaign to criticize Lin and Confucius (*pilin pikong*), which caused further declines in steel production and railway transportation. Given the need to restore "stability and unity" (*anding tuanjie*), Mao Zedong recalled Deng Xiaoping to take control of the national economy in 1974 (Vogel, 2011: 88). The decision to reverse chaos and anarchy was made at the first meeting of the Fourth National People's Congress in January 1975. Deng chose the railway sector as his civilian breakthrough because he believed that orderly production in this sector was paramount to the country's economic development. Deng also claimed that such a breakthrough would "quickly both increase production and inspire others" (Vogel, 2011: 103). At the same meeting, senior leaders decided to re-establish the MOR. To centralize railway production, Mao and Zhou Enlai approved Deng's decision to appoint a seasoned revolutionary, Wan Li, as the new railway minister.

In 1975, the Politburo realized that the railway sector was a significant weakness of the national economy, and railway production remained insufficient for meeting the demands of industrial and agricultural development (Li WY, 2005: 87). Sectoral production was caricatured as espousing "one major weakness and two insufficiencies" (*yige tuchu liangge bushiying*) (MOR Archive Centre, 1999: 120). Deng shared the same view, as he told all of the central and subcentral Party secretaries responsible for industrial development (*gongye shuji*) that "the plan to accelerate national economic development could not be achieved without solving problems associated with the railway sector first" (Selected Works of Deng Xiaoping, Vol 2., 1983: 5). Between February 25 and March 8, 1975, the Party secretaries met to discuss possible

improvements to railway transportation and industrial development. The *Decision on Improving Railway Works* was drafted at the meeting and approved by the Politburo.

The decision, which was published on March 5, 1975, aimed to strengthen the leadership of the Party in the sector. The Politburo called to improve the sectoral management system, establish comprehensive and necessary regulations, enhance organization and discipline, secure the transportation system and fight against destructive actions (Jiang and Xia, 1997-2006). The decision requested the MOR to collectively manage (*tongyi guanli*), centrally coordinate (*jizhong diaodu*) and collectively deploy (*tongyi tiaopei*) railway production in the country (MOR Archive Centre, 1999: 120-121).

Before the decision's implementation, Deng had already decided to bring the Xuzhou Railway Bureau under control. Xuzhou is crucial from a geographical perspective, as it intersects two major trunk lines: the Beijing-Shanghai Railway and the Lanzhou-Lianyungang Railway. However, as a major transportation hub, stations under the management of the Xuzhou Railway Bureau "had never once met its quota for loading or dispatching railway cars" between 1973 and 1975 (Vogel, 2011: 103). After Wan officially assumed the position in January 1975, Deng told him to solve the problem in Xuzhou "more quickly" (Vogel, 2011: 104).

The roots of the Xuzhou problem were rampant factionalism in the railway system and regionalism amongst four neighbouring provinces: Shandong, Anhui, Jiangsu and Henan. The rebel faction, under Gu Binghua, seized control of the Xuzhou Railway Bureau, resisted centralization efforts and exploited the autonomy of regional bureaus (Koll, 2019: 279). Regionalism worsened, as all four provinces claimed parts of the Xuzhou Railway Bureau's operations ranging from railway management to rolling stock and track maintenance (Vogel, 2011: 105). As a result, Deng called for the dismantling of regionalism and factionalism, as troublemakers in the railway system were connected with local troublemakers (Koll, 2019: 278). He argued that these troublemakers knew how to attract attention from Beijing by accentuating conflicts and blocking railroads (Selected Works of Deng Xiaoping, Vol. 2, 1982: 6).

As a result, the *Decision on Improving Railway Works* called for centralizing political and military authority under the MOR, effectively resolving the problem of overlapping

jurisdictions. On March 5, 1975, Deng argued that railway workers—one of the most advanced and best-organized groups of workers—could understand and support central decisions if these were explained to them (Selected Works of Deng Xiaoping, Vol 2., 1983: 5). After the publication of the decision, Wan Li arrived in Xuzhou and personally arrested Gu. Wan later held a mass meeting to allow workers to publicly denounce Gu's wrongdoings. On March 10, 1975, Wan gathered workers and their families from the Xuzhou Railway Bureau and encouraged them to become "a model for promoting the smooth flow of transportation" (Vogel, 2011: 107). Railway workers reacted positively and promised to resume smooth freight transportation (Vogel, 2011: 107).

Centralization and parachuting work teams from higher levels were effective means of addressing factional and regional strife in Xuzhou. As a result, the MOR organized study sessions, dispatched work teams and mobilized the masses to tackle the same problems in other regional bureaus. Through such tactics, the MOR used moral persuasion and requested that its workers take responsibility for the larger picture and work to solve capacity deficiency (MOR Archive Centre, 1999: 122). Moreover, as the MOR regained the authority to appoint leaders to its regional bureaus, it restructured some regional leadership groups to dismantle factional cliques that had formed during the Cultural Revolution. Leadership groups that had appeared "weak, undisciplined and lazy" were either shifted or sent to study sessions to reinstate Party discipline. As a result, the central ministry solved production problems in Zhengzhou, Nanchang, Kunming and the Zhuzhou Electric Rolling Stock Plant. Production in coal and steel improved as Deng applied similar approaches in these two sectors (Selected Works of Deng Xiaoping, Vol2., 1983: 9).

As Deng Xiaoping fell out of favour again in November 1975, the railway sector suffered yet another round of severe setbacks. The sector was regarded as the epitome of "the dictatorship of the bourgeoisie over the proletariat." As a result, a new wave of armed conflicts erupted against the MOR's leadership. In a movement against reversing the verdict against right-leaning cadres (*fanji youqing fan'an feng*), factionalism and regionalism that had been suppressed by Deng and Wan Li re-emerged. The rebel faction orchestrated violent attacks against technocrats, who had tried to preserve railway transportation (Wen, 2019: 335). In January 1976, the central

ministry was once again under immense pressure from the rebel faction, which rallied regional bureaus to criticize Deng, Wan and Liu Jianzhang, the Vice Minister of Railways (*pideng lianwan gualiu*). Rebel factions in regional bureaus rushed to Beijing and petitioned to end Deng and Wan's efforts to restore order and stability. As a result, Wan was hospitalized, and Liu was illegally detained for five days (Wen, 2019: 335-336).

Attacks on the MOR increased in both number and intensity in March 1976. One month later, after the "anti-revolutionary incident" at Tiananmen Square, Deng was again stripped of all positions. Moreover, after the Gang of Four seized control of several regional bureaus, a new campaign was launched against the 1975 *Decision on Improving Railway Works*. Slogans such as "just as it went up, let productivity go down" and "dragging down transportation productivity means victory" were promulgated (Koll, 2019: 281). Sectoral production plummeted once more; freight transport dropped 46.3 million tons compared to 1975; railway accidents rose by 17%, and the state lost 740 million CNY in taxation revenue (Guancha.cn, 2013).

Between the end of the Cultural Revolution in 1976 and the Third Plenum of the Eleventh National Party Congress in December 1978, the MOR was caught in a debate between "Red" and pragmatism. Proponents of class struggle resolutely supported Hua Guofeng's "Two Whatevers." However, Vice Minister Liu Jianzhang supported greater advancements in science and technology. At a meeting involving members of the central ministry's provisional leadership group, policymakers spent much of their time in bitter recriminations, bickering over the idea of railway modernization and scientific research and development (Wen, 2019: 342).

While central ministry leaders debated between two developmental approaches, the State Council and the Central Military Commission (CMC) moved to improve the management of military transportation via rail. On June 29, the State Council and the CMC published the *Outline of Chinese People's Liberation Army's Military Representatives in Railway and Waterway Systems*, which aimed to establish military offices in all regional bureaus, sub-branches and major railway stations. Unlike those found during the Cultural Revolution, these newly created offices were dedicated to assisting the mobilization of troops and military supplies via rail (SD19LY19). Military representatives helped facilitate "the Party's monopoly on power" (*dang de yiyuanhua lingdao*) in railway transportation (Ministry of Defence, 2009). In principle,

military transport took priority in the loading and dispatching of freight and passenger trains, as the railway sector had to obey military commands (SD19LY19). In practice, military representatives offered selective material benefits to both local governments and local railway staff members as incentives to support their work. The military also cooperated with the railway sector by reserving recruitment quotas for the families of railway staff members in exchange for freight carriages (SD9YM19).

Decisions made at the Third Plenum in December 1978 seemingly ended the MOR's two-year debate on "red" versus pragmatism. Deng Xiaoping's speech, which was titled "Emancipate the Minds, Seek Truth from Facts and Unite as One in Looking to the Future," announced the end of class struggle. The new focus of the Party-state was on developing socialist modernization. After the Third Plenum, the railway sector underwent a period of "adjustment, reform, rectification and improvement." The Politburo asked the central ministry to correct three major problems resulting from the Cultural Revolution: capacity deficiency, limited national kilometrage and outdated railway equipment technology. In response, the central ministry decided to focus on railway equipment upgrades and network expansion for the next three to five years (1979 to 1984; MOR Archive Centre, 1999: 149). These decisions later became part of the MOR's broader strategy to improve transportation capacity in the 1980s.

To facilitate rolling stock modernization and improve sectoral research and development capacities, Liu Jianzhang established the China Railway Society in 1979. The society served to rectify and elevate the status of "experts" and advance the role of intellectuals in railway production. In the same year, the MOR published the *Guideline for Railway Science and Technological Development between 1979 and 1985.* The guidelines proposed to "broaden central management capacities within three years, strengthen the foundation, modernize within five years and catch up and surpass" (*sannian dazhi dahao jichu wunian datigao gan zhong you chao*) (Li WY, 2005: 124). Within this set of guidelines, the MOR called for the establishment of a comprehensive railway research regime to achieve sectoral modernization.

By the end of 1980, the national network had reached 49,940 km. However, sectoral development failed to meet the demands of China's modernization efforts. In 1981, Wan Li, who had become the vice premier in 1980, admonished the central ministry for its lack of progress.

He concluded that the sector "lacked leadership, spirit, management and discipline" (Wen, 2019: 349). At the Twelfth National Party Congress in 1982, Chinese leaders echoed Wan's criticisms and asserted that railway transportation had become a bottleneck in national economic development. Consequently, senior leaders called on the MOR to "engage in a series of construction projects, accelerate railway development and raise transportation capacity" to enable China's industrial and agriculture output to double by the end of the 20th century (Gov.cn, 2006).

The Dismantling of the Railway Corps

The Railway Corps played an important role during the Sino-Vietnamese War. In 1979, approximately 10,000 members of the Railway Corps were sent to Guangxi and northern Vietnam to support railroad maintenance and repair and bridge construction. From February to March, the First and Second Divisions collectively repaired and constructed a total of 69.8 km of railroads and strategically destroyed 56.6 km of railroads in Vietnam (*The Railway Corps*, 2000: 193). However, the Railway Corps ceased to exist five years after the Vietnam War, as Deng Xiaoping decided to transition this specialized military force into the MOR's engineering bureaus.

After the Sino–Vietnamese War, Deng Xiaoping worked with Chen Yun and other cautious reformers to rebalance the Chinese economy and improve the quality of life of the Chinese people. One of their first moves was to reduce the national deficit. In the sixth FYP (1980 to 1985), the overarching policy line was adjustment, reform, restructure and enhancement (*tiaozheng gaige zhengdun tigao*). In addition to dismantling state institutions that prevented economic growth, state planners called for a shift from heavy industry development to the development of agricultural and light industries such as the textile sector. Chen and Deng reduced infrastructure and national defence spending by 10% and 2%, respectively. The new total for infrastructure spending, including foreign loans, accounted for just over 15% of the national budget. Those reductions were rebalanced toward expenses in education, sciences,

culture and public health. They also signalled an end to Mao's integration of national defence and economic development.

Another signature move was the dismantling of the People's Liberation Army's (PLA) Railway Corps, which was designed to undo the Maoist military-infrastructure complex. This decision by the CMC was a difficult and unpopular one. However, despite backlash from high-ranking generals to the move, Deng Xiaoping remained firm in his decision-making. As early as 1975, Deng and the CMC had initiated a series of downsizing efforts to reduce the number of combatants and staff members. Deng argued that a reduction of one million combatants and 500,000 personnel could save one billion CNY per year. The money could then be spent on modernizing military equipment (People.cn, 2014b). Therefore, a goal of the Fifth Large-Scale Military Downsizing was to reduce the total number of Railway Corps soldiers from 430,000 to 140,000. According to the CMC, technocrats within the Railway Corps would be kept while a significant proportion of troops would be let go (People.cn, 2014b). Despite its commitment to downsizing, the CMC could not decide whether to transition the Railway Corps into the MOR's engineering bureaus (*bing gai gong*) or vice versa (*gong gai bing*).

This round of military downsizing was unsuccessful. First, the Cultural Revolution and the Gang of Four brought an abrupt end to those plans (Xinhuanet.com, 2015b). Second, the Railway Corps resisted downsizing. In a meeting held on December 23 and 24, 1975, "an overwhelming majority of comrades" from the Railway Corps decided against a merger with the MOR (Capital Construction Engineering Corps, 2016). Despite strong opposition, the Twelfth and Fifth Divisions of the Railway Corps were transferred to the Capital Engineering Corps (Wang LX, 2018). By 1978, the total number of staff members and soldiers in the Railway Corps had been reduced from 430,000 to 380,000.

In October 1978, to reduce the PLA's budget, the State Council and the CMC decided to separate the Railway Corps' budget from that of the PLA. Though the Railway Corps remained as a part of the PLA's unit (*bianzhi*), its operating budget was derived from the national defence budget. This move forced the Railway Corps to engage in more construction projects outside of the national railway construction plan to fund its operations. Construction-related expenditures were financed through the National Railway Engineering Budget. In 1979, the Railway Corps

was able to self-fund 78.4% of its operations. Two years later, in 1981, the Railway Corps began to operate with a small surplus (CRCC, 2011).

Before the Sixth Large-Scale Military Downsizing, senior leaders of the MOR and Railway Corps met in Beijing Station on January 4, 1980. At the "Beijing Station Meeting" (*Beijing zhan huiyi*), Liu Jianzhang (the Vice Minister of Railways), Chen Zaidao (the Commanding Officer of the Railway Corps) and Lü Zhengcao (the Commissar of the Railway Corps) agreed on a plan to merge the Railways Corps with MOR's Engineering Bureaus. In the plan, the MOR would transfer the latter by nesting them under the Railway Corps (*gong gai bing*). While the Railway Corps would maintain its military status, it would have to follow the MOR's technical, budgetary and operational specifications. After the meeting, Liu, Chen, Lü and Guo Weicheng drafted and submitted a report to the State Council and the CMC. Deng Xiaoping agreed with *gong gai bing* in principle.

On November 10, 1980, the CMC officially announced the *Plan to Downsize and Restructure the Railway Corps*. According to the plan, the Railway Corps would have to reduce the number of staff members and troops by 174,683 to reach a new total of 200,000 (The Railway Corps, 2000: 401). As a result, three corps-level headquarters and three divisions were dissolved, and each division was reduced from five regiments to four regiments (CRCC, 2011). This round of downsizing was completed in April 1981.

On October 30, 1981, the CMC's Secretary, Yang Shangkun, held a meeting with PLA leaders in Beijing and discussed plans for the Seventh Large-Scale Military Downsizing. He relayed Deng's message and asked major PLA units to proffer a downsizing plan to the CMC. The Railway Corps submitted a plan similar to the one presented by Chen, Lü, Guo and Liu in 1980. Leaders of the Railway Corps hoped to retain their military status while remaining outside of the PLA's quota and budget. Under this proposal, which Deng had accepted in early 1980, the operation of the Railway Corps—including welfare provision, cadre appointment, salary, compensation and recruitment—would remain under military control. The engineering and construction aspects would remain under the leadership of the MOR. The proposal also called for an independent bank account to be established under the central government (Capital Construction Engineering Corps, 2016).

Between November 1981 and January 1982, Deng Xiaoping retracted his earlier stance and decided that the Railway Corps must incorporate into the MOR such that "not a single soldier shall be kept" (Baokan Huicui, 2018). In an attempt to maintain the Railway Corps' military status, Chen Zaidao petitioned the CMC against the incorporation. On February 4, 1982, members of the Standing Committee of the Railway Corps joined Chen's efforts and signed his petition. Ten days later, on February 14, in a meeting with General Zhang Zhen (the Deputy Chief of General Staff), Chen, Lü and Commissar Kuang Fuzhao handed the joint petition to Zhang and asked him to convey their letter to Deng Xiaoping.

Unmoved by the petition, the Politburo and the CMC, under Deng's instructions, converged on the idea of dismantling the Railway Corps on March 20, 1982. Five days later, Yang Shangkun held a meeting with Chen, Lü, Kuang and Liu Jianzhang, who had become the Minister of Railways in early 1981. At the meeting, Yang relayed Deng's message that the Railway Corps had to be dismantled and integrated into the MOR. Deng believed that the Railway Corps' status as a military unit had become a burden to the Chinese peasantry. He explained that the MOR could be transformed into a military unit in times of war; therefore, the state's military apparatus no longer needed a specialized military force (CRCC, 2011; CRCC, 2016).

As a result, on April 9, 1982, the State Council and the CMC jointly published the *Notice on the Creation of the Railway Corps Transition Work Leadership Group* to facilitate the dismantling of the Railway Corps. Lü Zhengcao was appointed Director of the leadership group, and Chen Zaidao and Liu Jianzhang became his assistants. At the same time, similar leadership groups were created within the MOR and the Railway Corps to facilitate the *bing gai gong* process.

The Railway Corps' Party Committee held an expanded meeting between May 25 and June 2, 1982, during which it established an item of due diligence concerning the transition. Some of the priority items included welfare provision, salary and compensation, cadre management and new appointments, family relocation and war preparation (Capital Construction Engineering Corps, 2016). As the preparation work was ongoing, the State Council and the CMC officially published the *Decision to Incorporate the Railway Corps into the MOR* on December

6, 1982. The Decision explained that the move to transition the Railway Corps into a civilian engineering bureau was based on national economic considerations. Through the document, the State Council and the CMC offered their last praises to the Railway Corps for its historical achievements, especially with regard to railway development in China's frontier regions.

On February 1, 1983, two leadership groups were established to finalize the transition. The Railway Corps Command Headquarters, led by Chief of General Staff Shang Zhigong, was created to migrate all of the Railway Corps' construction projects and paperwork to the MOR. The Railway Corps Aftercare Leadership Group, led by former Minister of Railways Guo Weicheng, was established to manage individual soldiers' transitions into their new roles as engineers and workers. The creation of these two leadership groups signalled the demise of the Railway Corp's Party Committee and bureaucracy, whose historical missions quietly ceased after 30 years of military service.

On October 28, 1983, the State Council and the CMC officially approved the *Plan to Integrate the Railway Corps into the MOR*. As a result, 17,600 staff members, engineers and soldiers were reshuffled into other positions within the Chinese military, 3,867 cadres and staff members were placed under the authority and management of the Railway Corps Aftercare Leadership Group and 148,260 soldiers, cadres, engineers and staff members transitioned into the railway ministry (CRCC, 2016). By the end of 1983, the Railway Corps' senior leaders, such as Chen Zaidao, Lü Zhengcao and Kuang Fuzhao, had transitioned into other senior positions in the state and in the military. Both Chen and Lü were elected as Vice Chairmen of the Sixth National People's Political Consultative Conference. Kuang remained in the PLA and served as the Associate Director of the Retired Cadre's Work Leadership Group. On January 1, 1984, the PLA's Railway Corps was officially integrated into the railway ministry. The Railway Corps' Command Headquarters (*zhihuibu*) was transitioned into the ministry's engineering headquarters/bureaus (*gongcheng zhihuibu*).

Decentralization for Modernization

Upon the successful transition of the Railway Corps into the MOR's engineering bureaus, the State Council discontinued the tradition of appointing railway ministers with strong military backgrounds. Until that point, the selection of China's railway ministers has focused on candidates' relevant experiences in railway engineering. This selection criterion was the result of Deng Xiaoping's gradual shaping of CCP's cadre composition (*ganbu sihua*). For example, the appointment of Chen Puru in 1982 was due to his success in implementing the contract responsibility system (CRS) in Liaoning, while Ding Guan'gen's appointment in 1985 reflected the concurrent rise of technocrats in China's ruling elite.

The remaking of China's governing organs can be traced to the 1982 reform of the State Council. In March of that year, the State Council's total number of ministries and departments was reduced from 100 to 61, and the total number of staff members was reduced from 51,000 to 30,000. The central government ended the lifetime tenure of high-ranking cadres, streamlined leading cadre groups and appointed younger cadres into key positions. By September 1982, at the Twelfth National Party Congress, the task of promoting a younger, more revolutionary, knowledgeable and professional cohort was integrated into the Party constitution.

To better coordinate the economic activities of the state, the State Council strengthened the SEC in 1982. Premier Zhao Ziyang dismantled the State Agriculture Commission, State Machine-Building Industry Commission, State Energy Commission and the State Council's Finance and Trade Group, merging some of their economic restructuring activities with those of the SEC. As a result, the commission became a pilot agency that was responsible for reforming the national economy and state firms. Additionally, the SEC was entrusted with the task of supervising and regulating the commercial activities of SOEs and state firms at the local level. At the same time, the State Science and Technology Commission's responsibility was restricted in establishing policy frameworks concerning scientific research and development. Implementation and coordination of these policies were transferred to the SPC and SEC.

While the state strengthened its capacities in economic restructuring, the gradual relaxation of economic planning resulted in the weakening of national planning. In the mid-

1980s, the central government moved away from setting mandatory economic targets to afford SOEs greater economic flexibility. This move made national planning redundant during the 1980s and 1990s (Heilmann et al., 2013). The SPC's control over pricing was gradually relaxed through the dual-track system. In 1989, Chairman Zou Jiahua engineered a round of decentralization and relinquished the state's coordinating capacities over the production of coal and steel.

In 1984, Deng Xiaoping also called for greater market transition and opening to the outside. Four initiatives ensued from Deng's reform: 1) a new tax system to replace the central government's reliance on profit remittance (*li gai shui*), 2) a new budget system to replace spending allocations to bank loans (*bo gai dai*), 3) fiscal decentralization (*fangquan rangli*) and 4) the gradual separation of business from the government. The last initiative began in the civil aviation sector with the creation of regional carriers and the reorganization of the Civil Aviation Administration of China (CAAC). This economic restructuring program, titled *Decisions on the Reform of the Economic Structure*, relaxed the central government's control over its service-providing central ministries, including the MOR.

Before administrative and economic decentralization, Chinese leaders had recognized by the Twelfth National Party Congress in 1982 that stagnant development in the railway sector was preventing rapid economic development. As a result, railway policymakers introduced two reforms for overcoming capacity deficiency alongside state-level reforms. First, the central ministry would focus on advancing sectoral modernization and strengthening capacities in research and development. Second, the MOR would begin to decentralize from the central government in pursuit of greater economic autonomy.

In 1984, the chief engineer responsibility system (*zong gongchengshi jishu fuze zhi*) was established as an important mechanism for fostering scientific development. Under this system, the chief engineer of the central ministry and their associates became responsible for managing and pursuing technological upgrades to meet the developmental needs of the railway sector. The central ministry appointed Tu Yourui to the newly created position of chief engineer. Under Tu's leadership, the railway ministry engineered three large-scale projects to improve transportation safety and capacity (Fu, 2017a: 62), two of which focused on rolling stock modernization. Tu

initiated two additional programs: a research program on the development of high-powered diesel and electric locomotives and an additional program aimed at lobbying the central government to increase funding for railway equipment modernization.

The MOR's Science and Technology Division spearheaded these two programs, initiating several new research projects and galvanizing national debates to pressure the central government for monetary support. Under Tu, the division also called on the central government to increase investment and attention to the development of a comprehensive national railway network (Fu, 2017a: 62). These practices showed that the creation of the chief engineer role was designed to harmonize railway equipment modernization and national network expansion. This position allowed the MOR to maintain a construction and operationally integrated sector (*jianyun heyi*) after the bifurcation campaign in the early 2000s. This centralized system also proved useful during the Big Leap Forward (BLF), when the development of a domestic highspeed rail industry flourished under the guidance of the central ministry's chief engineers: He Huawu and, more notably, Zhang Shuguang.

Concurrent with the empowerment of railway engineers, the central ministry oversaw a round of internal restructuring consisting of two initiatives that allowed for the rise of intellectuals and technocrats. This restructuring scheme aligned with national efforts to reform the CCP from a revolutionary clique into a ruling Party. First, initially under the leadership of Liu Jianzhang, the MOR rehabilitated intellectuals who had been prosecuted during the Cultural Revolution. After the rehabilitation, the central ministry then moved to streamline its leadership group as well as leadership groups in its regional bureaus.

The MOR introduced tripartite reform to dismantle the one-man management system. Under the new manager responsibility system (*changzhang zhi*), technocratic cadres were responsible for the management of railway production. Cadres in the Party stream became responsible for the operation of the Party branch and the local union. Thus, a new style of collective leadership consisting of a Party secretary, a work-unit manager and a union chairman was established in regional bureaus, sub-branches, railway stations and non-transport entities. This reform allowed technocrats to be appropriately positioned with suitable power and

responsibility in their management of railway production (*youzhi youquan youze*; MOR Archive Centre, 1999: 166-168).

The MOR also improved its research and development capacities. During the Mao era, there was a disjuncture between the research and development of railway technologies and sectoral transportation needs due to the suppression of intellectuals (MOR Archive Centre, 1999: 160). Indeed, the initial drive toward electrification failed to consider the realities of railway production at the time. In the 1980s, the central ministry decided to push researchers and engineers to the frontlines of railway production. With the introduction of the *Decision to Reform the Railway Technology Regime*, the central ministry provided researchers and engineers with a greater voice in terms of combining scientific development and capacity improvement and economic development. This round of focused reform for what railway policymakers described as "scientific management" (*kexue guanli*) became an institutional legacy of sectoral development, and its effects were similar to those associated with the creation of the chief engineer position.

In the subsequent Sixth and Seventh FYPs (1981 to 1990), sectoral modernization focused on researching, manufacturing and maintaining better and more powerful locomotives and track upgrades. In 1983, the railway ministry published *Policies on Major Railway Technologies*, in which the MOR argued that the increase of transportation capacity had to be conducted through scientific and technological improvements and gradual modernization (Li WY, 2005: 127). The 1983 decision also proposed a new timeline for catching up to developed nations: by the end of the 20th century, sectoral development should reach the technological standards adopted by advanced foreign countries in the early 1980s (Li WY, 2005: 127). The policy called for the gradual replacement of steam engines with electric and high-capacity diesel locomotives. The research and development of electric locomotives and the electrification of railway infrastructure were newly prioritized. By 1985, the annual production rate of diesel and electric locomotives had finally surpassed that of steam engines; 285 diesel locomotives and 100 electric locomotives had been manufactured, compared to 361 steam locomotives.

The central ministry undertook two initiatives to improve the national railway network. In the first round of track upgrades, 4,400 km of railway lines were upgraded into dual-track lines,

and an additional 4,700 km were equipped with electrification systems. Dedicated freight lines were equipped with electrification systems to facilitate the transportation of coal out of Shanxi. Notable projects included the Datong-Qinhuangdao Railway, the Taiyuan-Shijiazhuang Railway and the Taiyuan-Jiaozuo Railway. These efforts effectively raised the annual coal transportation volume from 60 million tons to 81 million tons. Second, the central ministry targeted major transportation hubs such that a small increase in capacity could meet national demand. Since a majority of domestic economic activities clustered around coastal areas, the MOR decided to repair, double-track and electrify old trunk lines that had been under stress due to heavy traffic and construct new lines between China's coastal cities and ports.

These modernization efforts during the Sixth FYP and particularly the Seventh FYP marked a shift toward development on the cheap and continuous market reforms. Despite recognizing that energy and transportation were obstacles to national economic development, the Politburo and the State Council had failed to invest in these sectors. Indeed, during the 1980s and early 1990s, profound changes were made to the financing scheme of the railway sector. Due to marketization and the introduction of a new tax system, the state gradually reduced the proportion of railway investment in its infrastructure spending. Investment in railway development accounted for 4.75% on average of the national infrastructure budget in the 1980s. However, expenditure accounted for around 10.6% on average between 1950 and 1980 (Li WY, 2005: 97). Given the reduced and insufficient national funding, there was an urgent need to increase transportation capacity, as the sector could only accommodate 70% of the national demand for freight transportation (MOR Archive Centre, 1999: 210).

With limited national funding to improve sectoral transportation capacity, the railway ministry began to diversify its fundraising methods. A crucial diversification strategy was to borrow from external sources. In 1984, the MOR secured its first loan from the World Bank for the construction of two new railway lines between Xinxiang and Yanzhou and Datong and Taiyuan. Those two lines were designed to meet the urgent needs of energy (i.e. coal) transport for economic development. They were a part of the central government's broader efforts in constructing seven new railway lines and three ports to connect the coastal regions and inland China. The 220 million-USD loan from the World Bank also assisted the Zhuzhou Rolling Stock

Plant to research and develop electric locomotives. Additionally, the World Bank pledged technical assistance and training to the MOR and its rolling stock plants (The World Bank, 1984).

International sources of funding were crucial for sectoral development, as the 1985 decision to transition the financing of national infrastructure development from appropriation to commercial loans (*bo gai dai*) fiscally starved the MOR. This reform in the national budget prompted the railway ministry to decentralize from the central government. Before 1982, the MOR had paid a 15% sales tax in addition to remitting all profits to the central government in exchange for investment and operational funding (Tjia, 2019: 345). Between 1982 and 1985, while the tax rate remained the same, the central ministry only submitted 85% of its profits as business tax to the central government, which also reduced its investment in railway development (MOR Archive Centre, 1999: 199). The 1985 decision made it impossible for the railway sector to continue upholding the extant arrangement, as the ministry would need to turn over its profits and repay bank loans and interests at the same time.

The introduction of the contract responsibility system (CRS) in 1986 provided the railway ministry with more autonomy vis-à-vis the central government. The MOR proposed being self-responsible for profits and losses and covering all expenses related to building and maintaining the national railway network (*zifu yingkui yilu jianlu*; Fu, 2017a: 105). According to Ding Guan'gen's plan, the MOR would provide the central government 5% of its profit, and the rest would be retained. In exchange, the central ministry would no longer receive financial backing from the central government. Ding promised to increase passenger transportation capacity by 45% and freight transportation capacity by 71% and invest heavily in rolling stock upgrades (People.cn, 2012). After some rumination, Deng Xiaoping agreed to "let the railway sector be entrepreneurial" (*rang tielu chuangyichuang*). Despite Deng's careful encouragement, Ding's lofty goals were never realized during his abbreviated tenure as railway minister. Ding resigned from the position in early 1988 due to a major railway accident that resulted in the death of 88 passengers.

In light of the reform, the MOR lobbied for four preferential policies from the State Council: lowering the cost of production material, writing off past debts, granting special

consideration to price-setting in railway services and the ability to control pricing (MOR Archive Centre, 1999: 200). To encourage decentralization, the central government forgave all of the railway ministry's existing debts and promised to increase the prices of railway services during the Seventh FYP (1986 to 1990). The central government, however, decided to maintain its strict control over railway pricing (Tjia, 2019: 345).

Thus, during the Seventh FYP, the sector's developmental approach focused on "limited but focused development in light of reduced investment" (*jingda xisuan jieyue touzi*; MOR Achieve Centre, 1999: 212). Three policy guidelines emerged as adjustments to the new CRS:

1. With limited financial capacity, the MOR focused on improving existing lines and modernizing railway equipment as the primary strategy for increasing transportation capacity.
2. The maintenance of existing tracks in China's coastal and northeastern regions took precedence over the construction of new trunk or branch lines.
3. Upgrading some of the busiest lines in the coastal and northeastern regions took precedence over other production tasks.

At the same time, the central ministry implemented market reforms according to the following five aspects: introduce responsibility systems, decentralize, strengthen coordination among different departments, ensure transportation safety and diversify the MOR's operations. At the sectoral level, the central ministry granted more autonomy to its regional railway bureaus and non-transport entities such as its engineering bureaus. Institutional legacies included the decentralization of financial and organizational powers to regional bureaus and the promotion of self-financing. Regional bureaus became responsible for the allocation of human, material and monetary resources (Tjia, 2019: 345). This newfound autonomy enabled regional bureaus to invest in rolling stock upgrades and plan, construct and operate new regional lines.

In 1984, the newly created Guangshen Railway Corporation was emblematic of sectoral decentralization. The corporation enjoyed several preferential policies, including pricing control over passenger and freight services, which charged 50% more than the national average set by the central government. The Guangshen Railway Corporation only needed to remit 20 million

CNY, with an annual increase of 2.32%, and an additional 60% of its profits from foreign transactions to the central ministry (MOR Archive Centre, 1999: 189). Similar reform logic in profit remittance was applied to non-transport sectors such as civil engineering and rolling stock.

Fiscal starvation continued in the late 1980s and the 1990s. In response, state planners established several preferential policies to allow the central ministry to diversify its fundraising efforts. For example, the central ministry and sub-national governments first began to experiment with joint ventures to share the cost of railway construction. Second, the State Council and the SPC allowed the MOR to establish a Rail Construction Fund (*tielu jianshe zhuanxiang jijin*) in 1991. The fund allowed the central ministry to collect a surcharge, which was levied on freight tariffs and accumulated for new railroad projects (Scales and Sondhi, 2009). The new fund was exempt from national taxation.

We can draw three lessons from the MOR's reform and modernization in the 1980s. First, sectoral development was constrained by a lack of financial support from the central government. As a result, the central ministry had to devise strategies to develop in a cost-effective manner. Second, market reforms and developmental strategies were driven by situational needs: catching up to China's economic growth on the one hand and making ends meet on the other. Third, due to a weakened SPC and a shift away from integrated industrial development, the output of railway production—especially coal transportation—lagged far behind. Market coordination failed to compensate for the MOR's meagre transportation capacity, which could only meet 70% of demand in passenger and freight services.

In light of those failures, state planners further promoted decentralization as a strategy for the Eighth FYP (1991 to 1995) and highlighted the three following initiatives:

1. Promote central-local joint ventures in railway development and focus on the development of local railway lines
2. Continue to decentralize from the central government and focus on energy supply to coastal areas
3. Integrate railway, highway, ocean and air transport

The purpose of those initiatives was to strengthen the railway sector such that it could accommodate the development in infrastructure and basic industries (*shizhi yu jichu gongye he jichu sheshi de fazhan xiang shiying*).

Deregulation and Marketization

Due to political movements in the late 1980s, cautious reformers within the Party gained the upper hand and called for a more measured approach to China's market reforms. Deng Xiaoping's appointment of Zhu Rongji as the new vice premier in 1991 and Deng's southern tours in 1992 provided the necessary forward momentum to accelerate further reforms. Indeed, during much of the 1990s, the Chinese economy was in the hands of Zhu, who had "bold political leadership skills, a strategic understanding of how to improve the economy, and an unusual confidence in pursuing reforms" (Vogel, 2011: 666).

Zhu Rongji made several intrepid moves to reform the Chinese economy. In 1993, a new tax-sharing reform was introduced, along with the announcement to transform China's state firms into modern corporate systems. Zhu also transitioned the SEC into the SETC. The new commission had two tasks to perform. First, Zhu envisioned the SETC as playing a similar role as Japan's Ministry of International Trade and Industry and coordinating China's industrial restructuring. Second, the SETC would engineer a reform agenda focused on superministerial restructuring, thus separating government from business (Heilmann and Shih, 2014). As a result, the SETC broke the Ministry of Information Industry's monopoly in the telecommunication sector by creating the China Unicom.

While the SETC was strengthened, the central government tried to shed power from the SPC. After the 1993 reform, the SPC could no longer set mandatory developmental targets for SOEs, state firms and local governments. The core task of Chairman Chen Jinhua, who had been newly appointed, was to maintain an overall balance between the national economy and supply and demand (Chen JH, 2016). In drafting the Ninth FYP (1996 to 2000), economic targets established by the SPC were deemed to be "guiding" (*zhidao xing*) and "futuristic" (*yuce xing*).

Three years into the Ninth FYP in 1998, Zhu Rongji, the new State Council premier, slashed all mandatory targets (*zhiling xing*) established by the SPC for large national projects (Heilmann et al., 2013).

During the 1990s, the MOR had a distant but cooperative relationship with the two central commissions. First, the railway ministry was in charge of its own reform agenda, independent from the SEC and the SETC. Railway ministers such as Han Zhubin and Fu Zhihuan were the main drivers behind sectoral reform and marketization. Second, the weakened SPC lacked control over the MOR, as the central ministry was directly managed under the State Council vice premiers, Zou Jiahua and Wu Bangguo. However, neither Zou nor Wu were familiar with railway development. Zou admitted in 1995 that he only had some experience with the latter (Huang SC, 1996: 15).

Zou Jiahua, who had served as Chairman of the SPC in the late 1980s and early 1990s, had limited interest in the sector. His lack of experience could be the result of the apparent distance between the SPC and the MOR in planning railway development and sectoral modernization. This relationship could not be described as the norm, since both state organs had historically worked closely on the drafting of the First FYP (1953 to 1957), the Third Front Movement (1964 to 1980) and the formulation of the Datong-Qinhuangdao Railway (1985). Previous chairmen such as Li Fuchun and Song Ping worked closely with the MOR on national planning and project implementation. The MOR and the SPC only became more cooperative after the mid-1990s, as the latter started to realize the importance of direct government investment and administrative supervision on large infrastructure development.

The principal contradiction in railway production was carried over from the 1980s to the 1990s: the increase in passenger and freight capacity failed to meet the ever-growing demands of the national economy and Chinese society. While China's average annual GDP and industrial growth in the early 1990s reached approximately 10% and 18%, respectively, the annual growth rate in freight and coal transportation via rail only increased by an average of 4% and 1.9%, respectively (Zhu RJ, 2011). As a result, the Party-state's plan for national economic production was constrained, and one-third of the national processing capacity was idled (MOR Archive Centre, 1999: 256; Gov.cn, 2008c).

On July 16, 1992, Zhu Rongji expressed concern about the lack of sectoral development, which lagged far behind domestic economic growth, at a meeting on national economic and railway development. Zhu asked Li Senmao, the Minister of Railways, to reform the central ministry according to the following four areas: corporatization, technological upgrade, labour organization and scientific dispatching. Zhu promised to push through pricing reforms within the State Council and requested the central ministry to diversify its fundraising methods to solve the growing debt problem.

In September 1992, Han Zhubin was appointed as the new railway minister. After assuming the position, he immediately moved to decentralize further and corporatize the MOR's subordinate units. In December, the MOR published *Implementation on Transforming the Operating Mechanism of Railway Enterprises*. The core of the document was twofold. First, regional railway bureaus and other transportation enterprises would receive more administrative, operational and financial autonomy vis-à-vis the central ministry. The central ministry allowed its regional bureaus the capacity to determine both the operation and pricing of passenger and freight services within their respective jurisdictions. Regional bureaus also maintained their capacities in labour organization and human resource management, as each bureau could set its own salary and bonus schemes (MOR Archive Centre, 1999: 259). Moreover, a new profit-sharing scheme was developed to enable regional bureaus to retain all of their profits above the remittance level.

Second, non-transportation enterprises would be pushed into the Chinese socialist market. *Implementation on Transforming the Operating Mechanism of Railway Enterprises* granted both rolling stock plants and civil engineering enterprises greater autonomy, pushing them to become "independently-managed, self-financed, self-improved and self-developed" (*si zi*; MOR Archive Centre, 1999: 263). The MOR gradually transitioned into a regulator of the railway non-transport sector as the central ministry and its rolling stock plants agreed on a CRS. Under the new arrangement, rolling stock plants would have to remit 33% of their profits in the form of a business tax (MOR Archive Centre, 1999: 264). In return, they gained full autonomy in the research, development and manufacturing of locomotives and freight and passenger carriages. More importantly, in 1993, the MOR relinquished much of its control over the pricing of rolling

stock products. As a result, rolling stock manufacturers could independently decide on 98.8% of all manufactured goods, while MOR maintained control over the pricing of 161 products (Wu CY, 1994: 448). This round of reforms was a prelude to the bifurcation campaign in the late 1990s.

Decentralization was also pursued, because the MOR needed to manage its growing debt problem. Under the CRS, though the MOR could retain revenues generated from railway services, the ministry failed to profit from its operations. During the late 1980s and early 1990s, the Chinese economy suffered high inflation rates, which increased the cost of production materials. In light of these increases, the MOR could not raise revenue through price adjustments, as price-setting had been under the control of the State Council and the SPC. As a result, the MOR began to record large losses. In 1993, the central ministry's debt reached 3.2 billion CNY (MOR Archive Centre, 1999: 257).

Due to the worsening financial situation, the MOR marketized and corporatized several regional bureaus and sub-branches. The goal of corporatization was to transform a state entity into an independently managed and self-financed (*zizhu yunying zifu yingkui*) corporate entity with independent accounting. The new corporate entity would have the full capacity to plan and manage railway services, including pricing, within its jurisdiction as well as serving national and inter-bureau transportation needs. In 1993, the MOR corporatized the Guangzhou Railway Bureau. The ministry subsequently moved to separate and list the Guangshen Railway Corporation on the New York and Hong Kong stock markets (Wu CY, 1994: 418-420). In 1994, the Dalian Railway Group Ltd. was created from the Dalian Railway Sub-branch for the same purpose. This initiative failed due to the emerging fragmentation between local railway policymakers in Dalian and the Shenyang Railway Bureau. The latter prioritized the operation of its passenger and freight services by "choking" passenger and freight trains from Dalian. Regional dispatch controllers stymied trains from Dalian from merging onto national trunk lines between Shenyang and Beijing and Shenyang and Changchun/Harbin (L2LY18).

In 1995, the MOR continued to decentralize. The central ministry's Document #173, titled *Relating to the Regulation on the Expansion of Railway Bureau's Decision-Making Power in Upgrade and Investment,* transferred the power to invest in railway equipment upgrades to

regional bureaus. The MOR believed that transferring these powers downwards could be the first step toward separating business from the government. Under the new arrangement, regional bureaus began to focus on the business aspects of railway transportation, and the central ministry began to concentrate on national infrastructure development and administrative responsibilities (Huang SC, 1996: 548). This round of decentralization was crucial to China's initial highspeed rail development, as different regional bureaus started to compete for customers by increasing transportation capacity and adopting wheel-track multiple unit technologies.

In terms of financial diversification, in 1994, in the spirit of implementing the State Council's *Decisions on Some Issues Concerning the Building of the Socialist Market Economy,* the MOR published *Suggestions on Deepening Railway Reform*, also known as *Thirty Items Concerning Railway Reform*. In the document, in addition to decentralization and deregulation, the MOR committed to increasing funding for network expansion (Laperrouza, 2014: 189). Three main approaches were identified: tariff reform, diversifying fundraising methods and establishing central-local joint ventures.

Tariff reform manifested in two ways. First, the MOR gradually gained pricing rights over passenger and freight services. In 1995, the basic tariff for passenger transportation was increased from 3.861 cents CNY to 5.861 cents CNY per kilometre. An additional 100% increase was imposed on air-conditioned trains, reaching 12.77 cents CNY per kilometre. Those increases yielded an additional 1.4 billion CNY in profit. However, the exponential increase in passenger tariffs drove away Chinese consumers, as some opted for long-distance bus travel and civil aviation.

In terms of freight transportation, the MOR gradually increased both the levy on the Railway Construction Fund and the basic tariff. By 1997, the levy had reached 2.8 cents CNY, an increase of 2.6 cents compared to 1991. Following these incremental increases, the new tariff for freight transportation in 1997 totalled 7.1 cents CNY per kilometre (MOR Archive Centre, 1999: 276). In addition to gradual tariff increases, the strategy of "new line, new price" (*xinlu xinjia*) was introduced as a way of balancing investment costs. Newly constructed lines such as the Beijing-Kowloon Railway were allowed an additional 50% increase relative to the national

price, and the Datong-Qinhuangdao Railway was allowed to charge 180% higher than the national price (Wu and Nash, 2000: 39).

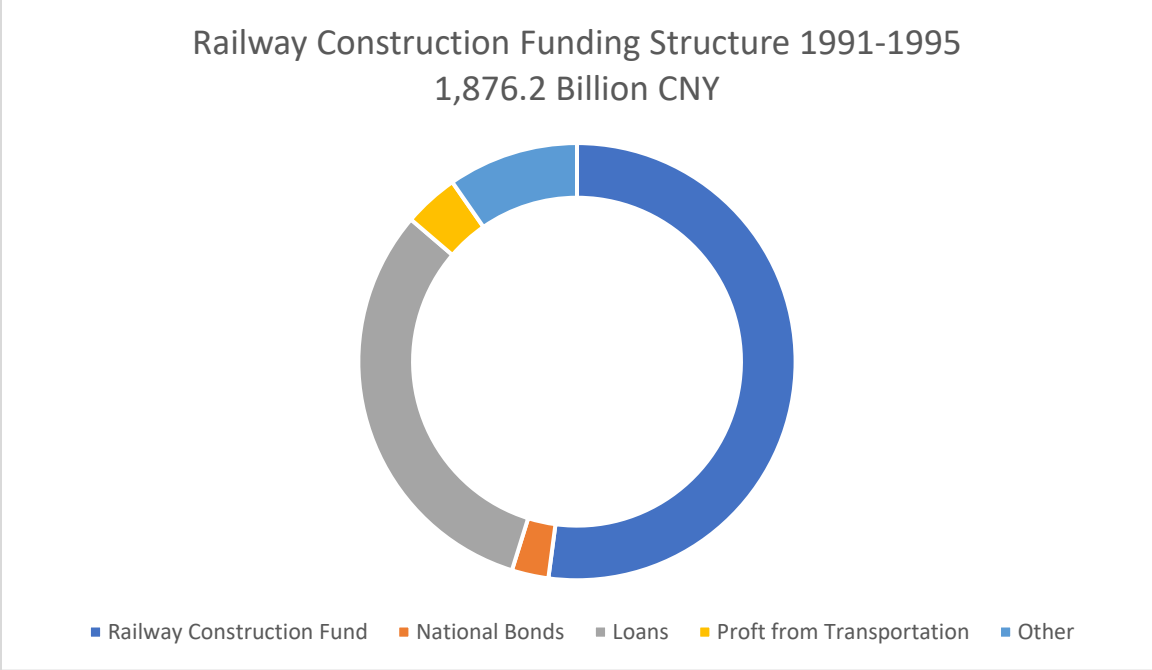
In addition to raising tariff rates, the MOR relied on domestic loans from China Development Bank and the issuance of national bonds. The central ministry also sought funding from foreign sources. In addition to the World Bank, the Asian Development Bank (ADB) became an influential donor in the railway sector, providing both monetary and technical assistance. Loans usually targeted railway construction in less developed areas and improving efficiency, commercialization, competitiveness and energy conservation. The ADB's technical assistance focused on strengthening business practices and modern corporate management (Laperrouza, 2014).

The World Bank and the ADB also provided guidance on sectoral reform. However, the World Bank had more success than the ADB, which noted that the sector was "insular and most comfortable with traditional traffic streams" (Laperrouza, 2014: 200). Indeed, while the ADB played a confidence-building role in supporting the separation of passenger and freight corridors and encouraging the diversification of railway investments, the World Bank helped alleviate infrastructure bottlenecks. The World Bank worked with the National Development and Reform Commission (NDRC) and the MOR in a dual-track approach: orchestrating railway reform with the NDRC and fostering railway development with the MOR (Laperrouza, 2014). Notable examples of the World Bank's institutional assistance to the production-driven MOR include "the separation between government and market-driven activities, financial transparency and flexible tariffing" (Laperrouza, 2014: 189).

Notable foreign donors in the early 1990s also included national banks such as the Japan Bank for International Cooperation and the Agence Française de Développement. Other international organizations and foreign governments also provided loans to the central ministry, including the Overseas Economic Cooperation Fund, Canada and Germany. Borrowing from external sources was planned at 1.88 billion USD under the eighth FYP (1990 to 1995). The MOR failed to reach this target, as it had only borrowed approximately 900 million USD from foreign sources (Cao J, 1999: 9).

In addition to loans and national bonds, the MOR began to work with provincial and municipal governments on network expansion. During much of the 1980s, central-local joint projects accounted only for 1.52% of all railway projects, whereas they accounted for 10.09% and 12.4% during the late 1980s and early 1990s (Cao J, 1999: 8). In 1992, the State Council published *Suggestions on the Development of Central-Local Joint Construction Projects* to regulate joint projects between the central ministry and local governments. The State Council reiterated the importance of a centrally coordinated national network as both vertical and horizontal administrative units were asked to provide support to the planning and construction of national projects. The publication of *Suggestions on the Development of Central-Local Joint Construction Projects* greatly stimulated growth in joint railway projects. The first central-local joint venture, the Hunan Shichang Railway Incorporated, was established in 1993. The MOR invested 100 million CNY, and the Hunan Provincial Government invested 50 million CNY in the joint venture. The new corporation served as an example to other joint ventures, which were created with a clear division of responsibilities and profit-sharing schemes.

Figure 1: Railway Construction Funding Structure (1991 to 1995)



In addition to sectoral decentralization and financial diversification, the MOR pursued rolling stock modernization and upgrades. In 1993, the MOR published the third edition of *Policies on Major Railway Technologies*, which included calls to computerize the management of the national railway network. The key emphasis of this round of technological upgrades was to increase transportation capacity by constructing high-capacity transportation corridors and increasing loading capacity, network density and operating speed. For example, the MOR increased investments in three types of high-capacity locomotives that could draw more than 10,000 tons, 8,000 tons and 5,000 tons (MOR Archive Centre, 1999: 305-306). By the end of the 1990s, locomotives with a tractive power of 5,000 tons were widely used on trunk lines—an increase of 2,300 tons compared to the 1980s.

The MOR also enacted six "grand speed elevation campaigns" (*datisu*) between 1997 and 2007 to increase passenger turnover. Within these ten years, the top operating speed of conventional passenger trains increased from 110 km/hr to 160 km/hr, and the average speed of passenger trains increased from 48.1 km/hr to 70.18 km/hr. During the sixth and final campaign, the MOR introduced several fleets of highspeed trains operating at a maximum speed of 250 km/hr.

Despite these reform initiatives, capacity deficiency did not significantly improve in the early and mid-1990s. Increases in the volume and turnover of passenger and freight services still lagged far behind China's overall industrial and GDP growth. Between 1991 and 1998, China's average GDP and industrial growth continued around 11.047% and 14.75%, respectively. Average growth rates in passenger and freight capacity were deemed disappointing, if not disastrous, as they hovered around 0.02% and 1.06%, respectively. Increases in turnover rates were better—an average of 4.37% in passenger and 2% in freight. On a more positive note, railway construction resumed at an accelerated pace despite the worsening debt problem. The introduction of the Qinghai-Tibet Railway was a signature trunk line of the time. Indeed, Jiang Zemin personally and gallantly approved the project despite the SDPC's strenuous efforts to suspend it.

Bifurcation and Vertical Separation

Han Zhubin's continuous efforts to reform the MOR failed to salvage the sector from its growing problems of capacity deficiency and increasing debts. At the turn of the 21st century, railway policymakers had grave concerns about the fate of a sunset ministry and industry (L2LY18). Decentralization, deregulation, technological upgrades and the diversification of funding led to a decade of marginal network expansion and considerable railway equipment modernization. Limited improvements on those fronts failed to yield higher capacity. In addition, due to the new fundraising structure of borrowing from both domestic and international sources, the MOR struggled to maintain a balanced budget. By the end of 1998, the MOR had accumulated 17.35 billion CNY in debt.

At the Ninth National People's Congress in 1998, Fu Zhihuan was appointed as the new railway minister. Against the backdrop of increased central government investment in infrastructure development, Fu took on the tasks of 1) increasing transportation capacity and service quality, 2) accelerating railway development and 3) balancing the budget book (*yige mubiao liangda renwu*; Fu, 2017a: 79). According to Fu (2017a: 82), further reform was needed to transform the management style of the MOR into one that could adapt to the burgeoning market economy. As a result, in 1998, a round of ministerial and sectoral streamlining took place under Fu's tenure; the number of staff members employed by the MOR's Beijing organs was reduced from 809 to 400 (Tjia, 2015: 53). In addition to administrative downsizing, Fu further increased the degree of decentralization vis-à-vis regional railway bureaus.

Fu Zhihuan's decentralizing efforts echoed Zhu Rongji's restructuring plan by moving the government away from managing daily economic and societal activities. In 1998, Zhu introduced another round of sweeping reforms to the State Council. The focus was on reducing the government's day-to-day management and increasing its macro-level control of the national economy and Chinese society. In this wave of significant downsizing, the State Council reorganized a number of its ministries to reflect the new role of the central government. The SDPC was created, and the SETC was restructured. The former undertook the role of medium- and long-term planning and economic restructuring, and the latter took on the task of reforming Chinese SOEs.

Similarly, Fu restricted the central ministry from micromanaging the entire sector. Under this new round of reforms, the MOR only retained responsibilities such as national railway planning and infrastructure development. The central dispatching system and the ministry's research and development capacities were weakened as a result, while regional railway bureaus gained more autonomy in those regards.

To balance the budget book, national and sub-national reforms were simultaneously pursued. First, at the national level, passenger and freight services at 1,230 stations were cancelled. The central ministry combined or disbanded 40 stations and 138 station-level work units (MOR Archive Centre, 1999: 276). The central ministry engineered a final round of financial downsizing, as the regional bureaus' pension systems were transferred to their respective provincial or municipal governments. In other words, the railway system was no longer responsible for the distribution of pensions to retired workers, staff members and cadres.

At the sub-national level, the central ministry first experimented with and introduced the asset management liability system in 1998 in regional bureaus such as Kunming, Liuzhou and Nanchang. This system was nationally implemented in 1999. Two notable policies included a new regional pricing structure and the separation of passenger pricing from infrastructure levy. These two policies allowed regional bureaus greater flexibility in determining tariffs on intra- and inter-bureau passenger services. In light of these gains, regional bureau directors signed a "pledge of responsibility" (*zeren zhuang*) with the central ministry, which committed them to running a balanced budget by 2001 (Fu, 2017a: 88-89). These reform efforts helped ameliorate the financial situation of the central ministry, which—to the surprise of many careful observers—began to make a profit in 2000 (Fu, 2017a: 93).

Power and fiscal decentralization fostered the emergence of sub-national innovation networks. Regional railway bureaus and the central ministry's rolling stock plants worked together on rolling stock modernization for speed elevation. For example, the Guangshen Railway Corporation worked with rolling stock plants in Zhuzhou and Changchun on the research and development of highspeed multiple unit trains (MU). By 1999, Guangshen wanted to increase passenger capacity between Guangzhou and Shenzhen by establishing a rapid transit system with shorter trains, higher network density and faster speeds (*xiaobianzu gaomidu*

gaosudu). Similar sub-national innovation networks emerged in Kunming, Liuzhou, Nanchang and Shanghai, as the relevant railway bureaus worked with rolling stock plants in Puzhen, Qishuyan, Sifang (Qingdao) and Tangshan for rolling stock upgrades. These regional bureaus competed with the national highspeed train program included as a part of the Ninth FYP (1996 to 2000) for both national funding and international technology transfer. The national program gave birth to domestic multiple unit (MU) trains such as the Great White Shark (*da baisha*), China Star (*zhonghua zhixing*) and Vanguard (*xianfeng*), while sub-national innovation networks manufactured similar models such as the Changbaishan. Despite only being able to manufacture primitive highspeed trains, sub-national and national innovation networks became the foundation of centralized HSR innovation during the BLF (2003 to 2011).

Furthermore, Fu Zhihuan adopted an ambition reform program that aimed to fundamentally restructure the sector. Fu drew inspiration from the State Council's call for a gradual separation of business and government in the railway sector. According to the State Council, the separation had to be implemented in accordance with the sector's existing characteristics and after the boundaries of the central ministry's government, social management and SOE functions had been clearly identified. Against this backdrop, Fu proposed bifurcation and marketization to deepen sectoral reform. This reform process represented a bottom-up initiative backed by both Zhu Rongji and Wu Bangguo. The central commission responsible for superministerial reforms, the SETC, played a relatively minimal role (Fu, 2017a).

The historical mission of MOR at the turn of the 21st century appeared to be one of metamorphosis—of becoming a modern corporate entity. By doing so, the MOR was taking up arms against itself; it had been characterized as a highly centralized, greatly coordinated and semi-militarized bastion of China's planned economy. Proponents of this system believed that the increase in transportation capacity and efficiency could only be achieved through a centralized government entity with tripartite responsibilities: railway administration, regulation and business operation (Fu, 2017a: 104).

However, Fu Zhihuan did not believe this to be the case. According to Fu, the core contradiction of railway production was that improvements in sectoral structure failed to adapt to the rapid marketization of the Chinese economy (Fu, 2017a: 103). Therefore, he identified three

areas of reform: separate business from government, create new transportation enterprises and bifurcate railway infrastructure from passenger and freight transportation. This round of reform would be the final step in a series of reforms that had been consistent with experiences in developed market economies (Laperrouza, 2014: 190).

In 2000, Fu Zhihuan proposed a two-step reform approach: bifurcation, then vertical separation. "Bifurcation" (*zhufu fenli*) referred to the separation of departments and work units in the non-transport sector from the central ministry. The MOR would retain its government-administrative and business-transport responsibilities. Vertical separation (*wangyun fenli*) would decouple infrastructure development and investment from passenger and freight service provision. Under this arrangement, the central ministry would be responsible for the maintenance and operation of railway infrastructure (the national network), and newly created passenger and freight firms would be responsible for providing transportation services. Fu's two-step approach was supported by Vice Premier Wu Bangguo, who was responsible for the railway sector. Wu complimented Fu's plan and directed Fu to "move fast and be brave" (Fu, 2017a: 105).

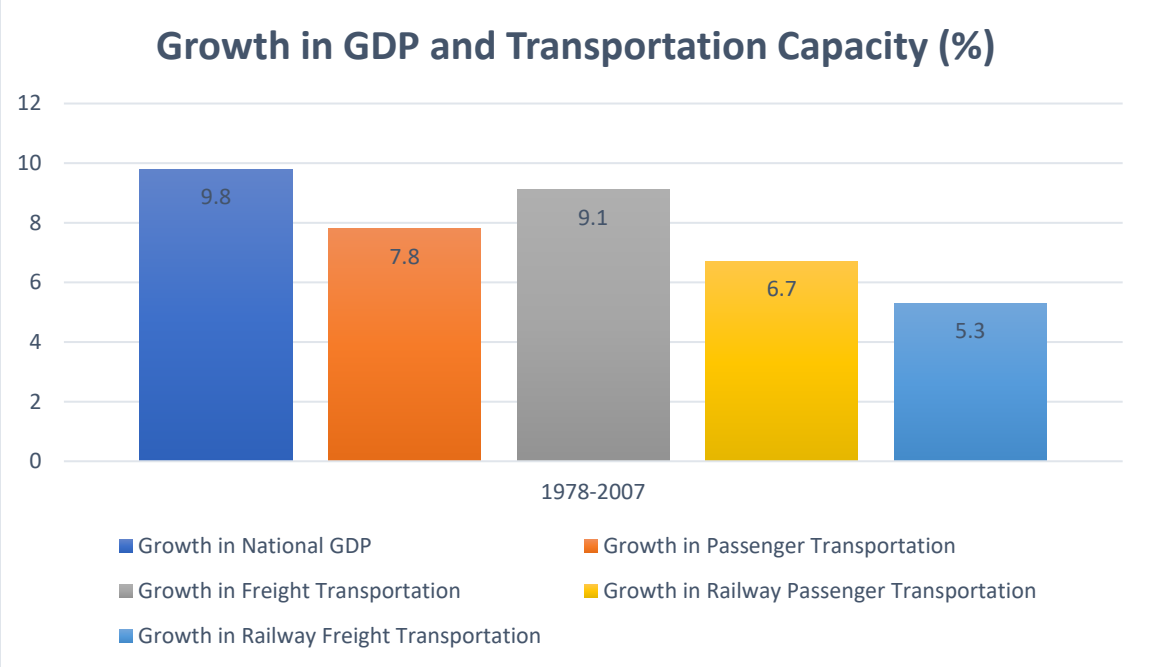
Thus, an important task assigned to the railway ministry in 2000 was to separate railway engineering, construction, industry, telecommunication, civil engineering and rolling stock firms from the central ministry. Therefore, after 2000, the entire railway sector (including both transportation and non-transportation sub-sectors) would no longer be formally under the control of the central ministry. The MOR transferred the ownership of its engineering bureaus and rolling stock plants to the State-owned Assets Supervision and Administration Commission (SASAC). The MOR's China National Railway Locomotive and Rolling Stock Industry Corporation was split into the China North Rolling Stock Corporation (CNR) and China South Rolling Stock Corporation (CSR) in 2000. Additionally, the central ministry transferred ownership of over 300 schools (primary, secondary and post-secondary), over 100 hospitals and local corporations to provincial and municipal governments. By 2004, more than one million staff members had transitioned out of the railway system. During this round of reforms, the MOR managed to retain its research arm, the Chinese Academy of Railway Science.

Concurrently with bifurcation, Fu Zhihuan began to prepare for vertical separation, which was officially included in the Tenth FYP (2001 to 2005). In Fu's proposal to Wu Bangguo,

passenger services would be separated from freight and infrastructure services by creating separate market-oriented service firms by 2006. Several large-scale and market-oriented freight firms would be established after 2006. Thus, full vertical separation would be achieved by 2010. Wu Bangguo instructed Tu Yourui, the Chairman of China International Engineering Consulting Corporation (and Fu's former boss), to evaluate the reform strategy. In his report to Wu, Tu agreed that the MOR could proceed. The SDPC, SETC and State Commission for the Restructuring of the Economic System concurred with Tu's opinion (Fu, 2017a). On April 4, 2000, at a meeting on railway reform held in Zhongnanhai (the residential compound of top Chinese leaders), Zhu Rongji and Wu offered their final approval, which Fu relayed to the members of the central ministry on April 9, 2000.

Despite Fu Zhihuan's wish to improve capacity deficiency, growth in railway production failed to draw level with national GDP growth (see Figure 2). China's rapidly growing economy needed an efficient logistics and distribution system that could move production materials from the northern and western regions to the southern and eastern regions of China. However, the central ministry was simply unable to meet those goals.

Figure 2: Growth in GDP and Transportation Capacity



Conclusion

This chapter began with a brief overview of centralizing efforts to bring railway transportation to order in 1975. However, Deng Xiaoping and Wan Li's efforts to restore stability were abbreviated when Deng lost his position after the April Incident in 1976. The end of the Cultural Revolution and the onset of reform and opening spurred the MOR to restore production and railway transportation. After the Third Plenum of the Eleventh National Party Congress in November 1978, the MOR entered in a period of adjustment, reform, rectification and improvement. As for the Party-state, it also underwent a prolonged period of searching—albeit, on how to build a socialist economy.

In the first 25 years of the reform and opening period (1978 to 2002), sectoral development focused on decentralization, deregulation and marketization. These reform initiatives failed to increase much-needed transportation capacity to meet the demands of national socio-economic development. By the end of the 1990s, capacity deficiency had ironically forced the MOR to become one of the most efficient railway systems in the world; with 6% of global kilometrage, China's national passenger and freight volume accounted for a quarter of the world's total (Wang and Su, 2003). The seasonal nature of China's railway transportation forced the MOR to sacrifice freight for passenger transport, short-distance travel for medium- and long-distance travel and service quality for volume during peak seasons such as Chinese New Year.

The absence of power concentration resulted from a combination of factors. First, sectoral development lacked central commitment, as top leaders did not provide a significant amount of financial support. Deng Xiaoping and Zhu Rongji, in particular, focused on decentralizing and marketizing the sector. In the 1980s, Deng took three steps to decentralize the central ministry: weaken the Railway Corps, fiscally starve the central ministry through national budget reforms and decentralize the MOR through the CRS. In the 1990s, Zhu called for the central ministry to improve transportation capacity but only provided limited financial commitment through gradual pricing reforms. Zhu was more concerned with the growing debt problem than the construction of railroads. In light of decentralization and sectoral restructuring, railway construction did increase toward the end of the 1990s. Top leaders regained interest in

railway development, culminating in Jiang Zemin's decision to intervene in favour of and approve the Qinghai-Tibet Railway project.

Post-Mao national and sectoral reform lacked an alternative developmental approach, other than pragmatism. Reform and opening were driven by situational needs, as reformers sought international experiences to help develop the Chinese economy and learn about the role of national governments in economic development. During the process, the Party-state pushed through four domestic reform strategies. In the late 1970s and early 1980s, Deng Xiaoping focused on modernizing the Chinese military and reforming the Party. In 1985, fiscal decentralization and national budget reforms were implemented to stimulate regional growth and marketize infrastructure development. In 1993, Zhu Rongji reversed fiscal decentralization and implemented the tax-sharing reform. At the same time, Zhu called for the modernization of Chinese enterprises. Finally, in 1998, large-scale reforms to the State Council and SOEs took place to streamline governmental functions and relinquish control over medium and smaller SOEs.

China's developmental institutions were also evolving during the 1980s and 1990s. The SEC was strengthened, while the SPC's roles as macro-economic manager and medium- and long-term planner were steadily reduced. It was believed that Zhu Rongji's mistreatment during the Anti-Rightist Movement and the Cultural Revolution had deeply scarred him, and the weakening of the SPC was intended to avenge past misfortunes (Heilmann et al., 2013: 31). As a result, the SPC and the SDPC's overall planning, medium- and long-term industrial programs and FYPs became redundant and obsolete. Economic targets became guiding and suggestive, as the SPC and the SDPC's roles were restricted to balancing the national economy.

Strategic industrial policy and multi-year programs were also lacking. Detailed industrial designs found in the First FYP and the Third Front Movement were no longer present. Due to fiscal starvation, the MOR began to develop on the cheap by making full use of available funding, starting in 1986. Network expansion and upgrades focused on strengthening capacity in coastal and northeastern regions. In the 1990s, Han Zhubin granted regional bureaus more autonomy, introduced new pricing on new lines and diversified the operations of the MOR. By 1997, these reform efforts had driven the MOR deep into debt. In a bid to balance the budget, Fu

Zhihuan further decentralized the central ministry's decision-making capacities in 1998, bifurcated non-transport sectors and vertically separated the central ministry in 2000.

Despite slow growth in sectoral development, two initiatives during the post-Mao era laid the foundations for the success of the BLF (2003 to 2011). First, the chief engineer responsibility system allowed the central ministry to integrate railway construction and rolling stock production with its operational needs. Technocrats were pushed to the frontlines of railway production. The MOR's chief engineers in the 2000s, He Huawu and particularly Zhang Shuguang, played critical roles in China's rapid highspeed rail development. Second, sub-national innovation networks in the research and development of highspeed trains provided the basis for a centralized and national innovation system.

The emergence of transportation bottlenecks motivated the State Council to reverse its commitment to market reforms—namely, both Fu's vertical separation and Liu Zhijun's regional competition (Wang, 2013). Instead, the central government endorsed Liu Zhijun's new developmental approach: a BLF in national railway development. The BLF was designed to achieve rapid network expansion and upgrades and railway equipment modernization through power concentration and technology leapfrogging.

Chapter 5

A Big Leap Forward in Post-WTO Development

"The railway sector needs to be comprehensively planned at the macro-level."

Zhang Guobao,[12] interview with China Economic Weekly, July 23, 2019

Introduction

The external conditions in which to develop the Chinese economy became increasingly complex as China's entry into the World Trade Organization (WTO) brought new geoeconomic challenges to the Party-state. In his speech at the Sixteenth National Party Congress on November 8, 2002, Jiang Zemin argued that the Party-state must be prepared to confront challenges from economic globalization, rapid technological evolution and intense global competition. Given this perspective, economic reform in the post-WTO era focused on strengthening the role of the central government in managing the national economy. Indeed, Jiang concluded that the national central government should be responsible for "economic adjustment (*jingji tiaojie*), market regulation (*shichang guanli*), social management (*shehui guanli*) and public service provision (*gonggong fuwu*)." The provision of both hard and soft infrastructure became a marked feature of the statist consensus that emerged under the Hu Jintao and Wen Jiabao administration (Lin JYF, 2012; Shih, 2018).

The new Hu-Wen leadership focused on the idea to improve the industrial structure and strengthen the international competitiveness of China's centrally-owned state enterprises (SOEs) (Nolan, 2011). To achieve economies of scale, state planners identified several sectors as the commanding heights and insulated them from competition through one round of mergers. Notable examples include the consolidation of the civil aviation industry from ten to four carriers and the telecommunications sector from seven to three carriers.

[12] Zhang Guobao served as the Vice Chairman of the State Development Planning Commission (1999 to 2003) and the Vice Chairman of the National Development and Reform Commission (2003 to 2011).

The top leaders moved to strengthen the weak railway transport sector, which had become a bottleneck in the national development of forces of production and production capacity. During peak passenger transport seasons, the movement of raw materials, especially coal, became problematic at best. Additionally, state planners confronted international competition in the sector. Due to China's WTO agreement, the central railway ministry was required to gradually open the domestic freight market and make it fully accessible to foreign firms by 2007. Therefore, the sector faced two immediate challenges from China's WTO accession. First, the cost to modernize the sector became higher than what it had been in the late 1980s and 1990s. Second, a rapidly globalizing world no longer provided the environment in which gradual indigenous innovation could be pursued.

Power concentration was adopted by the state planners and sectoral policymakers to improve the railway sector's performance and competitiveness. Railway modernization in the post-WTO era could be divided into two periods: the Big Leap Forward (BLF) period (2003 to 2011) and the post-BLF period (2013 to 2019). The post-BLF period began with a watershed reform that transitioned the Ministry of Railways (MOR) into an SOE—the China Railway Corporation (CRC). Despite the 2013 reform, power concentration has remained as the *leitmotif* of sectoral development.

Hu Jintao and Wen Jiabao took a different reform path than Zhu Rongji, who had emphasized market coordination instead of government planning. In stark contrast with Deng Xiaoping and Zhu Rongji's decentralizing moves, new state planners such as Wen Jiabao, Huang Ju and Zeng Peiyan decided to recentralize the railway sector, placing it under the direct control of the State Council and the coordination of the newly established National Development and Reform Commission (NDRC) (Koll, 2019). While Zhu Rongji and Wu Bangguo supported Fu Zhihuan's proposal to vertically separate the sector, Wen Jiabao rejected market reforms, including Liu Zhijun's initial proposal to introduce regional competition. Additionally, Huang and Zeng strengthened the MOR's centralizing capacities. In 2008, against a possible reform to marketize the MOR, the State Council sided with the central ministry and rejected the NDRC's call to separate the MOR's administrative and corporate functions. The State Council only introduced such a reform in 2013, after rampant corruption problems within the sector and the

growing public outcry concerning highspeed rail (HSR) safety. The reform, however, maintained a statist monopoly.

The introduction of the "five coordinations" (*wuge tongchou*) marked a shift in governmental priorities—from economic restructuring to strategic coordination, resource mobilization and macro-economic control (Heilmann et al., 2013). At the Third Plenum of the Sixteenth National Party Congress in 2003, Wen Jiabao emphasized that the central government should play a coordinating role in urban and rural development, regional development, socio-economic development, harmonious development, domestic development and opening the economy to the outside.

The emphasis on strategic coordination shaped two metavisions concerning SOE reforms: tiered economy and controlled competition. Three major ownership tiers gradually took shape, as the Party-state established a political pecking order in its management of the Chinese economy (Huang YS, 2008).[13] Controlled competition was introduced to regulate the top tier as the central government placed SOEs under the dual regulation of the State-owned Assets Supervision and Administration Commission (SASAC), the principal investor, and quasi-independent regulators (Pearson, 2005). To further advance and preserve the role of the state, the number of SOEs under each strategic sector was reduced to three to five, effectively forming an oligopolistic market structure. During this round of reform, new national champion groups were created, including three in civil aviation, Air China, China Eastern Airline and China Southern Airline; four in commercial banking, the Agricultural Bank of China, the Bank of China, the China Construction Bank and the Industrial and Commercial Bank of China; and four in telecommunications, China Mobile, China Netcom, China Telecom and China Unicom.

In the railway sector, the top leaders requested the Ministry of Railways (MOR) to seize the opportunity and accelerate railway development. In 2003, Huang Ju, on behalf of the Politburo, visited the central ministry, highlighting the need to improve transportation capacity and solve transportation bottlenecks. Therefore, as "governments around the world have taken

[13] Concerning tiered economy, the top tier comprises China's strategic industries. The middle tier comprises enterprises with diverse ownership. The Party-state does not exercise direct control. And the bottom tier mostly consists of private firms (in Kennedy, 2011).

major steps to restructure their old government-owned monopoly railways," China decided to strengthen the monopolistic railway transport sector under the MOR and pursued a BLF in national railway development (Pittman, 2015: 99).

The BLF boiled down to rapid network expansion, upgrades and railway equipment modernization through centralization and technology leapfrogging. According to Liu Zhijun, railway development remained as the backbone (*gugan diwei*) of China's nascent comprehensive transportation system (*zonghe jiaotong tixi*). Therefore, sectoral development must be planned to serve the broader strategic developmental objectives of the state. Railway equipment modernization could be achieved by forging several new national champions in the rolling stock sector (Liu ZJ, 2004). The MOR transferred four of its rolling stock research centres in Dalian, Sifang, Qishuyan and Zhuzhou to the newly created China South Rolling Stock Corporation (CSR) and China North Rolling Stock Corporation (CNR) to enhance the two rolling stock groups' research capacity. The central tenets of the BLF reflected the broader movement aimed at 1) fostering comprehensive and cross-sectoral planning and 2) creating globally competitive, large and multi-plant national champions (Heilmann and Shih, 2014; Nolan, 2001).

China's developmental institutions were strengthened to take on the task of cross-sectoral and multi-year planning. After the 1998 restructuring of the State Council, two more rounds of reform took place in the 2000s to further consolidate the role of the central government as a market-oriented macro-manager. In 2003, Wen Jiabao strengthened the state's planning organ and eliminated the State Economic and Trade Commission (SETC). Wen did not see the SETC "as an effective vehicle of supra- and interministerial policy formulation" (Heilmann and Shih, 2014: 13). Two new state organs were created: the NDRC and the SASAC. The NDRC was designed to facilitate the shift toward national planning and cross-sectoral coordination—with restrictive targets. Treated as a "mini State Council," the scope of the NDRC's authority encompassed macro-economic planning (medium- and long-term) and the coordination and supervision of developmental policies. The commission did so by integrating China's developmental agenda and (cross)sectoral multi-year programs into the state's Five-Year Plans

(FYPs), which outlined restrictive economic targets. The creation of the SASAC was designed to enhance the state's "ownership agency" in strategic sectors (Naughton, 2015: 46-48).[14]

In 2008, another round of centralization took place as the State Council created several "super ministries" (*da buzhi*), such as the Ministry of Transport, the Ministry of Industrial and Information Technology and the Ministry of Environmental Protection.[15] The intention was to streamline overlapping responsibilities among various state ministries and strengthen the integration of administrative organs (*jiada jigou zhenghe lidu*). Furthermore, the NDRC's power was strengthened after the 2008 global financial crisis, as it was placed in charge of China's stimulus package in light of a recession.

The new administration also emphasized the need for strategic industrial policies and multi-year programs, with Wen reiterating that industrial policies would not be approved without such programs (*meiyou guihua bupi xiangmu*). Moreover, policy formulation must pay attention to top-level design (*dingceng sheji*) and overall planning (*zongti guihua*) (Heilmann and Shih, 2014: 14). Therefore, the new task for Zeng Peiyan and Ma Kai, the new Chairman of the NDRC, was to establish a comprehensive planning system that could integrate cross-sectoral and project planning (*zhuanxiang guihua*), medium- and long-term planning and annual planning (Bai and Zhao, 2013). In addition to institutionalizing national planning, the central government strengthened its control over subnational cadres. A new cadre evaluation program was designed to weave performance in meeting central targets with promotion (Ong, 2012; Shih et al., 2012).

The Medium and Long-term Railway Program (MLTRP) became the hallmark of sectoral industrial policy. It was designed to reflect overall planning, and its implementation was "complemented by a series of Five-Year Plans" (Lawrence et al., 2010: 3). To support the implementation of the MLTRP, the central government began to provide significant and unprecedented financial commitment and policy support. Vertical separation was displaced by

[14] The State Council merged its Office for Restructuring the Economic System with the State Economic and Trade Commission (SETC) and the State Development Planning Commission (SDPC) to create the NDRC. The SETC's role in managing and reforming SOEs was transferred to SASAC, which then concentrated SOEs in the strategic sectors including oil and petrochemicals, energy, telecommunications and military industries.
[15] In 2008, the Ministry of Communications, Civil Aviation Administration and the State Postal Bureau merged into the new Ministry of Transport.

the old tactics of vertical integration (*wangyun heyi*) and the (broadly defined) integration of railway construction and operation (*jianyun heyi*).

Further, centralization, the forging of new national champions and technology leapfrogging were pursued simultaneously. In the process, three new national champions were created in the freight sector and seven in the rolling stock sector.[16] Technology leapfrogging was adopted in the development of highspeed trains, high capacity and heavy axle load diesel and electric locomotives, all under centralized management.

Maoist and post-WTO power concentration must be distinguished. In the Mao era, as documented in the First, Second and Third FYPs, the central government controlled all aspects of economic activities under command-control planning. Railway production and planning in road construction, freight turnover rates and rolling stock manufacturing were fixed and in proportion to the national capacity in steel production and energy supply. Despite central attention and commitment, planning was institutionalized but under frequent and periodic revolutionary attacks. In addition to political movements that made planning obsolete, various actors could influence the outcome of national planning as well. They include the State Council, the Central Military Commission, the State Planning Commission, the State Economic Commission and the State Construction Commission, to a certain degree. As a result, power concentration relied on the proper transmission of administrative orders to overcome fragmentation and implementation problems.

Post-WTO power concentration reflected significant government commitment to support market-oriented development and uphold national and sectoral planning, which were recentralized and institutionally streamlined. The newly created NDRC became responsible for the drafting of the basic guidelines (*jiben sixiang*) for national development, placed a sharper focus on the strategic and medium- and long-term development, and decided on market-rational restrictive targets. Railway policymakers were tasked to complete these targets through

[16] The three new national champions in the freight sector were China Railway Container Transport Corporation, the China Railway Special Cargo Service Corporation, and the China Railway Parcel Express Corporation. The seven national champions in the rolling stock sector were: CNR Changchun, CNR Tangshan and CSR Sifang in highspeed trains, CNR Dalian and CSR Qishuyan in diesel locomotives, and CNR Datong and CSR Zhuzhou in electric locomotives.

organizational *and* market mechanisms. The state, on the other hand, provided policy support to insulate sectoral policymakers from bureaucratic fragmentation and societal backlash. Power concentration had evolved toward one that focused on fostering a more assertive state to manage market dynamics and resource distribution.

Table 1: The Third and the Eleventh FYP in Strategic Planning.

Third FYP (1965 to 1970) —Third Front Movement	Eleventh FYP (2005 to 2010) —Western Development Project and Northeast Rejuvenation Project
• 9.3 billion CNY toward the railway construction ○ 3 billion CNY toward the laying of new tracks (1,707 km in total) in the Southwest • Complete Guiyang–Kunming Railway in 1966, and Chengdu–Kunming Railway in 1969 (with an additional 1.6 billion CNY) • Focus on the Chengdu–Kunming Railway first, then work on the following lines in tandem: Chengdu–Wuhan Railway, Chengdu–Zhengzhou Railway, Beijing–Yuanping Railway and the Houma–Xi'an Railway • Purchase 1,230 new locomotives to meet the annual freight volume of 700 million tons	• Strengthen infrastructure development • Construct international and interregional railway lines • Construct new eastward railway lines for coal transportation • Strengthen national trunk lines in the Northeast

This chapter is divided into six sections, including the introductory and concluding sections. The second section focuses on what went wrong with Fu Zhihuan's vertical separation and why the State Council decided to reverse its earlier commitment to market reforms. The third section explores the BLF and the MLTRP, while the fourth section examines some of the notable legacies of the BLF and the MLTRP. The fifth section discusses the MOR's transition into the CRC in 2013 when the central government decided to separate the government from business but retain a monopolistic transportation sector.

The Defeat of Vertical Separation

In the initial drive toward vertical separation, problems started to surface in the newly created passenger service firms. Inter-bureau conflicts increased, as these regional firms limited the number of tickets available to railway stations across the country. Cut-throat competition and regional strife forced travellers to purchase tickets after they had boarded the train (Li W, 2012). Zhengzhou Railway Bureau recorded a massive loss of 70 million CNY in the first year after the official introduction of vertical separation (Li W, 2012).

In addition to operational deficiencies, railway experts from both the World Bank and the Organization for Economic Cooperation and Development (OECD) cautioned against the pursuit of progressive reforms. In March 2000, Louis Thompson, from the World Bank, briefed Fu Zhihuan and suggested a more gradual and practical approach. Thompson shared with Fu that sectoral reform should experiment with the United States' model of regional competition before vertical separation (Thompson, 2000). In January 2002, the OECD and the State Council's Development Research Centre (DRC) hosted a seminar on railway reform in Beijing. In a report produced as a result of the seminar, advisers from the OECD suggested that horizontal separation and vertical separation should be pursued *after* "the conditions for commercial operation have been established" (OECD, 2003: 47).

The DRC, however, believed that sectoral reform must be introduced as soon as possible due to pressure from the State Council. The DRC proposed to reform the central ministry along the following lines: 1) separate government and business, 2) introduce competition within the ministry, 3) stimulate investment according to market mechanisms and 4) establish a complete, fair, unified and efficient regulatory system (Li W, 2012). The core of this reform proposal was similar to Fu Zhihuan's vertical separation. Both the DRC and Fu believed that such a comprehensive reform agenda could increase transportation capacity to meet the demands of a rapidly growing economy (Li W, 2012).

However, senior leaders began to regret their prior commitment to vertical separation and vacillated between Fu Zhihuan's vertical separation and the DRC's new proposal. At the Fifth Meeting of the Ninth National People's Congress in March 2002, Zhu Rongji asked relevant

departments to accelerate the drafting of a new plan concerning sectoral reform. To railway policymakers, the speech signalled the defeat of Fu's vertical separation and the premier's dissatisfaction with the DRC proposal (Tjia, 2015: 87). In early 2003, the new railway minister, Liu Zhijun, submitted an updated reform proposal that focused on regional competition under an integrated national network—also known as horizontal separation (*wangyun heyi quyu jingzheng)*. The State Council, now under Wen Jiabao, rejected Liu's plan.

By 2003, the State Council had become acutely aware of the problems associated with railway transportation. According to Huang Ju, the principal contradiction in railway production was that sectoral production could not meet the state and society's increasing needs—hence, a lack of transportation capacity (China Railways Yearbook, 2004: 3). Even before China's WTO accession, capacity deficiency had been a troublesome issue. In the early 2000s, for example, agriculture production was compromised due to significant delays in the delivery of farming products such as pesticides and seeds during Spring Festival Travels (*chun yun*) (Tang, 2004). Southern Chinese provinces were hit the hardest as their spring harvest season began almost immediately after the end of the annual *chun yun.*

In the early 2000s, additional socioeconomic problems included power supply shortages and growing energy consumption. Since both were needed to ensure China's "peaceful development" and to maintain a high level of manufacturing, the State Energy Leadership Group was established under Premier Wen Jiabao to ensure that an adequate supply of energy could be secured for economic growth and household living (Tjia, 2015: 90). Other notable members included Huang Ju, Zeng Peiyan, Ma Kai and Bo Xilai.

However, as the dominant distributor in coal transport, the railway ministry struggled to meet the national demand. In 2002, the central ministry allocated only 12 million tons despite an order of 20.46 million tons at the Changsha Coal Ordering Conference (Tjia, 2015: 91). During the winter of 2003, and especially during Spring Festival Travels, the application for coal transportation reached 70,000 carriages per day, but the central ministry's loading capacity could accommodate only 40,000 carriages. The lack of freight capacity forced large manufacturing provinces, such as Henan and Jiangsu, to reduce their energy consumption levels (Tang, 2004).

The energy situation worsened as the MOR accommodated only approximately 30% of the national demand in 2004 (Tjia, 2015: 91).

Problems in freight transport were directly caused by the need to move large segments of the population during the Chinese New Year. At the national level, the central ministry could provide only 2.42 million seats per day, yet the daily loading capacity reached as high as 2.9 million passengers (Li and Su, 2003). The suppression of freight for passenger service (*yahuo baoke*) became a national strategy as the central ministry struggled to transport people home for the Chinese New Year. On trunk lines between Beijing and Shanghai and Wuhan and Guangzhou, all freight trains had to be suspended to provide room for medium- and long-distance passenger trains—up to 280 dispatches per day (Li and Su, 2003). The Beijing-Shanghai Railway, which accounted for only 2% of the national kilometrage, was required to accommodate more than 10.2% of the national turnover (Li and Su, 2003). Ticket purchases during peak seasons were especially challenging; passengers had to join the queue as early as 4 to 5 a.m. to purchase their train tickets (Tjia, 2015: 106).

In addition to seasonal problems, problems of capacity deficiency persisted throughout 2004, as the central ministry was able to meet only 60% of the national demand in both passenger and freight transport (Lian and Su, 2003). Container services were underdeveloped in the late 1990s and early 2000s (Luger, 2008: 208-209). During that period, the national priority in freight transportation was on bulk goods, which accounted for more than 70% of the total freight volume (Wang Huiying, 2018: 28). In light of high demand and low turnover, the MOR failed to invest in the necessary railway infrastructure upgrades to improve capacity, such as the electrification of existing lines, the establishment of container carriages and the development of craning facilities (Tjia, 2015: 104).

Against this backdrop, railway policymakers and state planners failed to reach a consensus on the path for sectoral reform, as the two shared highly different understandings of what had been hindering the national system. Fu Zhihuan and the DRC, to a lesser degree, believed that the state's new-found interests in infrastructure investment after the Asian financial crisis and China's entry into the WTO were important catalysts to deepen marketization. Fu and the DRC believed that the core issue concerning railway development was incompatibility—that

the existing structure of decision-making, management and operation could not meet the demands of a more market-oriented economy.

The senior leaders shared a different understanding. They believed that sectoral development should focus on rapid network expansion and upgrades and railway equipment modernization, as indicated in Huang Ju's speech in 2003. Senior leaders believed that sectoral transportation bottlenecks could not be solved through mere market reforms. The central ministry needed to double its freight transportation volume and construct an additional 100,000 km of railroads to meet the basic national demand, as these measures could increase the daily loading rate to an estimated 150,000 to 200,000 carriages (Zhao, 2005). This doubling of capacity, in the eyes of senior leaders, was crucial to China's integration into the free-trade world. Therefore, further decentralization-oriented market reforms stood at odds with state planners' recentralization strategies, which focused on fostering national champions that could solve domestic economic problems and compete internationally.

The WTO Challenge

As China continued to open to the outside, the railway sector had become increasingly important. While the provision of safe, accessible and quality transport service to passengers became a matter of social stability, adequate accommodation of national economic needs through freight transportation was a matter of China's economic lifeline. Chinese state planners and railway policymakers were staring at the barrel of two guns in the early 2000s: an insufficient national railway network, which limited the number of operating trains, and a shortage of modern and heavy axle load locomotives were symbiotic causes of capacity deficiency. Indeed, the answer to China's WTO challenge was not a simple one—increase transportation capacity. Due to China's WTO entry agreements, domestic operators were forced to face the onslaught of multinational corporations wanting to gain access to the Chinese market and establish their own distribution and logistics systems. If successful, multinational corporations could push domestic operators out of the freight market.

The purpose of China's entry into the WTO was to maintain its economic growth, open its domestic market for foreign investment, bolster the export sector and integrate into the free-

trade world (Luger, 2008: 24). Under the accession agreement, China was required to open market access in the freight sector in three phases. Between 2001 and 2004, foreign firms wishing to operate in China could take a minority of shares in domestic and international joint ventures; between 2004 and 2007, the proportion of shares owned by foreign firms could expand into majority positions; and after 2007, the Chinese government would lift all market-access restrictions (TERA International Group, 2007: ii).

By 2002, international logistics firms—such as DHL, UPS, FedEx and TNT—had already been working with Sinotrans in exploring the Chinese market. Some of them expressed interest in continuing to invest in China's logistics sector. For example, in 2001, the Canadian Pacific Railway formed a joint venture with China Railway International Freight Forwarding, Lanzhou Railway Bureau Container Transportation Co., and three additional container transport centres from Lanzhou, Yinchuan and Xi'ning. Surprisingly, and although it was not legally permitted, the Canadian Pacific Railway took 50% of the total shares.

The emergence of new market actors challenged state monopoly. The shift from one service provider to many providers could erode the state's control over the national distribution system, on which it relied for the transportation of bulk goods for economic production and industrial growth. In addition to international competition, the railway sector was also facing intense challenges from domestic sources. The emergence of road, waterway and air transportation came at the expense of the railway sector, which saw a steady decline in market shares.

Other challenges, identified in the report submitted to the central ministry by the Asian Development Bank, included (Tera International Group, 2007: iv):

1. The separation of government and business,
2. Protecting lucrative market niches from investors,
3. Improving network capacity by large sums of capital investments, and
4. Maintaining and improving railway safety.

In light of these challenges, state planners decided that existing reforms could not meet the urgent need to increase capacity and the new standards of globalization. Indeed, the primary concern of the Party-state was to accelerate the building of national champions that could solve internal transportation problems as well as engage against international competitors in a short period of time. The state planners understood that the advantage of reduced costs for consumer goods would not be enough to ensure future success in maintaining and expanding China's high level of exports. Therefore, the building of a reliable, efficient and cost-effective logistics and transportation sector was essential for the Party-state, since the efficient integration of a national supply chain would increase China's competitiveness in the global market.

Moreover, state planners understood that, in an era of globalization, the environment for slow, gradual and indigenous innovation no longer existed (L3ZB18). Railway equipment modernization and network expansion, involving highly specific technology and equipment, require intensive capital investment. Thus, the nature of railway modernization rendered immediate market competition inappropriate against state planners' urgent need to improve transportation capacity (Tjia, 2015: 154). Therefore, policy tools were needed to ensure that the sector could compete in the domestic market through the provision of intermodal transport services. Against this backdrop, state planners decided to deploy a set of economic tools that could "provid[e] a degree of insulation from the vicissitude of globalisation" (Friedberg, 2018: 10). These tools strengthened the comparative advantages of China's strategic sector by redistributing productive sources and achieving economies of scale (Eaton, 2016; Hsueh, 2015; Nolan, 2014; Tjia, 2015).

New railway policymakers in 2003, such as Liu Zhijun and Huang Min, the new Director of the MOR's Development and Planning Division, agreed with the concept that railway development must be done through network expansion *and* management reform (Tang, 2004). Liu's reform was, of course, not market-oriented, as the post-WTO ministry became a bulwark against marketization. Thus, the new approach in sectoral development was a symbiotic combination between rapid network expansion and upgrades on the one hand and railway equipment modernization on the other—all done through centralized means.

Marching into the BLF

Liu Zhijun quickly recentralized the MOR's assets and realigned the previously active transport-related businesses. In a public appearance, Liu argued that reforms must improve the efficiency of railway transportation in response to inadequate capacity. Liu asserted that reforms must also support the Party-state's macro-management of the national economy and defence (People.cn, 2012).

Liu Zhijun argued that the BLF was an appropriate developmental approach in meeting the demands of the state. Liu identified four key reasons behind his push toward a centralized modernization effort. First, China's geographical and geological conditions required medium- to long-distance means of transportation, which could only be supplied via rail. Second, China's imbalanced industrial grid and resource allocation required a unidirectional movement of bulk goods, from north to south and west to east. Third, the transportation cost for a large segment of the population—rural and migrant communities—needed to be subsidized. Fourth, railway transportation was more environmentally friendly and cost-efficient than other modes of transportation (Lian and Su, 2003).

Therefore, the improvement of sectoral competitiveness, according to Liu, must be done through rapid network expansion, upgrades and railway equipment modernization under centralized control. Titular market-oriented institutional and management reforms could be pursued in light of the pressing need to improve capacity. Liu asserted that the implementation of the BLF must comply with market demands. However, Liu's understanding of the market cannot be described as profit-oriented. Market demands (*shichang xuqiu*), to Liu, meant compliance with the precondition of building a moderately prosperous society (*fucong quanmian jianshe xiaokang shehui fazhan xuyao wei qianti*). As a result, such demands manifested in the call to create opportunities for sustainable development and land development (*wei jingji chixu fazhan he guotu kaifa chuangzao tiaojian*) through railway network expansion, improvement and upgrades (Lian and Su, 2003).

Despite the need for sustained intensive capital investment over the long term, Liu Zhijun argued that railway development could profoundly affect socio-economic development.

Therefore, railway planning must be made with a strategic, forward-looking and long-term vision that could consider both the big picture of national development as well as a solution for the immediate issue of capacity deficiency (Lian and Su, 2003). Seemingly, Liu's statement signalled that the immediate and medium-term task of the central ministry was to improve transportation capacity at all costs. Indeed, Liu did not pay much attention to the problems of profit and debt. State planners, at the time, also considered profitability as a minute issue compared to the possibility of stimulating economic growth and domestic consumption (Bai and Zhao, 2013).

As a result, in 2003, Liu Zhijun boldly presented the BLF in his speech titled *Implement the "Three Represents," Seize the New Historical Moment, Strive to Realize the BLF of the Chinese Railway Sector,* and outlined the following four characteristics:

1. The principal contradiction in the railway sector could only be solved via the BLF.
2. Only the BLF could provide reliable support to the building of a moderately prosperous society.
3. The new industrialization of the sector could only be achieved via the BLF.
4. The realization of the BLF could only be achieved by meeting specific baselines and criteria (China Railways Yearbook, 2004: 9-10).

Under the BLF, the sector must 1) become as developed as that of the developed countries within a relatively short period of time, with fewer complications and fewer consequences and 2) skip some unnecessary procedures (China Railways Yearbook, 2004: 9-10). The BLF resulted in the stalling of market reforms in the railway sector as the MOR centralized all powers and coordinated all relevant actors in its push toward rapid development—especially highspeed rail (HSR) development. With support from the Politburo and the State Council, the BLF emerged as the guiding approach to sectoral development for the next seven years (from 2003 to 2011). Despite the fall of Liu in 2011, major tenets of the BLF—rapid network expansion and upgrades and railway equipment modernization through centralized means—have remained the principal developmental approach in the post-BLF era, from 2013 to 2019.

In 2003, Vice Premier Huang Ju visited the MOR and offered top leaders' unswerving support for the BLF. On behalf of the Politburo and the State Council, Huang asked the sector to "trailblaze into a new era and a new stage in railway works" and "concentrate powers to solve major problems and accelerate railway development" (China Railways Yearbook, 2004: 3). After Huang's visit, the MOR accelerated the preparation of a sectoral multi-year program—the MLTRP—and submitted it to the NDRC in June, after many rounds of sectoral consultation with regional bureaus, non-transport SOEs and railway experts.

NDRC Vice Chairman Zhang Guobao was tasked to guide sectoral and cross-sectoral planning. Upon receiving the draft, Zhang worked with various departments within the commission, other state ministries, universities, research institutes and provincial governments on a revised version. Based on the MOR's draft version, the commission suggested double-tracking the Harbin–Manzhouli Railway, dropping the Kashgar–Lhasa Railway and constructing a new trunk line between Hami and Linhe, Inner Mongolia. Ningxia proposed to add an extra stop in Yinchuan between Taiyuan and Zhongwei, and Guangxi proposed two new trunk lines between Litang and Zhanjiang, and Litang to Qinzhou and Fangcheng.

Concerning HSR development, Zhang Guobao axed a wheel–track HSR corridor between Hangzhou and Shanghai to avoid pushback from supporters of maglev trains. Zhang believed that further discussions were needed to decide how to link these two fast-growing cities. As a result, the MOR bypassed Hongqiao Airport and suggested building a new HSR station in Qibao, a small township southwest of Shanghai. The decision to transform Hongqiao Airport into an inter-modal transportation hub was made after the establishment of the Beijing–Shanghai HSR Construction Leading Group in 2007. Zeng Peiyan was appointed as the director, and Ma Kai, Zhang Ping and Liu Zhijun were named as Zeng's assistants. Other notable members of the Leading Group included vice ministers from Ministries of Science and Technology, Finance, National Land Resources, Information Industry, Communications and Public Security.

The MLTRP suggested three approaches in improving the national network: 1) construct new trunk and branch lines, 2) separate passenger and freight lines and 3) upgrade existing lines. On January 7, 2004, the State Council approved the revised version of the MLTRP based on the advice from the NDRC. After the State Council's approval, the NDRC worked toward weaving

this sectoral multi-year program into the Eleventh FYP (2006 to 2010). The targets of the new FYP emerged as restrictive—not indicative or guiding. One of the most well-known propositions in the 2004 version was the "Four Vertical and Four Horizontal Passenger Networks" (*sizong siheng keyun zhuanxian*).

The program was also a comprehensive and detailed national developmental agenda between 2004 and 2020. Some of the precise targets included (Gov.cn, 2005):

1. The total kilometrage shall reach 100,000 km,
    a. 12,000 of which shall be passenger networks with a minimum speed of 200 km/hr,
    b. 16,000 of which shall be newly built,
    c. 13,000 km of existing lines shall be double-tracked, and
    d. 16,000 km of existing lines shall be equipped with electrification systems.
2. Separate passenger and freight lines.
3. Double-track and electrify 50% of existing lines.
4. Improve transportation capacity.
    a. Redesign the existing trunk lines between Beijing-Harbin, Beijing-Shanghai, Beijing-Kowloon, Beijing-Guangzhou, Lianyungang-Rotterdam, Shanghai-Wuhan-Chengdu and Shanghai-Kunming into double-track railways with electrification systems,
    b. Expand upon existing lines dedicated to coal transportation with the goal of transporting 1.8 billion tons,
    c. Build railway transportation hubs, and
    d. Establish logistical and containerization centres.
5. Promote technological innovation.
    a. Raise the speed of passenger trains and increase loading capacity for freight trains, and
    b. Continue to import advanced technology for self-innovation.

To reach these goals, in 2004, Huang Ju and Zeng Peiyan instructed the MOR and the NDRC to strengthen their guiding and coordinating capacities. In terms of railway equipment

modernization, Huang and Zeng asked the two state organs to raise the levels of research, manufacturing and design of locomotives, and strengthen the industry's international competitiveness (China Railways Yearbook, 2005: 90). Zeng's involvement in sectoral development was due to his new portfolio in cross-sectoral planning.

With the formulation and approval of the MOR's medium- and long-term plan, the central ministry was significantly weakened as a result of the State Council's effort to exert greater control. In the 1990s, the MOR received direct control signals from Li Peng and Zhu Rongji, while vice premiers such as Zou Jiahua and Wu Bangguo were responsible for day-to-day supervision. However, the formulation and approval of the BLF and MTLRP were under the guidance of Vice Premier Huang Ju, who, while he was a member of the Politburo's Standing Committee, ranked lower than Premier Wen Jiabao. The same formulation and approval process highlighted the role of the NDRC under Chairman Ma Kai. Since its inception, the NDRC gained much power *vis-à-vis* the MOR, as the commission became responsible for formulating a railway reform agenda *and* approving sectoral multi-year programs. The gradual strengthening of the NDRC eroded the MOR's monopoly on macro-sectoral planning.

The NDRC's role as a comprehensive national planner became more evident in the 2008 revision of the MLTRP. To create the national stimulus package, Chairman Zhang Ping visited the railway ministry and exchanged views with Liu Zhijun. At the meeting, Zhang asked the commission's Transport Division, Finance Division, Pricing Division and Price Supervision Division to work with relevant departments of the MOR on ways to accelerate development. After the MOR had submitted the revisions, the NDRC, again, organized one round of cross-sectoral coordination and integrated the MLTRP into national and regional planning.

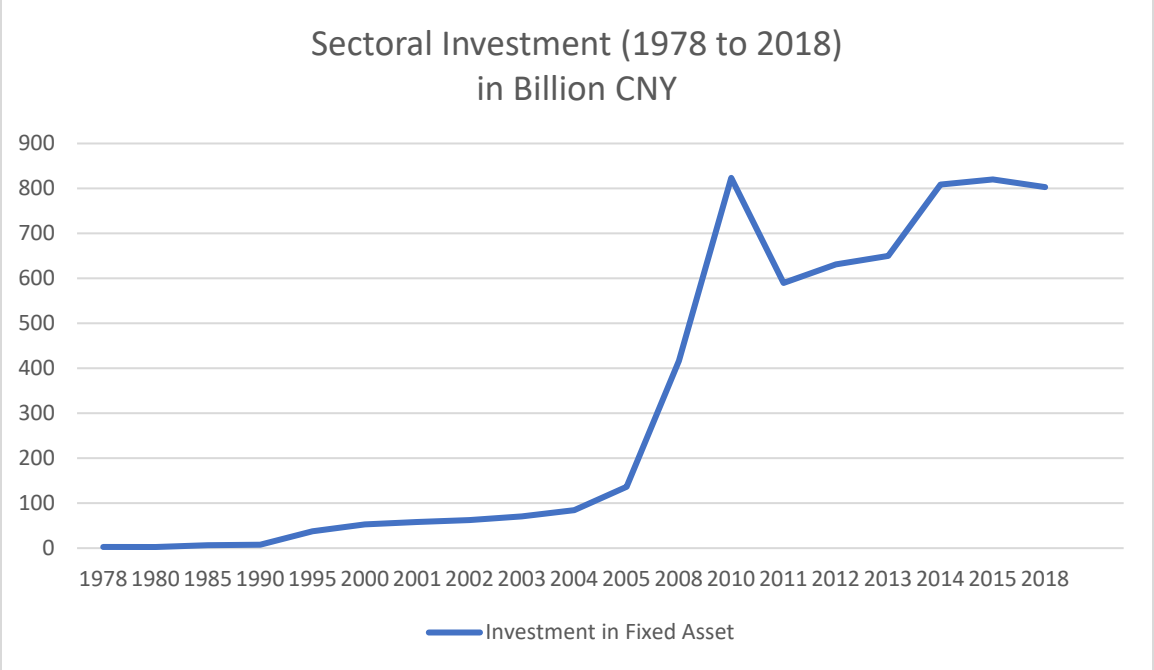
Despite a weakened central ministry, the State Council pledged its unconditional support for the implementation of the MLTRP. Unlike in the 1980s and 1990s, the Party-state provided an unprecedented amount of capital through lines of credit via its commercial banks, such as the Bank of Communications and the China Development Bank. As a result, investment in fixed assets soared in 2005—reaching 136.431 billion CNY, a noteworthy 51.4% increase over 2004 levels for infrastructure development, track renovation and rolling stock manufacturing. In 2005, investment in railway infrastructure increased by 65.6% over 2004 levels.

Table 2: Central Railway Investment (2005 to 2008)

Type of investment / Annual amount in billion CNY	2005	2006	2007	2008
Fixed Asset	136.431	208.836	255.24	416.547
Infrastructure	88.018	154.25	179	337.554
State	71.431	128.154	149.24	334.97
Track Renovation	21.834	22.256	19.8	22.66
Rolling Stock	26.579	32.33	56.44[17]	56.635

In a review of the Tenth FYP (2001 to 2005), Huang Ju praised the railway ministry for achieving great success (China Railways Yearbook, 2007: 3). Huang reminded the central ministry of its "sacred mission" (*shensheng shiming*) in promoting national socio-economic development, implementing state directives and pursuing the BLF comprehensively. To facilitate network expansion and railway equipment modernization, the State Council continued to support the central ministry financially. These increases cannot be considered marginal, as the post-BLF level of state investment dwarfed state investment in the 1980s and 1990s.

Figure 3: Sectoral Investment (1978 to 2018)



[17] Equals to the total amount spent during Ninth FYP (China Railways Yearbook, 2008).

Centralization and Forging National Champions

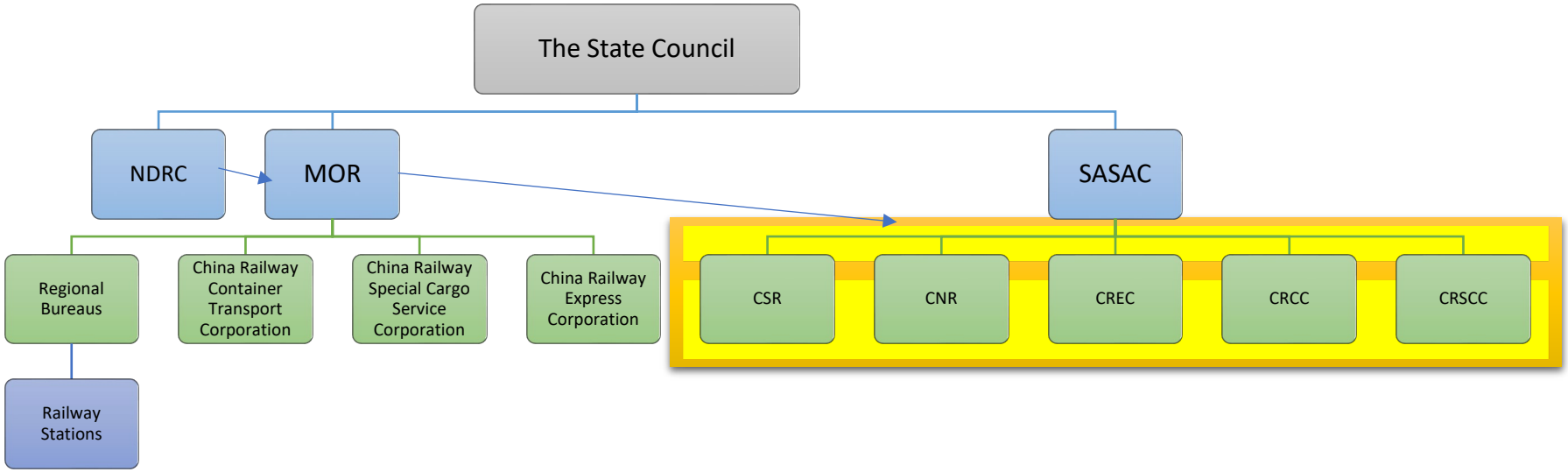
Prior to the introduction of the BLF, the central ministry, under Fu Zhihuan's bifurcation campaign, had already released its rolling stock corporation, civil engineering bureaus, research and design institutes, and signal and telecommunication firms by marketizing and corporatizing them (see Figure 4).[18] The ministry's 30-plus local rolling stock plants and four rolling stock research institutes were evenly divided and transferred to the newly created China North Rolling Stock Corporation (CNR) and the China South Rolling Stock Corporation (CSR). The goal of creating two rolling stock groups was to facilitate "controlled competition" and ensure the railway ministry's dominating position as a central regulator and single buyer. Despite bifurcation, the MOR continued to manage both administrative and business functions and controlled all aspects of railway production. In the 2009 version of *the Notices on the Responsibilities and Internal Organization of the Ministry of Railways*, the State Council retained the railway ministry's capacity as the central regulator in railway production.

While the Maoist sectoral centralization was no longer possible, the MOR relied on organizational influence and market leverage to ensure compliance. Organizationally, the MOR could still make recommendations to the SASAC concerning the appointment of senior leaders in these non-transport SOEs (SR27ML17; SN4MS17). Indeed, the SASAC "had some difficulty exerting influence over the top managers of these firms" (Pearson, 2015: 37). Therefore, the SASAC relied on the MOR to coordinate non-transport SOEs to serve the state's broader developmental agenda.

[18] Notable non-transport SOEs, in addition to the two in rolling stock, include China Railway Engineering Corporation (CREC), China Railway Construction Corporation (CRCC) and China Railway Signal and Communication Corporation (CRSCC).

Figure 4: Sectoral Structure (2003 to 2013)

Solid arrows indicate the direction of control, while solid lines indicate hierarchy and ownership. The highlighted entities are non-transportation SOEs in the railway sector.



In terms of market leverage, the MOR, as a statist monopoly, was the only buyer of goods and services provided by the non-transport sector and invited bidders to participate in railway construction and rolling stock manufacturing projects. Through its Railway Construction Fund, loans from domestic commercial and development banks, foreign loans and the national budget for science and technology innovation, the MOR paid non-transport SOEs for their services in road construction and rolling stock manufacturing. For example, in the construction of the Shijiazhuang-Wuhan HSR Corridor, the MOR's capital investment reached 57.24 billion CNY. The central ministry borrowed an additional 59.53 billion CNY from the World Bank, the Agricultural Bank of China, the Industrial and Commercial Bank of China, the China Construction Bank, the China Merchants Bank and the Bank of Communications (Zhang R, 2012). The MOR used the funding to purchase construction material and pay contractors, such as the China Railway Construction Corporation (CREC), for the roadwork.

Though "market reforms" had been implemented by the central ministry, the nature of these reforms focused on strengthening the statist monopoly, which allowed for greater control of the non-transport entities for rapid modernization. Indeed, the central ministry was far from marketized, as the sectoral developmental philosophy was focused on "seeking answers from railway construction" (*xiang jianshe yao da'an*).

In an integrated system in which railway operation and construction are coordinated, state-owned firms in the non-transport sector must continue to comply with the MOR's technical specifications and developmental plans. As a result, the central ministry could ensure compliance by threatening to suspend the procurement of services from these SOEs. According to Zhang Guobao, these non-transport SOEs remained as "concubines" (*xiaoxifu*) of the central ministry. They were embarrassingly obsequious (*weiewi nuonuo*) and "scared to death" (*pade yaosi*) (Zhang GB, 2018: 395-401). These structural obstacles (*tizhi zhang'ai*) to marketization have remained intact despite the 2013 reform (Zhang GB, 2018; SR27ML17).

In 2004, the central ministry punished the leadership teams of CSR Puzhen, CSR Zhuzhou and CNR Tangshan for their clandestine meetings with foreign highspeed train manufacturers. Liu Zhijun decided to forbid CSR Puzhen and CSR Zhuzhou from participating

in the manufacturing of highspeed trains. Moreover, since part of CSR Puzhen's manufacturing capacity was focused on the research and development of subway trains, Liu decided to dismantle CSR Puzhen's partnership with Alstom, leaving the French manufacturer without a Chinese partner. Despite CSR Puzhen's extensive networking and lobbying efforts, Liu continued to exclude the manufacturer from the national HSR program (Zhang GB, 2018).

Apart from organizational control and market leverage, there were strong emotional and personal attachments to the MOR in the early 2000s. These firms were just separated from the MOR, and some had expressed opposition to the very idea of bifurcation (Fu, 2017a). Many cadres enjoyed working with and listening to the MOR, as they did not understand how to interface with the socialist market economy (SN4MX17).

The central ministry adopted three additional strategies to implement its developmental approach and multi-year program. First, the MOR engineered one round of centralization as regional bureaus were transformed into its executive arms. Second, national champions were created in the freight and rolling stock sectors. Third, the MOR pursued technology leapfrogging in railway equipment modernization. The central ministry's new technical specifications called for the research and development of highspeed trains and heavy axle load diesel and electric locomotives.

Centralization within the MOR took place on two levels—the MOR *vis-à-vis* its regional bureaus, and regional bureaus *vis-à-vis* their sub-branches. This round of recentralization integrated all vertical units under the unified control of the central ministry, which regained its status as the sole provider of both railway infrastructure and transportation services. On the first level, administrative and institutional aspects of decision-making and especially approval power were centralized within the MOR's Transport Division. After the implementation of the BLF, Liu Zhijun immediately recentralized these powers that had been decentralized in the 1990s by Han Zhubin and Fu Zhihuan. As a result, regional bureaus no longer had the capacity to independently invest in new regional railway lines and upgrade or purchase new locomotives.

Recentralization at the regional level was much more profound. In a move to strengthen the authority of the central dispatching system and harmonize the national grid, the central

ministry dismantled all of its 41 sub-branches (*tielu fenju*). On March 12, 2005, the central ministry's General Party Committee and the Minister's Office conducted a joint meeting to discuss the Transport Division's plan to disband all sub-branches. Two days later, on March 14, the central ministry created a detailed plan to execute recentralization. Liu made it clear that all ministerial leaders must remain alert and work with regional bureaus to complete the recentralization project within 12 days. Liu divided ministerial leaders into work teams and parachuted them to all regional bureaus. Notable work teams were led by Vice Ministers Sun Yongfu, Wang Zhaocheng, Peng Kaizhou and Hu Yadong, and they were sent to the Zhengzhou Railway Bureau, Lanzhou Railway Bureau, Xi'an Railway Bureau and Beijing Railway Bureau, respectively. Military-type orders were issued by Liu, who told these senior cadre members that they would be removed from their positions, immediately, if something went awry during the reform process (W25JW18).

On March 15, 2005, under the guidance of these work teams, fragmented local dispatching systems merged into regional ones, which were then integrated into the national system. This decision changed the hierarchical and institutional structure of China's railway system from a four-tiered system (ministry → regional bureaus → sub-branches → local stations) into a three-tiered one (ministry → regional bureaus → local stations). By March 25, 2005, local dispatching systems had successfully transitioned into the purview of the regional bureaus. This round of harmonization involved 1,322 control towers, 3,585 railway stations and 228 private networks.

The centralization of transportation decision-making manifested in the transferring of responsibilities both upward and downward. For example, military decision-making was centralized at the regional level as military representatives of sub-branches moved upward to serve in regional bureaus (SD20LY19). Second, the coordination of the roadwork section (*gongwu duan*), rolling stock section (*jiwu duan*), carriage section (*cheliang duan*), telecommunication section (*dianwu duan*) and transport section (*chewu duan*) were transferred downward to local stations (SD20LY19). These sections work together to ensure transportation safety through the maintenance of tracks and trains. Local stations now play a more direct and

salient role in ensuring that all outbound and inbound trains and services, as well as roadwork within their boundaries, are up to the safety standards established by the central ministry.

According to the MOR, this round of centralization was beneficial in five ways. First, it improved transportation efficiency by eliminating unnecessary jurisdictional boundaries. Second, it reduced an additional layer of decision-making in railway equipment investment and innovation. Third, it reduced transportation costs by shifting more than 28,000 staff members to other profit-making enterprises. Fourth, centralization fostered innovation and reform in the existing railway system. Lastly, placing the coordination of five railway work sections in the hands of local stations increased overall railway safety (Yan B, 2005).

In addition to centralizing decision-making at the ministerial and regional levels, the MOR worked to establish national champions in both transport and non-transport sectors. These moves reflected the national trend of forging SOE groups. The creation of national champions in the freight sector was aimed at reducing the impact of foreign and joint-venture competitors on the MOR's market share in the national distribution and logistics systems.

In light of China's accession agreement, the MOR decided to modernize its freight services. As a result, the central ministry created three national champions—the China Railway Container Transport Corporation (CRCTC), the China Railway Special Cargo Service Corporation (CRSCS) and the China Railway Parcel Express Corporation (CRPEC). The establishment of these three companies, which remained under the control of the central ministry, was to accommodate market competition through better allocation of resources, according to Vice Minister of Railways Sun Yongfu (Zhang W, 2004). More fundamentally, it was about creating centralized and monopolized freight firms that could compete in the domestic market against potential international competitors (Tjia, 2015: 138).

The MOR centralized regional freight carriers, which had been fragmented with overlapping services and had engaged in orderless competition (*wuxu jingzheng*), to create these national monopolies (Xu WG, 2004). During the late 1990s, the formation of regional carriers resulted in a waste of capital investment, as scarce central funding was dispersed. As a result, various firms with similar freight capacities raced to compete for policy and monetary resources.

To reverse the situation, the CRCTC was created to monopolize containerization and facilitate the establishment of several logistic centres and dedicated freight railway stations across the country. The CRSCS and CRPEC were established to monopolize the transportation of special cargos and light parcels, respectively. The central ministry believed that, through these monopolies, it could exert greater control over the implementation of a strategic vision concerning the development of, investment in and efficiency of the freight sector (Xu WG, 2004).

The CRPEC rapidly expanded its parcel services within the country with centralized support from the MOR. For example, in 2005, the central ministry reorganized the national train schedule to include two dedicated train services for parcel delivery between Guangzhou and Hunan (Tjia, 2019). This move helped the CRPEC increase its business as it successfully courted large corporate clients such as Lenovo. As for parcel delivery through luggage carriages of passenger trains, the central ministry helped the CRPEC establish transit arrangements with railway stations and regional bureaus for speedy delivery. For example, Hengyang Railway Station established a transit centre for parcels moving from Guangzhou to Beijing (Tjia, 2019).

In light of potential challenges, entry into the WTO created opportunities for China to strengthen its domestic logistics and distribution system. As multinational corporations began to move into and expand their business activities in China, they needed reliable, efficient and cost-effective logistics partners to distribute their goods. This new demand provided a crucial catalyst for containerization. In March 2003, the NDRC approved the MOR's *Overall Plan to Establish Railway Container Centres in the Country*, which aimed to set up 18 containerization centres in cities such as Chengdu, Chongqing, Dalian, Kunming, Qingdao, Shanghai, Wuhan, Xi'an and Zhengzhou by 2006. The plan was integrated into the Eleventh FYP (2006 to 2010), which called for the establishment of new container centres that could serve as multi-purpose logistics and intermodal transportation hubs serving domestic and international consignors and consignees.

At the same time, the central ministry moved to reduce network density. Between 2003 to 2006, the MOR reduced the number of smaller freight railway stations with a loading capacity of less than 5 tons by 50% (Shanghai Chaorui Logistics, 2019). In 2006, the MOR moved to establish strategic loading centres by amalgamating railway stations that had handled limited

transportation volume and offered less-than-container-load (LCL) services (*liang zhenghe yi jianshe*) (Shanghai Chaorui Logistics, 2019). These industrial restructuring moves were made to accelerate the speed of freight trains and establish a modernized containerization system.

In the rolling stock industry, seven national champions were created to foster rapid industrial upgrades. Through a careful balance between two rolling stock groups, three rolling stock plants were chosen from the CSR and four from the CNR. The goal was to build a national industry capable of producing modernized and advanced locomotives and electric multiple unit trains (EMUs) as well as advancing a Chinese national brand (People.cn, 2004; Gov.cn, 2007). On February 22, 2004, the MOR hosted a meeting concerning railway equipment modernization and decided to pursue technology leapfrogging. The MOR arranged the CSR to compete against the CNR to strengthen the market competitiveness of both groups. To level the playing field, financial support and access to highspeed train and heavy axle electric and diesel locomotive technologies were evenly distributed between the two rolling stock groups; CNR Tangshan was added to the original six rolling stock plants in 2005 due to its partnership with Siemens.

The seven new national champions included CNR Dalian and CSR Qishuyan in diesel locomotives, CNR Datong and CSR Zhuzhou in electric locomotives, and CSR Sifang, CNR Changchun and CNR Tangshan in highspeed train innovation. The central ministry became the principal investor and primary coordinator in the modernization process. It was responsible for paying the technology transfer fee and providing funding for its regional bureaus to purchase the newly innovated locomotives and highspeed trains. The MOR also played the actual role of implementing its rolling stock modernization program through various work groups, expert groups, inter-governmental forums and committees. The ministry's chief and associate chief engineers, the Transport Division and the Chinese Academy of Railway Science (CARS) also coordinated political, industrial, academic and research actors to modernize railway equipment.

Technology Leapfrogging

In addition to centralization, the MOR pursued technology leapfrogging to modernize China's rolling stock industry. The MOR, the CARS and regional railway bureaus worked with rolling stock manufacturers on harmonizing various technical specifications, which were established by

the central ministry (People.cn, 2004). During this process, the MOR was responsible for both importing foreign technology and fostering indigenous innovation. The purpose of the MOR's coordination was to ensure a better allocation of limited resources so that the entire sector could participate in the modernization of critical rolling stock technologies in an orderly fashion.

The MOR developed three initiatives to implement the leap. First, the central ministry decided to limit the channels of knowledge and technology transfer, as foreign rolling stock giants could enter the Chinese market only by cooperating with one of the seven designated national champions. Second, the MOR placed national bets on three types of rolling stock specifications—heavy axle load alternating current (AC) electric locomotives, heavy axle load diesel locomotives, and EMU. Third, the process focused explicitly on importing advanced technology for the ultimate purpose of indigenous innovation.

Three sectoral policies in 2004 outlined and accelerated China's railway equipment modernization. First, the MOR and the CARS upgraded domestic technical specifications and published the fourth version of *Policies on Major Railway Technologies*. In this version, the central ministry prioritized the research and development of high capacity diesel locomotives and AC electric motors. Second, the central ministry, in cooperation with the CSR and CNR, settled on the *Implementation of Rolling Stock Modernization.* This strategy focused on the joint production of modernized and advanced railway equipment between foreign and domestic rolling stock manufacturers. Third, in July 2004, the MOR and the NDRC published additional regulations on the import and indigenization of AC electric motors and EMUs.

In an agreement arranged by the MOR, CSR Zhuzhou and Siemens signed a contract with the central ministry for the delivery of 160 electric locomotives, the HXD1 model, with a total value of 7.34 billion CNY. Similarly, CNR Datong and Alstom agreed to deliver 180 electric locomotives, the HXD2 model, in a contract worth 7.25 billion CNY. Both newer models were known as "Super Hercules" (*chaoji dalishi*) due to their high towing capacity, at 20,000 tons. The HXD1 model was acknowledged to be the most potent freight locomotive in the world in 2006 (SASAC, 2006). The 13,052-horsepower locomotive was immediately placed into operation on the Datong-Qinhuangdao Railway for coal transportation. In May 2007, CNR Datong and Alstom produced the HXD2 model with similar towing capacity and horsepower

comparable to the HXD1. The new locomotive was also placed into operation on the Datong-Qinhuangdao Railway. The inclusion of these two models significantly boosted the capacity of this specific railway. In 2002, before the introduction of the BLF, the annual coal transportation volume was 100 million tons. By the end of 2007, the annual transportation capacity had tripled, reaching 300 million tons (Liu, 2006).

For the 2012 edition, the fifth, of the *Policies on Major Railway Technologies*, the MOR revised the technical specification on electric locomotives and called for the development of a series of AC motors with different speed, axle load and traction power. This revision suggests that the development of rudimentary AC motors and high capacity electric locomotives has been completed.

In terms of heavy axle load diesel locomotives, the central ministry matched CNR Dalian with Electro-Motive Diesel for the production of 300 new diesel locomotives. The deal was worth 6.642 billion CNY. The newly manufactured HXN3 model is a 6,000-horsepower locomotive with an axle load of 25 tons, a towing capacity of 5,000 tons, an operating speed of 120 km/hr and a maintenance cycle of 1.8 million km (a doubling of the maintenance cycle of existing diesel locomotives). CSR Qishuyan and General Electric Company worked together on the HXN5 model with similar features. Both new diesel locomotives rolled off the assembly line in 2008.

The hallmark of the BLF was the development of an indigenous brand of highspeed train, also known as the China Railway Highspeed (CRH).[19] By 2011, on these newly constructed passenger networks, the CRH had operated at a minimum of 200 km/hr and a maximum of 350km/hr.[20] These achievements were remarkable, as the average operating speed of China's passenger trains in 2004 was only 65 km/hr (Y4GL17). In a mere seven years, the country had established a record-setting HSR system with some of the fastest operating highspeed train services in the world. China's nascent HSR industry, though it may not be the most

[19] A detailed discussion of highspeed train modernization will be provided in Chapter 6.
[20] The top speed of passenger trains running on passenger and freight shared networks was 140 km/h.

technologically advanced, can be considered "the most comprehensive one in the world" (SR27ML17).

Indigenous innovation geminated in a 2003 decision within the MOR to promote closed passenger corridors (*keyun zhuanxian*). *Keyun zhuanxian*, first coined by Fu Zhihuan for the Qinhuangdao-Shenyang Passenger Corridor, was a subtle and non-controversial titular substitute for HSR corridors (*gaosu tielu*). In his meeting with Huang Ju, Liu Zhijun presented the building of a national network as a way of increasing transportation capacity. The plan aimed to separate passenger and freight transportation and free up space on existing lines to accommodate an increase in the scheduling of freight services. Liu argued that such a new closed passenger network consisting of several corridors could increase freight capacity without compromising passenger capacity.

Huang Ju highly praised Liu's vision and asserted that the plan "reflected both the thinking of the Sixteenth National Party Congress on the building of a moderately prosperous society and the real conditions of the country's railway sector" (China Railways Yearbook, 2004: 3). Top leaders and planning institutions have since realized that, after China's entry into the WTO, the principal contradiction in sectoral production had to be solved through rapid growth under a more assertive state. As a result of direct central commitment and attention, HSR advancements and upgrades were integrated into the 2004 and 2008 editions of the MLTRP and the Eleventh and Twelfth FYPs (2006 to 2015). Additionally, the central government provided an unprecedented amount of capital investment to facilitate the expansion of the national network, as more than one-tenth of the central government's 2008 stimulus package was channelled into the sector.

In addition to central commitment, the railway ministry began to promote HSR development by setting restrictive technical specifications. Both the 2004 and the 2012 versions of the *Policies* contained specific technological goals for the nascent industry. In the 2004 edition, the priority was placed on fusing advanced foreign technology into the domestic production network. The speed target was set at 200 km/hr. In the 2012 version, the priority was changed to improving network management to accommodate a new operating speed of 350km/hr. To ensure complete technology transfer, the MOR and the CARS dispatched work

teams to rolling stock plants to test engineers and staff members on the know-hows of highspeed train production. The central ministry threatened to suspend procurement and discontinue payment if rolling stock plants failed to absorb and digest foreign technology (W25JW18).

Moreover, with the construction of new HSR corridors, the 2012 edition of the policy disallowed the operation of conventional rolling stock on closed corridors. In addition to arranging these technical specifications, the railway ministry actively led and coordinated the research, design, innovation and testing of the CRH (CRC, 2016).[21] For example, the Signal & Communication Research Institute of the CARS worked closely with relevant domestic firms, such as Huawei, and research centres in the development of a harmonized China Train Control System (CTCS) (Huawei, 2012).

The MOR successfully mastered and self-innovated relevant EMU technologies by the end of 2009, when the central ministry had successfully applied for 946 patents for the CRH. These patents ranged from railway engineering to highspeed rail technology to and station engineering. Various technological platforms were integrated into a national innovation system in which the China Standard Electric Multiple Unit (CEMU) would be developed. China would own the independent intellectual property rights of this new highspeed train model, which became a new benchmark for rolling stock manufacturers around the world. Against this backdrop, Chinese railway experts argued that "China should be the rule-maker in setting international highspeed rail standards, as the country had the most kilometrage, the most complete technology and had tackled many geological difficulties" (SN4MS17).

Rapid HSR development was not the only technological advancement that took place during the BLF. The central ministry also pushed toward the electrification of the existing trunk and branch lines. Goals for network upgrades were outlined in both editions of the *Policies*. In terms of network upgrades, the total kilometrage of electrified railway lines doubled between 2005 and 2012. Specifically, in 2005, the total kilometrage of electrified lines was 20,000 km, and the new national total in 2012 reached 48,000 km. With about 50% of the national network,

[21] These are written documents provided by the CRC during fieldwork. They are cited as (CRC, 2016) and (CRC, 2017). The year indicates the time when those documents were obtained.

China's electrified kilometrage ranked first among other countries, surpassing Russia (Qi ZX, 2018).

Legacies of the Big Leap Forward

With the introduction of the BLF, two systemic characteristics of the railway sector were strengthened, and each has left a profound institutional effect on China's hitherto railway development. First, the BLF enhanced the vertical integration (*wangyun heyi*) of the national network and transportation services by consolidating it in two ways. The first was that the MOR disbanded all passenger firms that were created during the late 1990s and early 2000s. The purpose of this was to discourage regional competition and to recentralize and coordinate passenger transportation under the supervision of the central ministry. The creation of three national champions in the freight sector was also part of the move to nationalize railway transportation. The second was that the MOR designated its regional bureaus to be mere executors, as the central ministry recentralized regional autonomy.

Second, with the introduction of several national and sectoral policies in 2003 and 2004—namely, the MLTRP, the fourth edition of *Policies* and the *Implementation of Rolling Stock Modernization*—the MOR effectively integrated railway construction and operation (*jianyun heyi*). Such integration concentrated decision-making power in the MOR's Transport Division and the HSR Office. The two departments ensured that the research and development of new railway equipment could meet the immediate needs of the central ministry. This decision-making is a continuation of the central ministry's earlier attempts to bring technocrats and engineers to the production frontline through the chief engineer responsibility system. Furthermore, the introduction of the MTLRP, approved by the NDRC, consolidated railway planning and insulated such planning from national policy fluctuations. Indeed, railway planning was integrated within the state's broader medium- and long-term planning, which established restrictive economic targets. After the integration of sectoral programs with national ones, they "rarely change once approved" (Lawrence, Bullock, and Liu, 2019).

These two characteristics make up the extant domestic market structure of the railway sector, both transport and non-transport. For example, in the operation of the national HSR network, the MOR had absolute control over dispatch responsibilities as well as revenue and profit calculation (SR27ML17). The central ministry supervised production and technological innovation by having firms work together with its engineering and research branches—the Third Railway Survey and Design Institute (CDRC) and the CARS (SE1MS16).

Greater Local Involvement

In 2003, Huang Ju asked the MOR to "centralize power and push forward […] the reform of its fundraising structure" (China Railways Yearbook, 2004: 3). As a result, the MOR made several attempts to diversify its fundraising methods, and one of these was to work with local governments in railway infrastructure investments. In 2005, at the Forum on the Reform of the Chinese Railway Sector's Fundraising Structure, Huang Min, now the MOR's chief economist, stated that the new fundraising structure should be "operated according to market principles with diverse investment sources, but ultimately government-oriented" (People.cn, 2005). At the same forum, Wang Qingyun, the NDRC's Director of the Transport Division, pointed out that government policies and support are "of the utmost importance" to railway development, and "[local] governments should increase their financial support to the railway sector and directly invest or subsidize railway projects" (People.cn, 2005). As a result, the central ministry began to allow other state-owned and private enterprises to participate in railway infrastructure investment and the construction and operation of dedicated freight lines.

The participation of local governments has complemented MOR's fundraising capacity and helped promote the expedited construction of HSR networks. Since the publication of the multi-year program in 2004, the central ministry has worked actively with local governments to form joint ventures. Local governments became attracted to the multi-year program and especially the proposed national passenger network, as they exhibited great enthusiasm to work with the MOR to bring highspeed rail to their localities (provinces, municipalities and even counties). They saw opportunities to integrate their local economy with the surrounding region, and the construction of new train stations could facilitate the relocation of dense urban centres and the building of new ones. Large metropolitan centres such as Beijing, Shanghai and

Guangzhou were especially welcoming of the idea. For example, Guangzhou was considering integrating with the Pearl River Delta through the establishment of a one-hour economic zone. Local governments, both at the provincial and municipal levels, were willing to be financially responsible for land acquisition and residential relocation.

In 2004, the MOR negotiated with more than 20 provinces, municipalities and autonomous regions for railway infrastructure investment and HSR network integration (China Railways Yearbook, 2005). By 2008, the MOR had signed more than 210 contracts with local governments, up to a total of five trillion CNY in investment, with 1.6 trillion CNY being invested by local governments through a combination of land dedication, commercial loans and capital investment (Li J, 2009: 54). Table 3 illustrates local governments' investments in building both inter-regional and regional HSR corridors or conventional railway lines.

Table 3: Local Railway Investment (2005 to 2008)[22]

	2005	2006	2007	2008
Infrastructural Investment (billion CNY)	12.037	22.566[23]	29.76	91.176
Kilometrage (tracks) (km)	185.6	70.5	86.7	127.5
Kilometrage (operation) (km)	76	156.7	106	n/a

This wave of local participation in large national projects could be described as unprecedented. The Chinese population suddenly was interested in lobbying for a highspeed rail station to be placed in their locales. Sometimes, this interest translated into collective action, such as petitioning their local government to negotiate with the MOR for a highspeed rail station. Moreover, the competency of local government officials in handling HSR-related matters became an important criterion that the locals used to gauge their performance. Yueyang County and Rongjiawan Township lobbied heavily for a new HSR train station. The two local governments approached Chen Zhanglian, the Chief Commander of the Wuhan-Guangzhou HSR Corridor, and asked to be included in the overall planning of this HSR line. Similarly, Leiyang

[22] Statistics were taken from 2006, 2007, 2008 and 2009 editions of the *China Railways Yearbook*

[23] The total amount of railway infrastructure investment made by local governments and enterprises during the Tenth Five-Year Plan is just a little more than that of 2006 (China Railways Yearbook, 2007)

County urged Chen to requite his hometown (*huibao jiaxiang*) and contribute to Leiyang's economic transition. These efforts were emblematic of the broader movement, as local governments, strongly pressured by residents, often resorted to making petitions to the central ministry or even the State Council and the NDRC in attempts to land an HSR station.

Responding to these lobbying efforts, including additional pressures from nine other municipalities and counties, Chen Zhanglian's initial proposal for the Wuhan-Guangzhou corridor included 25 stations. A short meeting between Chen and Liu Zhijun on June 20, 2015, ended Yueyang County's hopes of integrating into the Wuhan-Guangzhou HSR Corridor (Chen ZL, 2016). Just minutes before the ground-breaking ceremony for the corridor, Liu reproached Chen's decision and quickly decided to reduce the number of stations from 25 to 15 (Li and Duan, 2016). In that meeting, Liu fervently questioned the sensibility of building a station in Rongjiawan—where the deadliest train crash in the People's Republic's history took place in 1997 (Chen ZL, 2016). Liu claimed Chen was out of his mind when he agreed to include Rongjiawan in the project. After the decision was made public, local leaders who lost out in this round of bargaining petitioned directly to the State Council. Localities with better connections, such as Yingde and Lechang, succeeded in their bids, as Yingde West Station and Lechang East Station were incorporated into the corridor in 2012 and 2017, respectively (Chen ZL, 2016).

To jointly push for swift HSR construction, these localities with HSR stations established a unique partnership with the MOR and the central ministry's regional bureaus. Informal strategic groups were created between the railway sector and local governments—the Railway-Local Joint Initiative (*ludi liandong*)—to facilitate cooperative leadership (*xietong lingdao*) (L11EZ18). Under this arrangement, the central ministry was responsible for mobilizing non-transport SOEs. Additionally, the arrangement of other suppliers on the lower end of the supply chain was done through both market mechanisms and local governments, which played active roles in coordination, procurement and road construction. This ensured the adequate supply of construction materials and provided policy frameworks to washout principal-agent problems. (L11EZ18). As a result of this division in labour, sectoral implementing agencies could focus on the progress and quality of construction projects (L11EZ18).

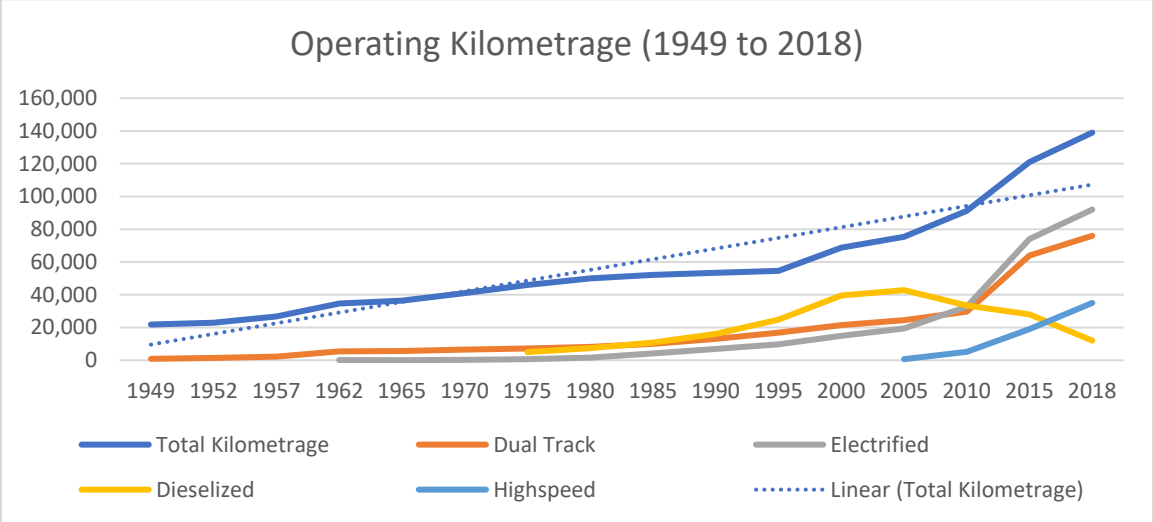
Moreover, municipal and county-level governments, under the direction of the provincial Party and government leadership, became responsible for troubleshooting (W18ZJ19). In the construction of the Zhengzhou-Taiyuan passenger corridor, the CREC's Ninth Bureau worked with Changzhi's county administration to overcome forms of everyday resistance due to meagre compensation packages (L11EZ18).

Examining Railway Development Data

Below are four figures on sectoral development since the founding of the People's Republic. Each figure consists of a linear (dotted) trendline, which helps identify the historical average in sectoral growth. These four figures tell a compelling story about power concentration.

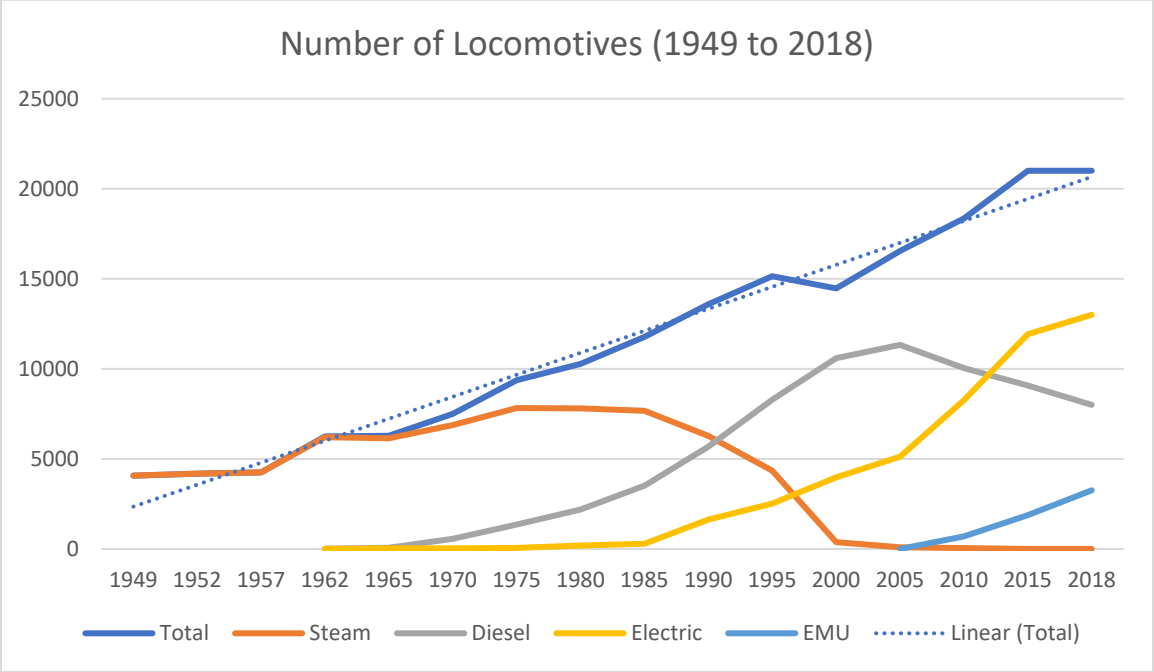
Concerning the operating kilometrage (see Figure 5), it is evident that the post-Mao era fell below the overall average rate of increase. The slope between 1949 and 1970 suggests above-average growth, while the slope between 1975 and 1995 indicates stagnant development. The growth in network expansion started in 1995 and was reprised in 2005 with greater momentum, which conforms with the theoretical argument. It is worth noting that rapid upgrades in railroads took place *after* the introduction of the BLF. The operating kilometrage of electrified and dual-track lines accelerated about 2010, as they began to displace dieselized lines, which had gained momentum in the mid-1990s. HSR kilometrage has been rapidly increasing since 2005.

Figure 5: Operating Kilometrage (1949 to 2018)



Concerning the total number of locomotives (Figure 6), the slope suggests that the average increase across three temporal periods corresponds to the linear trendline. However, a closer examination of the figure helps identify key moments when state planners and railway policymakers pursued rolling stock modernization. The decline of steam locomotives began in the early 1970s, concomitant with the research and development of diesel locomotives. In the mid-1980s, manufacturing of both diesel and electrified locomotives began to accelerate. The number of diesel locomotives peaked in 2005, concurrent with another sharp increase in electric locomotives. These slopes conform to the MOR's significant efforts toward railway equipment modernization during the BLF when the central ministry prioritized the research and development of heavy axle load AC electric motors and EMUs.

Figure 6: Number of Locomotives (1949 to 2018)



In terms of transportation capacity, there is no unified database indicating capacity development since 1949, and the scarcity of these available data cannot be plotted to reveal any credible aggregate change. As a result, changes in transport volume (Figure 7) and turnover (Figure 8) were selected and plotted instead. Understandably, volume and turnover can be affected by several factors. For example, since the reform and opening, the rise of other modes of

transportation eroded the rail sector's market share, from two-thirds to half of the national total. Second, natural disasters could affect the total volume and turnover of passenger and freight transport. Despite these insufficiencies, sharp increases in volume and turnover can suggest an increase in capacity. However, this logic applies only when the sectoral market share and the overall population were relatively stable during these periods of sharp increases.

In light of these caveats, these slopes indicate that transportation capacity increased rapidly after the mid-2000s. Suboptimal performance between the mid-1960s and early 2000s corresponded to a deficiency in capacity. More specifically, before 2005, increases in passenger volume and turnover were relatively steady, without protracted periods of stagnation. While growth in turnover slowed during the Cultural Revolution, it regained momentum afterwards. The slopes concerning freight volume and turnover suggest stagnant growth during the Cultural Revolution and after 1985. There was a moderate drop in volume in the late 1980s, when increases in freight volume began to stagnate. These quantitative data points correspond to pieces of qualitative evidence, which suggest that a deficiency in freight capacity limited production capacity and led to the idling of forces of production during the 1980s and 1990s.

Figure 7: Passenger and Freight Volume (1949 to 2018)

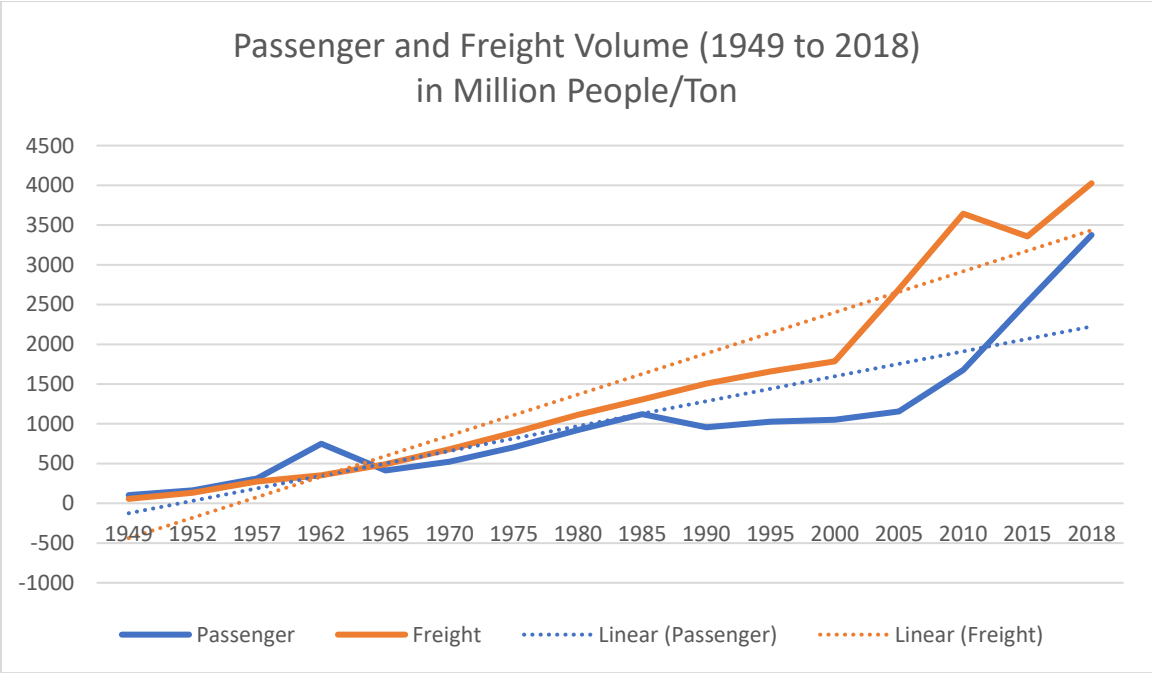
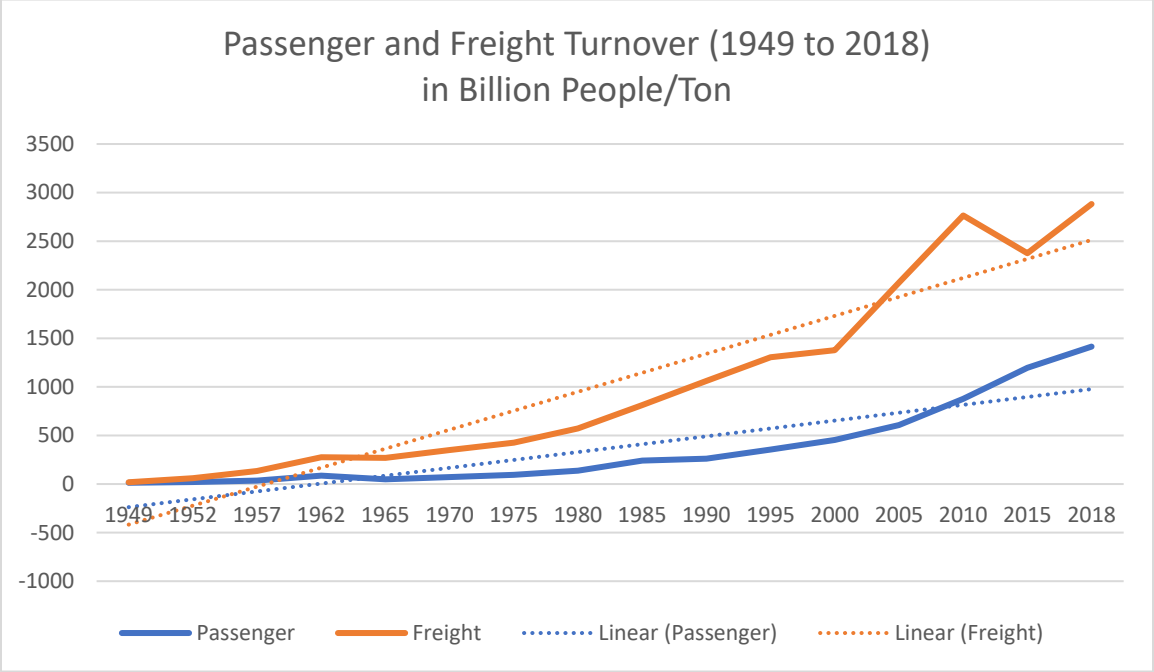


Figure 8: Passenger and Freight Turnover (1949 to 2018)



Transitioning into the China Railway Corporation

The 2003 restructuring of the State Council fundamentally changed the relationship between the central ministry and the Party-state's planning apparatus. The newly created NDRC became one of the most potent administrative organs through a delegation of responsibilities from the State Council and a centralization of power that had been held by sub-central governments (Martin, 2014). New responsibilities included the organization and implementation of national social and economic development strategies, long-term planning, annual planning, industrial and pricing policies and economic reform (People.cn, 2003).

In 2003, the State Council decided that the NDRC, instead of the railway ministry, should serve as the primary driver of railway reform. By the second half of 2003, the commission's Transport Division had conducted three seminars with experts and local government representatives, addressing possible ways to reform the MOR. However, the division failed to produce any satisfactory results (Zhao, 2005). Ultimately, senior Chinese leaders supported the

NDRC and MOR's proposal to increase government investment and expand the national network. Wang Qingyun shared that there was a broad consensus on using railway development to address the problem of transportation bottlenecks (Sina, 2005). As a result, the commission decided to prioritize reforms in pricing, finance, taxation and corporatization for initial public offering instead of marketization and government-business separation (Sina, 2005).

In 2008, in light of another round of State Council restructuring, the NDRC drafted the *Plan to Reform the Railway Management System*. In this proposal, the commission suggested disbanding the MOR and merging it with the Ministry of Communications to create a new Ministry of Transport (MOT), responsible for macro-transport planning (Wang Huiying, 2018; Sun CF, 2012). In the early 2000s, intermodal transportation and macro-transportation planning were embryonic, as the Ministry of Communications, the MOR, the Civil Aviation Bureau and the Postal Bureau were working independently to improve the national transportation network. The NDRC believed a merger and the creation of an MOT could strengthen the state's macro-planning capacities.

Concerning railway reform, according to sources from the Institute of Comprehensive Transportation, the NDRC and the Development Research Centre of the State Council agreed on a reform agenda that focused on separating government from business. The commission proposed to transfer the railway ministry's administrative duties to the proposed MOT. Afterwards, a new transport corporation (*tielu yunshu zonggongsi*) would be created to perform the MOR's business activities—managing railway transport services. In addition to the creation of a new SOE, regional railway bureaus would be dismantled, and 46 new regional subsidiaries would be established (Yang, 2008: 43). The logic for this round of reform was to attract private investment to the sector, solve the debt problem and reduce over-reliance on government investment (Yang, 2008: 43).

Senior leaders were not committed to the idea, and neither was the central ministry (Sun, 2012). Consequently, Liu Zhijun began his lobbying efforts as early as the second half of 2007 (Sina, 2013a; Yang, 2008: 42). Liu expressed three reasons to maintain the status quo. First, he argued that an independent railway ministry could better serve the need for rapid network expansion and railway equipment modernization. In exchange for state support, Liu promised to

build 7,000 km of new passenger corridors in addition to another 10,000 km of conventional tracks before the end of his second tenure as the minister of railways in 2013 (Yang, 2008). Moreover, due to the need to meet these restrictive targets spelled out by the MLTRP and the Eleventh FYP (2006 to 2010), Liu argued that a weakened corporation would not have the strong and appropriate political and commercial leverage *vis-à-vis* local governments and SOEs (Yang ZX, 2008: 44).

Second, before and at the annual Two Meetings in 2008, Liu Zhijun gathered sufficient support from local governments, which had suffered from the 2008 snow crisis in southern China. Local governors believed that a centralized and potent ministry was useful for national service and disaster relief. Indeed, during the snow crisis, the central ministry mobilized diesel locomotives to transport more than 1,200 carriages of coal and over 10,000 utility poles to Jiangxi, on a daily basis, in support of the province's efforts to restore electricity (Yang, 2008). Third, sectoral policymakers argued that corporatizing regional bureaus could fragment the national system. Intense competition would occur as a result of independent accounting and ticket sales (SN4MS17). Additionally, the pricing and the distribution of tickets for inter-regional travel would be difficult to determine and account for.

In light of these arguments, senior Chinese leaders retained an independent railway ministry to serve the state's broader developmental agenda. As a result, the State Council rejected the NDRC's plan to merge the MOR into the newly created MOT. Top leaders continued to prioritize railway equipment modernization and national network expansion, and market-oriented reforms were secondary to the provision of public welfare. The central government continued with its gargantuan investment program in the sector.

According to Lu Dongfu, the Vice Minister of Railways, the decision to maintain an independent railway ministry emerged from several strategic considerations of the Chinese state. Senior leaders saw the central ministry useful in land development, national defence and unification (BBC, 2013). As a result, the NDRC and the MOR compromised and reached an agreement to gradually transfer the central ministry's public security, court and procuratorate systems to those of the central and subcentral systems. However, in the eyes of the public, the ministry transformed into a bulwark against reform.

The fall of Liu Zhijun and Zhang Shuguang, and the 7.23 incident—a highspeed train collision on July 23, 2011, in Wenzhou that killed 40 people and injured 192—resulted in calls for an immediate reform of the ministry, which had been plagued by additional corruption and safety concerns. Serious discussions on the issue of profitability emerged as a part of the national debate after the fall of Liu Zhijun. As a result, the NDRC drafted another reform proposal in 2012, which was similar to its 2008 plan. The commission again proposed to separate government and business and attract private investment in railway development. Additionally, a new feasibility study was conducted to understand the "technicalities" of merging the MOR with the MOT (Henan Business Daily, 2012).

In 2013, the central government restructured the State Council and abolished the MOR. The central ministry's responsibilities were bifurcated: railway planning was integrated into the MOT, while regulatory duties in railway technology, safety and transportation were transferred to the newly created National Railway Administration (NRA). The newly created China Railway Corporation (CRC) would assume all business operations of the MOR.

The 2013 reform intended to achieve three goals. First, the separation of government from business would force the newly created CRC to diversify its fundraising methods. The hope was that the CRC, without administrative functions, could adopt market mechanisms and lower access barriers for private investors who wanted to invest in railway construction. The imposition of this new goal meant that the NDRC had been unsatisfied with the slow progress toward marketization under the MOR. Second, the separation would result in clearly demarcated responsibilities between the government (the regulator) and the CRC (a business entity). For example, in the event of a railway accident, both the government and the business entity can be penalized accordingly. Third, the transferring of responsibilities in railway development from the MOR to the MOT (*dajiaotong tizhi*) could facilitate the establishment of a comprehensive national intermodal transportation network (Yan B et al., 2013; Jiang YX, 2013).

In reality, the 2013 reform, however, was "skillfully designed and implemented to adapt to the changing environment" of the market while maintaining a statist monopoly (Yu H, 2015: 1087). It resulted in a few administrative subtleties, which made the CRC quite special. Unlike those in the non-transport sectors, the CRC became a ministerial-level (*zhengbu ji*)

administrative SOE (*xingzhenglei zhongyang qiye*), which meant that the leadership group of the CRC was placed under the direct management of the Politburo, not the SASAC (Gov.cn, 2013a; Guo F, 2013). The Ministry of Finance (MOF), instead of the SASAC, became the principal investor, and the financial relationship between the CRC and the MOF was listed under an independent category (*caiwu guanxi danlie*). As a practical matter, the newly created CRC retained some of the administrative responsibility of the MOR. In terms of railway planning, the NDRC requested the CRC, not the MOT, to draft the 2016 edition of the sectoral multi-year program and planning. The NDRC's decision means that the MOT has yet to incorporate railway development in its macro-management of China's transportation network.

Similarly, the newly created NRA has overlapping responsibilities with the CRC—rendering the NRA practically obsolete (Yu, 2015: 1086). For example, the NRA is responsible for the regulation of railway transportation safety. The CRC, similarly, oversees the safe production and operation of railway services. To this effort, the CRC established a Safety Supervision and Management Division and six sub-divisions in Shenyang, Beijing, Wuhan, Shanghai, Chengdu and Lanzhou. The location of these sub-divisions overlapped with six of the NRA's eight regional management bureaus. The responsibilities of the CRC's Safety Supervision and Management Division include drafting railway safety laws and regulations, supervising transportation and production safety and managing railway accidents (Li and Huang, 2017: 23-24). All of these responsibilities overlap with the NRA's regulatory capacities. Additionally, and more interestingly, the NRA, a vice ministerial-level regulator, is a half rank lower than the CRC. As a result, the new corporation's position in the political hierarchy makes it difficult for state regulators to enforce proper regulation and supervision (Yu, 2015: 1086).

During the reform, the central government ruminated over the placement of the new corporate entity and the associated social, political and economic consequences. With rail transport comprising an indispensable and strategic sector in national economic and industrial development, the State Council decided to manage the CRC directly, as top leaders were unwilling to relax their control of the sector. Top leaders believed that a statist monopoly would insulate and protect the sector from market competition, in both freight and passenger transport (Chan G, 2009; Yu H, 2015).

The State Council considered two additional political factors before reforming the MOR. First, as a ministerial-level SOE, the MOR became a half administrative rank higher than the SASAC-managed SOEs. Second, the sheer size of the railway ministry became a management challenge to senior leaders. With more than two million employees across the country, maintaining the CRC as a ministerial-level SOE could assuage opponents of market reforms—stabilizing both the financial market and the labour force within the sector (Sina, 2013b; SN4MS17).

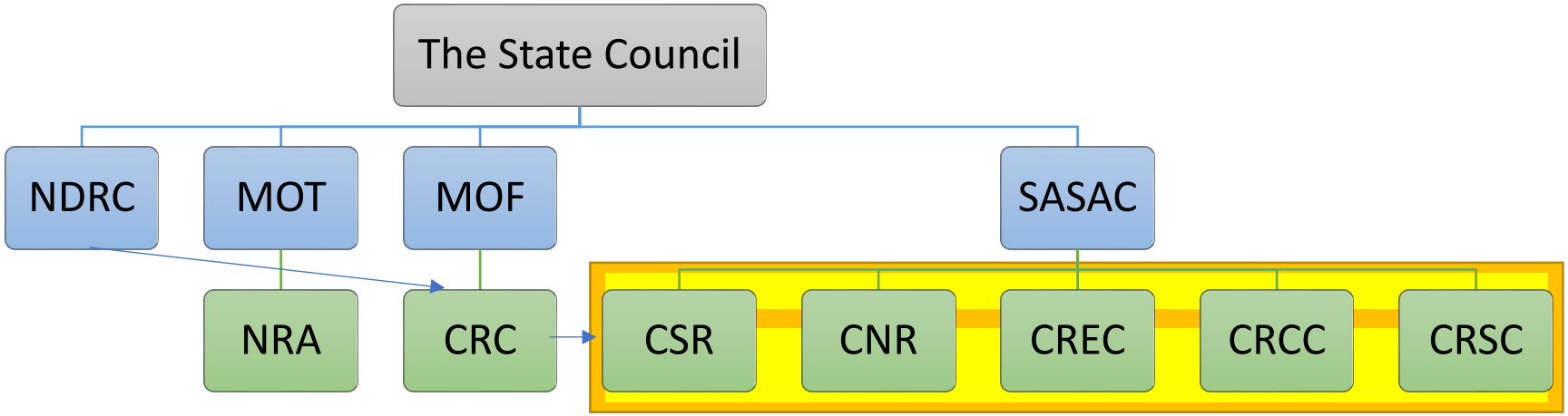
Since its inception, the CRC took on the financial burden of supporting greater and faster economic growth through the provision of public welfare, as the MOR had done. Public welfare provision manifested in 1) the provision of transport services for the vast majority of the Chinese population, 2) the provision of discounted tickets for students, people with accessibility needs and the military and 3) the ensuring of the movement of bulk goods for economic and industrial development (Wang Huiying, 2018: 12). Serving the Chinese military would become another key component of the CRC's operations. As a result, senior leaders believed that a monopoly could better facilitate the unidirectional transportation of bulk goods and help reduce regional economic imbalances. The CRC's national railway network remained an important asset of the national economy and an essential means to extend the authority of the central government—facilitating national and political unity (Wang Huiying, 2018: 12).

As a result, the CRC continues to be self-regulated in practice, as "its monopoly over the transport sector has facilitated such an arrangement" (SR27ML17). At the same time, it continues to manage and regulate the non-transport subsector. Though the regulation (quality control) of railway engineering and equipment has been vested upon the NRA, the CRC's monopoly in the transport sector makes it a *de facto* regulator. Non-transport SOEs must continue to meet the regulatory and technical specifications that are published by the central corporation.

Despite the 2013 reform, a centralized approach to rapid network expansion and upgrades and railway equipment modernization has persisted. After a three-year fluctuation in sectoral investment between 2011 and 2013, total investment rebounded to approximately 800 million CNY per year in 2014 and has remained at that level since.

Figure 9: Sectoral Structure (Post-2013)

Solid arrows indicate the direction of control, while solid lines indicate hierarchy and ownership. The highlighted entities are non-transportation SOEs in the railway sector.



Conclusion

This chapter argued that rapid railway development took place during the BLF (2003 to 2011). In the early 2000s, the railway sector was in a state of lethargy: containerization was underdeveloped, rolling stock was unadvanced, passenger tickets were extremely scarce and regional railway bureaus engaged in intense competition due to vertical separation. The lack of much-needed freight and passenger capacity became an impediment to further economic development and a potential source of social instability. These problems were magnified by China's entry into the WTO, as the central ministry failed to provide the much-needed raw materials, especially coal, during peak passenger travel seasons. As a result, the State Council thwarted sectoral decentralization and marketization. Instead, a new statist consensus was reached, and power concentration was pursued. The state forcefully intervened and provided both policy and financial support to develop this crucial sector.

Direct central commitment—especially from top leaders such as Hu Jintao, Wen Jiabao and Huang Ju—ensured both policy and financial support. By the end of the 20th century, senior leaders had become aware that further global integration would weaken the Party-state's control over the economy. The state sector would suffer the most, as it had remained weak compared to China's global competitors. Hu and Wen, therefore, called on the sector to modernize and supply the much-needed support for the establishment of a moderately prosperous society. Additionally, Huang and Zeng Peiyan became personally responsible for providing the forward momentum for the BLF and the modernization of rolling stock. Financial support from the central government increased exponentially. In 2008, top leaders blocked the NDRC's proposal to reform the MOR, as they believed that the MOR must continue to operate as a statist ministry instead of a corporate entity.

Forging national champions became an important task of the Party-state to reduce foreign influence and insulate SOEs from international competition. A tiered economy and controlled competition emerged as two critical developmental approaches in the post-WTO era. Under this statist consensus, the introduction of the BLF became a part of the central government's broader movement to foster comprehensive planning. The BLF manifested in rapid network expansion, upgrades and railway equipment modernization through centralization and technology

leapfrogging. These tenets remained the principal approach to sectoral development in the post-BLF period (2013 to 2019).

Pursuant to the state's regained emphasis on strategic coordination, top leaders created two new developmental institutions responsible for macro-managing the national economy and SOE reform—the NDRC and the SASAC. In the 2003 restructuring of the State Council, the NDRC emerged as one of the most potent state organs, as it gained the power to oversee national, cross-sectoral and sectoral planning. Economic targets listed in the Eleventh and subsequent FYPs changed from suggestive and guiding to restrictive. Under Zeng Peiyan and Ma Kai, the NDRC developed a comprehensive planning system, which was then integrated by the Party-state into its nomenklatura system. By the time Zhang Ping became the new leader of the NDRC in 2008, the commission's comprehensive planning mechanisms were ready to take on a massive stimulus package to ease the effects of the global financial crisis.

The NDRC played a key role in formulating and supervising the implementation of sectoral and cross-sectoral industrial policies. The establishment of these durable industrial policies echoed Wen Jiabao's emphasis on overall and top-level design. Against this backdrop, a sectoral multi-year program and strategic industrial policy, the MLTRP, emerged. In the drafting of the 2004 and 2008 versions of the MLTRP, the NDRC sought broad and comprehensive suggestions before finalizing these specific and restrictive targets of sectoral planning. After the State Council's approval, the commission integrated railway planning with the state's overall planning.

Sectoral policymakers pursued three strategies to implement the BLF and the MLTRP. First, the central ministry recentralized powers that had been decentralized to regional bureaus and used its political and market leverage to coordinate the non-transport SOEs. Second, the railway ministry forged three new national champions in the freight sector. Additionally, the central ministry chose seven rolling stock plants to work with foreign manufacturers on the research and development of EMUs and high capacity and heavy axle load locomotives. Third, the railway ministry pursued technology leapfrogging. With support from state planners, sectoral policymakers provided large sums of capital to import advanced foreign technology and limited the channels of knowledge and technology transfer.

The BLF strengthened vertical integration and a construction and operationally integrated sector. The MOR bolstered the roles of the chief engineer and the Transport Division so that research and development in railway equipment and road construction would serve the practical needs of the central ministry. Second, power concentration helped achieve rapid network expansion, railway equipment modernization and an exponential increase in capacity. Between 2005 and 2018, the operating kilometrage doubled; freight volume and turnover increased by approximately 80% and 50%, respectively; and passenger volume and turnover increased by nearly 300% and 100%, respectively.

Simultaneous to the railway ministry's efforts to solve capacity deficiency, the NDRC was searching for an appropriate reform agenda that could separate the government from business. In 2003 and 2008, two separate reform schemes were developed by the NDRC. The spirit of these reform strategies centred around stimulating competition, attracting private investment, solving the debt issue and reducing the sector's over-reliance on government investment. However, both proposals were defeated by senior leaders. In February 2013, the MOR finally disintegrated into the NRA and the CRC.

The railway sector, after the 2013 reform, maintained 1) a vertically integrated market structure and 2) an integrated construction and operation developmental model. The new corporate entity, a statist monopoly, continued to enjoy a monopolistic market position and coordinated with relevant firms in meeting its and the state's predetermined developmental goals (Zhen et al. 2012: 57). It continued to be mainly self-regulated and simultaneously served as the *de facto* regulator of the non-transport sector.

Chapter 6

Highspeed Rail and Power Concentration

"Highspeed rail development was made possible under the wise leadership of the Chinese Communist Party and our socialist institutional advantage—concentrating power to accomplish big things."

Liu Zhijun, conversing with US Speaker of the House Nancy Pelosi, May 28, 2009

Introduction

During the 2001 Chinese New Year celebration, the total number of passengers travelling through railway, road, waterway and civil aviation reached a record 1.6 billion during the 40-day peak season. Train tickets were scarce, as China's railway system carried "the largest and fastest-growing volume of traffic" (Scales, 2012). With a limited national network, the volume of rail traffic on an average kilometre in China was three times that of the United States and ten times that of the European Union (EU) (Scales, 2012). China's initial pursuit of highspeed rail (HSR) development was driven by the ever-growing demand to transport the massive population migration during the Spring Festival. More importantly, the decision to forge a comprehensive national HSR network—or a network of dedicated, closed, passenger corridors (*keyun zhuanxian*)—was not independent of the need to increase freight capacity. The idea was to move a portion of passenger capacity onto dedicated trunk lines and free up the much-needed space for freight services, especially during peak passenger travel seasons.

The development of China's HSR industry is an illustrative case of power concentration. According to Liu Zhijun, it succeeded because of "the wise leadership of the Chinese Communist Party (CCP) and the institutional advantage of concentrating power to accomplish big things" (Li KP, 2010). Indeed, the burgeoning of a new industry was made possible through central attention and commitment, and a robust multi-year program coordinated and supervised by institutionalized planning agencies and a potent state ministry. Framework policies and organizational support from the State Council and the National Development and Reform

Commission (NDRC) helped the Ministry of Railways (MOR) and its successor, the China Railway Corporation (CRC), herd bureaucratic and corporate actors toward the establishment of a complete industry chain. Chinese leaders in the era after the nation's entry into the World Trade Organization (WTO) understood that solving domestic transportation problems through quality services and low-cost medium- and long-distance travel would be a meaningful way to ensure the social, political and economic order of the country.

Unlike the 1990s, when the MOR's HSR ambitions had received limited support from China's top leaders, such as Li Peng and Zhu Rongji, the Hu Jintao and Wen Jiabao administration provided full backing to Liu Zhijun's HSR program. Closed corridors were not novel to both railway policymakers and state planners. Before the test run on the Liaodong Peninsula, workers in the Shenyang Railway Bureau had already suggested separating passenger and freight lines to increase capacity. At the central level, in 1993, the MOR pursued the same strategy and proposed to construct a new HSR corridor between Beijing and Shanghai. The goal was to improve capacity between the two largest cities in China. Despite hopeful wishes, before the launch of the Big Leap Forward (BLF), HSR development had been postponed. Li and Zhu failed to provide succour to the central ministry as the latter was unable to push through HSR construction against myriad attacks from opponents.

With the arrival of a new generation of top leaders in 2002 and 2003, China quickly moved to establish a national HSR program. The post-WTO leadership immediately approved the Four Horizontal and Four Vertical Dedicated Passenger Network—a total of eight HSR corridors. At the same time, state planners endorsed the central ministry's pursuit of technology leapfrogging. Wen Jiabao decided on the overall modernization strategy of "import, digest, absorb and re-innovate" (*yinjin xiaohua xishou zaichuangxin*) (Zhang TM, 2016: 266). In addition to this framework principle, Huang Ju and Zeng Peiyan oversaw the initial process of importing foreign highspeed train models. In the latter phases, the State Council—perhaps under orders from Wen, Zeng Peiyan and Zhang Dejiang (after 2008)—instructed the Ministry of Science and Technology (MOST) to work with the MOR on indigenous innovation.

The fragmented sub-national innovation systems were nationalized by Liu Zhijun to support a centralized effort in the research and development of electric multiple unit trains

(EMUs). In that process, the MOR limited the channels of technology transfer by establishing three points of contact, all under centralized control, for foreign manufacturers. Rolling stock plants in Changchun, Tangshan and Sifang were chosen to participate in Liu and Zhang Shuguang's national innovation system, which oversaw four aspects of highspeed train modernization: management, evaluation, research and development, and manufacturing.

To exercise power concentration and implement technology leapfrogging, the MOR strengthened its coordinating capacities. The development of a comprehensive and national HSR network was a process of negotiation through which to achieve a convergence of interests among various levels of government. HSR development also led to a systematic integration of railway engineering (*tielu daxing gongcheng xitong jicheng*). In the process of indigenous innovation, a national innovation system was established to harmonize six engineering and industrial systems: 1) railroad civil engineering, 2) rolling stock, 3) traction and electrification systems, 4) signal and telecommunication systems, 5) operation and dispatch and 6) passenger services. Mechanisms such as "joint production," "coordinated adjustment and experiments" and an "industry, education, research and application network" were also created for coordination purposes. The carefully choreographed move toward modernization showcases the railway ministry's organizational capacity in the pursuit of China's developmental agenda.

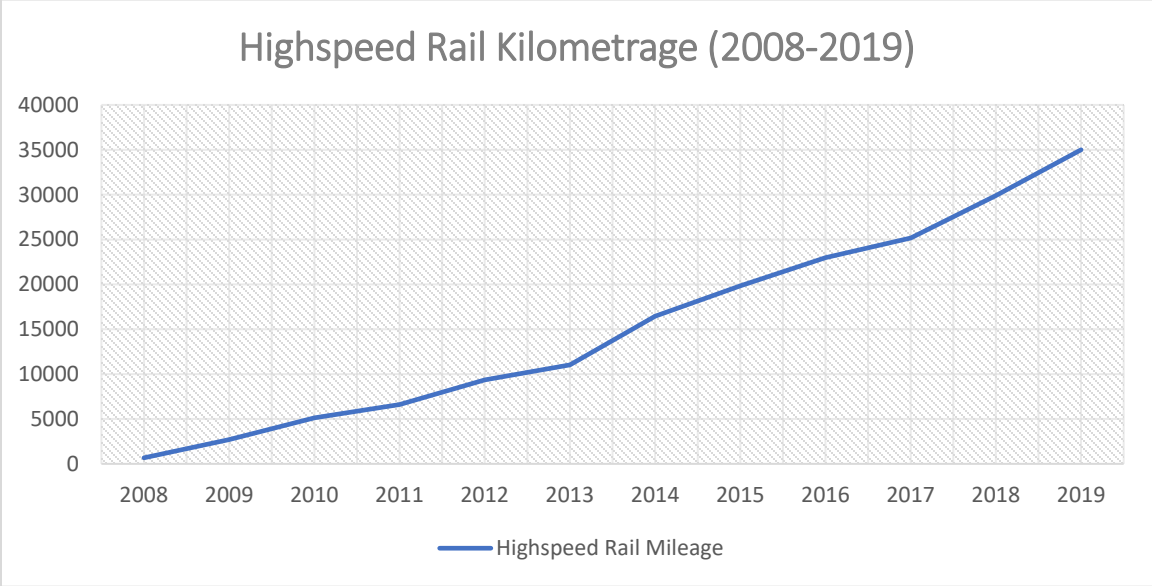
At the sectoral level, the central ministry turned regional railway bureaus into mere executive arms and utilized its organizational and market leverage to streamline the behaviour of the non-transport sector. The Chinese Academy of Railway Science (CARS) played an indispensable role in organizing the research and development, production and evaluation of highspeed train technology. The CARS served as an effective extension of the chief engineer and the Transport Division's power, as it controlled these non-transport centrally-owned state enterprises (SOEs) for modernization purposes.

The State Council and NDRC played important leadership roles in providing policy support to the MOR. In the Eleventh Five-Year Plan (FYP, 2006 to 2010), the research and development of 200km/hr highspeed trains became an industrial priority of the state. The NDRC integrated HSR and highspeed train development into the state's broader science and technology modernization scheme—the *Outline of the National Medium- and Long-term Planning for*

Development of Science and Technology (2006 to 2020). New committees were established by the State Council to draft implementation strategies for the development of highspeed trains. The State Council and the NDRC continued to support the establishment of a comprehensive HSR network in the Twelfth and Thirteenth FYPs (2011 to 2020). The NDRC, the MOR, the MOST and the National Natural Science Foundation of China (NSFC), using the state's budget for science and technology development, funded the research and development of EMUs with full Chinese intellectual property rights.

Two notable sectoral strategic policies were designed to guide highspeed train innovation. First, the *Outline on the Acceleration of Railway Rolling Stock Modernization* laid the foundation for the early phase of domestic EMU development. After that, the MOR and the MOST published the *Independent Innovation of Chinese Highspeed Train Cooperation Agreement and Joint Action Plan* to guide the research and development of a national brand. In addition to these two policies concerning rolling stock modernization, the central ministry and its reincarnation—the China Railway Corporation (CRC)—guided industrial development through the publication of the *Policies on Major Railway Technologies* and the *Temporary Technical Specifications for the 350km/hr China Standard EMUs*. Together, these measures effectively culminated in the launch of China's inchoate HSR industry (see Figure 10).

Figure 10: Highspeed Rail Kilometrage (2008 to 2019)



This chapter consists of five sections, inclusive of the introduction and the conclusion. The next section examines how a lack of central commitment hindered early HSR development in the 1990s. The third section provides an overview of the general policy frameworks concerning HSR development, and the fourth section examines the process of highspeed train modernization in detail. The modernization process could be divided into three phases—the initial import phase, the digestion and absorption phases and the re-innovation phase. Each phase corresponds to a specific period of railway development and a period with specific outcomes—the first generation of the China Railway Highspeed (CRH), the CRH380 series and the China Railway (CR) series. This section clearly illustrates the various roles and responsibilities of each actor in the modernization process and the effects of a more assertive Party-state in railway development.

The Two Great Debates

The early HSR development in China was conducted by the one powerful MOR, encompassing both transport and non-transport sectors. In the 1990s and early 2000s, despite the MOR's "need for speed," the State Council failed to provide the necessary policy and financial support. Additionally, because of its own fiscal starvation and growing debt problem, the ministry also did not have the capital required for the development of highspeed train technologies. An elusive national program was deemed economically infeasible and fiscally unsustainable. As a result, HSR development was not a priority of the Chinese state.

In the early 1990s, Vice Premier Zhu Rongji realized that sufficient transportation capacity was the foundation of a healthy national economy. In 1993, during a visit to Hunan, Zhu witnessed the abject conditions of railway travel, as migrant workers flooded passenger carriages, which were 300% over the loading capacity. In light of the situation, Zhu called on the MOR to "expand railway construction to promote the national economy" (Zhu, 1993: 17). Responding to Zhu's call, the MOR began to study various ways of increasing passenger and freight capacity, including the feasibility of building HSR corridors in more developed areas of the country. Despite a call to upgrade railway service and transportation capacity, the State

Council never wholeheartedly supported any nation-wide projects. In addition to a lack of central commitment, China's early HSR development lacked long-term vision and was faced with situational attacks. Sectoral policymakers lamented the absence of viable support from China's top leaders such as Li Peng and Zhu.

By the early 1990s, the railway ministry had discussed the possibility of improving transportation capacity between Beijing and Shanghai, as the existing trunk line could barely accommodate the movement of people and goods between the two cities. In 1990, the MOR submitted the *Report on Tackling HSR Technology During the Eighth FYP* to the State Council. Two years later, the MOR submitted another report titled *Suggestions to Construct HSR As Soon As Possible*. The two proposals, unexpectedly, galvanized the first round of two national debates concerning HSR construction in China. These debates focused on three core issues—money, necessity and technology—and while they severely limited the central ministry's ability to establish one HSR corridor between Beijing and Shanghai, the debates occurred because Li Peng and Zhu Rongji vacillated between two sides of contentious arguments. Due to the lack of political consensus regarding the necessity and the type of technology, Li and Zhu provided only titular support, which was insufficient for the MOR to overcome waves of resentment from railway experts. Indeed, practical support, such as promoting the establishment of the Beijing-Shanghai HSR Corridor as a national project, was absent from the State Council.

In 1993, four state commissions and the railway ministry jointly ordered a feasibility study on an HSR corridor between Beijing and Shanghai. The State Science and Technology Commission, the State Planning Commission (SPC), the State Economic and Trade Commission (SETC), the State Commission for the Restructuring of the Economic System and the MOR, together with more than 100 experts, jointly drafted *An Early Research Report on the Major Technological and Economic Questions of the Beijing to Shanghai HSR*. The report concluded that there was an urgent and dire need to build an HSR corridor between Beijing and Shanghai; the report also argued that the proposed project was "technologically viable, economically sensible, within the national capacity, and the funding for which could be resolved" (Fu, 2017b: 2). Here, economically sensible meant that the central ministry was willing to fundraise for the

project without additional financial support from the central government, as it believed that the HSR corridor could be profitable.

In April 1994, the same four commissions and the MOR proffered another proposal to the State Council. In their proposal, titled *Regarding the Request to Build an HSR Corridor Between Beijing and Shanghai*, these administrative bodies outlined a basic timeline for the project, as they had hoped to start the construction work by 1995 and complete the project before 2000 (Fu, 2017b: 2). In May and June 1995, Li Peng and Jiang Zemin studied the proposal in tandem. At a working meeting of the Central Leading Group for Financial and Economic Affairs in June 1995, Jiang agreed that the central ministry could begin preparing a pre-feasibility study for the proposed project (Fu, 2017b: 2). Encouraged by Jiang's consent, the MOR immediately hosted a meeting with railway experts at Xiangshan, Beijing. At the meeting, an agreement was reached to adopt wheel-track multiple unit (MU) technology for the HSR project (Han FD, 2006).

Upon hearing this decision, railway experts such as Hua Yunzhang and Yao Zuozhou initiated a national debate against the construction of a new and separate trunk line. According to Hua, the former Chief Engineer of the Shanghai Railway Bureau, transportation capacity could be improved through the electrification of the existing lines, which would cost only 2.2 billion CNY (Han FD, 2006). Hua argued that the MOR's plan was not economically sensible, as it could cost as much as 52.3 billion CNY. Therefore, according to Hua and Yao, the urgent task of the time was to invest in electrification systems and explore speed elevation on existing lines. Convinced by these arguments, Zhu Rongji decided to postpone the project in 1995 and claimed that he needed more time to consider both sides of the argument (Han FD, 2006). In the same year, State Council Premier Li Peng instructed the MOR to *prepare* to start the construction phase of the Beijing-Shanghai HSR Corridor during the Ninth FYP (1996 to 2000). Still, the exact date would be decided based on need and feasibility (Li Peng, 1997).

Since the State Council remained uninterested in accelerating HSR construction, the central ministry pursued speed elevation to shorten the time for passenger turnover and free up some track space for freight traffic. The preparatory work of the first grand speed elevation campaign, scheduled for 1997, took place at the Shenyang Railway Bureau in 1994. Under the leadership of Director Liu Zhijun, engineers and railroad workers had to "figure out and solve

track and rolling stock-related problems" associated with the century-old trunk line between Shenyang and Dalian (W29JZB18). However, the curve radius of the trunk line—first built by the Russians during the late Qing, then by the Japanese during the early years of the Republic—could not sustain long-distance highspeed operation. Unencumbered by these technical obstacles, Liu warned that anyone who could not ensure the successful debut of the "Liaodong Peninsula" (*liaodong bandao hao*) would lose their jobs (W29JZB18).

On the day of the test run in early 1994, the trunk line was the scene of a critical moment in the PRC's railway history. Just like those senior cadre members in the Guangzhou Railway Group who endured three hours of a fateful ride to test the Wuhan-Guangzhou HSR corridor, senior leaders from the Shenyang Railway Bureau, including Liu, boarded the test train without hesitation. The growling sound of the "East is Red" locomotive's (*dongfanghong hao*) combustion system produced what witnesses at Dalian Station saw as a black dragon hovering over half of the city sky. The trial successfully reduced the travel time between the two cities from eight hours to three and a half hours, though with trembling tracks and overpowered diesel locomotives (L2LG18). Perhaps because of Liu's extraordinary but deranged efforts in proving that speed elevation was more than plausible, he was soon promoted to be the MOR's general director of transportation, responsible for the MOR's future speed elevation campaigns.

Simultaneous to the MOR's speed elevation efforts, in 1996, senior leaders decided to further postpone the construction of the Beijing-Shanghai HSR corridor to the early 2000s. Despite the delay, the SPC was able to push for the inclusion of two highspeed train research programs as a part of the National Programs for Science and Technology Development during the Ninth FYP (1996 to 2000): the Early Research Program on Highspeed Train Technology and the 200km/hr Electric Multiple Unit (EMU) Research Program. The first program was led by the MOR, and the second program, which particularly focused on the research and development of highspeed trains, was led by stock plants in Changchun, Puzhen and Zhuzhou.

Unsatisfied with the delay on the Beijing-Shanghai project, the MOR continued to seek support from the State Council. In April and May 1996, the central ministry proposed, in tandem, an additional, albeit shorter, HSR project between Nanjing and Shanghai and a pre-feasibility study of the Beijing-Shanghai project to Li Peng. In an afternoon meeting on September 18,

1996, Li told participants, including Fu Zhihuan, that the proposed Beijing-Shanghai HSR Corridor's transportation capacity and investment opportunity must be carefully reviewed. Specifically, Li and senior Chinese leaders were worried about the economic return of the project. Therefore, top leaders needed more information concerning the cost of railway construction and operation, ticket pricing and profitability (Han FD, 2006).

Li Peng did, however, acknowledge that an HSR corridor between Beijing and Shanghai was necessary for national economic development (Fu, 2017a: 191). Fu interpreted the premier's suggestions as slight encouragement to proceed with the project. The MOR immediately moved to deepen its preparation work and submitted the *Proposal to Build an HSR Between Beijing and Shanghai* in March 1997. This time, the railway ministry decided to garner public and societal support and use such enthusiasm to pressure the State Council. The MOR sought advice from field experts, staff members, academics and researchers and organized several conferences and publications. This round of hard work resulted in the State Council's decision to designate the Beijing-Shanghai HSR project as a top national priority (Fu, 2017a: 191).

The MOR soon found itself in another round of intense national debate. In 1998, at the annual meeting of the Chinese Academy of Science and Chinese Academy of Engineering, the new Premier Zhu Rongji asked about the possibility of building the HSR project with maglev technology (Han FD, 2006). Zhu himself had been fascinated by the prospect of maglev trains, which was the most advanced railway technology of the day (SR27ML17). Encouraged by Zhu's interest, maglev experts such as Yan Luguang began a multi-year lobbying program—asking the State Council for support for the development of a domestic maglev industry chain. After Zhu's speech, Yan wrote to Zhu and outlined the benefits and necessity of importing maglev trains for China's economic and industrial development (Wang Q, 2004). After reading the letter, Zhu instructed the MOR to discuss and cooperate with Yan and German experts on the possibility of promoting indigenous innovation (Fu, 2017a: 194; Wang Q, 2004).

Responding to this new demand, the railway ministry dispatched Vice Minister Sun Yongfu and Associate Chief Engineer Zhou Yumin on a fact-finding trip to Germany and France to learn about the commercial application and operation of maglev trains (Fu, 2017a: 194). Despite pressures from the State Council, the MOR reached an internal conclusion to reject

maglev technologies based on incompatibility with the existing national network. Fu Zhihuan cogently argued that the cost of building a nation-wide maglev network would be too high. Even worse, the central ministry could not harmonize the technical specifications of maglev trains with its existing standards. Moreover, according to Fu, an independent maglev line could not offer many benefits to the Chinese society, and the problem of capacity deficiency would persist (Fu, 2017a: 194). In addition to these concerns, the central ministry was unsure of the environmental consequences, such as radiation, and it was uncomfortable with the high cost of relocation and land acquisition. But more importantly, maglev trains, compared to wheel-track highspeed trains, lacked successful and comparable cases, as the commercial viability of these trains in large-scale and nation-wide settings remained questionable at best (SN04MS17).

The MOR's *Investigation Report on HSR Technologies in Germany and France* proposed that the new HSR corridor between Beijing and Shanghai should still adopt wheel-track systems. In September 1999, the China International Engineering Consulting Corporation—together with the SPC, the SETC, the MOST, the MOR, the Chinese Academy of Science and the Chinese Academy of Engineering—jointly hosted a conference highlighting their efforts to support the adoption of wheel-track EMUs and put an end to those polemics in favour of maglevs. After four days of discussions, a majority of conference participants agreed to adopt wheel-track EMUs for the new Beijing-Shanghai HSR Corridor (Fu, 2017a: 195). Upset with the decision, Yan Luguang wrote to Zhu Rongji and argued that the MOR was biased in its handling of the affair (Wang Q, 2004). The two sides finally reached a compromise on June 12, 2000, as the State Council approved a pilot maglev project between Lujiazui and Pudong International Airport. At the same time, the State Council again delayed the construction of the Beijing-Shanghai project. In light of that decision, Fu Zhihuan implored the State Council to reassign the research and development of maglev technologies to the MOST, so he could focus on reforming the railway sector (Wang Q, 2004).

The lesson from these two debates was consequential—the MOR failed to heavily invest in HSR development as it never received a firm commitment from the State Council. Alongside the lack of central commitment, the central ministry was unable to present a clear vision of HSR development. As a result, policy entrepreneurs such as Hua Yunzhang, Yan Luguang and Yao

Zuohou capitalized on these opportunities to stymie HSR development. Yan, in fact, competed for central resources in his campaign for the national adoption of maglev trains.

Against this backdrop, the Qinhuangdao-Shenyang Passenger Corridor was presented to the State Council in 1998. Interestingly, the MOR presented this project as a dedicated passenger corridor (*keyun zhuanxian*) instead of an HSR corridor (*gaosu tielu*). The central ministry argued that this line was needed to ameliorate capacity deficiency and boost passenger transport between Beijing and Shenyang (SR27ML17). At that time, while the technology for domestic wheel-track highspeed trains was still being developed, the plan was to use two high-power locomotives for speed elevation (SR27ML17). Consequently, the Qinhuangdao-Shenyang corridor debuted in 2003 with an operating speed of 200 km/hr and a design speed of 250 km/hr.

Despite the backlash against a national program, innovation was fostered at the regional level. With their newly gained investment autonomy in the 1990s, regional railway bureaus and rolling stock subsidiaries worked together to develop highspeed train technologies. Indeed, as part of their preparation work for the MOR's speed elevation campaigns, regional bureaus discovered that railway equipment upgrades likely would attract more passenger traffic, and they would profit from ticket services. Therefore, domestic highspeed train innovation began with scarce resources and primitive foreign technology (SN04MS17).

The Nanchang Railway Bureau and China North Rolling Stock (CNR) Tangshan jointly produced the Lushan model in 1998, and CNR Changchun with Guangshen Railway Corporation manufactured the Blue Arrow model and the Changbaishan model in 1999 and 2001, respectively. The former was used for the Guangzhou-Shenzhen Railway, and the latter served as the signature train, albeit for an abbreviated period, for the Liaodong Peninsula. The self-researched and innovated China Star (z*honghua zhixing*), the designated highspeed train for the Qinhuangdao-Shenyang Passenger Corridor, reached a test speed of 321.5 km/hr. However, the rapid development of HSR technology and corridors only began after 2004 during the national Big Leap Forward (BLF). This time, the State Council pledged its unconditional support to the central ministry, without any hesitation.

An Overview of Post-2003 HSR Development

In the mid-2000s, HSR emerged as one of the primary ways to mitigate geoeconomic stress and sustain high-level growth. Against this backdrop, state planners shifted developmental and sectoral policy directions toward supporting a concentration of power to accomplish big things. Liu Zhijun decided to merge scattered, fragmented and competing regional research initiatives into one ambitious national program, under the guidance of the central ministry. At the same time, Liu abandoned domestic innovation. In the development of HSR or dedicated passenger networks, both the State Council and the NDRC reversed their previously held lukewarm positions. The former approved a national network consisting of four north-south corridors and four east-west corridors, and the latter worked with the central ministry to ensure cross-sectoral and national coordination.

The NDRC had a steep learning curve during the 1990s and only realized the economic value of large national infrastructure projects as a means to stimulate economic growth in the early 2000s (Bai and Zhao, 2013). While the commission supported the more economically sensible corridor between Beijing and Shanghai, it did not see the necessity of a comprehensive national network. The commission's support for a national plan came after Jiang Zemin had approved the Qinghai–Tibet Railway in 2000. In the initial policy formulation process, an overwhelming number of cadre members within the commission opposed Fu Zhihuan's vision of connecting Lhasa with the national railway network. Some members opted for "a few more aircrafts" since they believed "there was nothing in Lhasa to be transported out of Tibet" (Bai and Zhao, 2013). After Jiang had personally intervened, and during the implementation phase, the commission then learned how one particular project could stimulate domestic consumption and economic growth.

Therefore, by the early 2000s, the NDRC had begun to devise new ways to promote HSR construction through power concentration (*jizhong liliang ba gaotie gaoqilai*). State planners realized that HSR development could be a way to achieve social and political stability, as an increase in passenger capacity would help solve issues concerning the overwhelming task of moving billions of Chinese people during the Chinese New Year. Indeed, more passenger trains, operating at a higher speed and with a faster turnover rate, would improve the ticketing situation.

The commission also realized that administrative and policy guidance were needed to promote endogenous growth. Investment in highspeed rail and highspeed trains became a feasible alternative, as it could stimulate industrial upgrades from downstream manufacturing sectors. Before Zheng Xinli left the NDRC in 2000 to assume the position of associate director of the Central Policy Research Office, he had already become an early advocate for the establishment of a national HSR network through power concentration (Bai and Zhao, 2013).

With full support from the Politburo, the State Council and the NDRC, HSR development witnessed unprecedented financial investment and organizational support. This shift in priorities was documented in the Eleventh FYP (2005 to 2010), which highlighted the construction of dedicated passenger networks and inter-city railways as national priorities.

Prior to the decision in early 2003 by the State Council and the NDRC to import foreign technology, Liu Zhijun and Zhang Shuguang asked the Bombardier and Sifang joint venture (BST) to build a model highspeed train based on Bombardier's existing EMU technologies. The train would then be presented to the NDRC. Liu and Zhang convinced the leaders of the NDRC, Ma Kai and Zhang Guobao, of the need to import foreign technology for the embryonic domestic industry. In light of the MOR's enthusiasm, in July 2003, the commission asked its Institute for Comprehensive Transportation (ICT) to study the MOR's proposal concerning importing foreign technology for the Beijing-Shanghai HSR Corridor. According to Dong Yan, who later became the Party secretary of the ICT, new State Council leaders decided to pursue the Beijing-Shanghai project. Still, they had some reservations concerning foreign technology (Wu Q, 2011). Dong and the ICT, in their report titled *A Few Strategic Considerations on the Construction of the Beijing-Shanghai HSR Corridor*, argued that importing foreign technology was feasible and, more importantly, should be the new starting point for domestic innovation (*zuowei yanjiu qidian*) (Wu Q, 2011).

Ma Kai and Zhang Guobao proffered the report to the State Council. They reportedly persuaded the Politburo—including Wen Jiabao, Huang Ju and Zeng Peiyan—to support the MOR's strategy concerning railway equipment modernization and HSR construction based on wheel-track EMUs. After reading the report, senior Chinese leaders understood that foreign models were much more advanced and mature compared to the China Star, which had been

considered as the epitome of domestic innovation (L12BZ18). Wen then announced the principle of importing foreign technology for indigenous innovation in late 2003. The transition of top leadership in 2003 was crucial to the emergence of a national HSR program. As a result, Li Peng and Zhu Rongji, who had retired from their respective positions, could no longer hinder HSR development through direct policy intervention.

In the decision-making process, the immediate market consideration for state planners was to stimulate domestic growth and modernize and strengthen downstream manufacturing, including the steel, cement and glass-making industries (Bai and Zhao, 2013). Commenting on the ICT's report, State Council leaders also argued that HSR construction, as part of a comprehensive project to improve the national economy, must stimulate domestic economic growth (Wu Q, 2011). They understood from Dong Yan's study of the Japanese Tokaido Shinkansen, which began to profit after 33 years of commercial operation, that the immediate concern of HSR construction was not about profitability (Wu Q, 2011). There was a broad consensus, albeit not a unanimous one, that profitability would come only after the completion of a comprehensive regional and national network and steady financial commitment over an extended period. Weighing these economic and market considerations, the State Council and the NDRC decided to entrust the railway ministry with the power to coordinate the entire process, thereby achieving rapid development through centralization and economies of scale.

The structure and nature of the Chinese regime create a natural advantage in pursuing nation-wide projects on such an unprecedented scale. Other than the ability to forge a national consensus, the socialist system bestows on various levels of government the power to acquire land quickly and inexpensively, which was of utmost importance for building new trunk lines (SN2I17; SN4MS17). Once a policy has been approved and elevated to a level of national importance—gaining the attention of top central leaders (members of the Politburo's Standing Committee)—such a policy is sure to be implemented swiftly and with strong financial backing.

The central ministry's status as both government and business and its monopoly over the vertically integrated and construction-operationally integrated sector allowed it to pursue HSR development in a highly centralized fashion. Indeed, the ministry consolidated all resources and asset management, promoted collective action among government ministries and various levels

of government, and coordinated railway-related research institutes and engineering teams for the purpose of road construction and highspeed train modernization (Ma and Zhen, 2016: 44).

Sounds of confidence and strong central support for HSR development came from Huang Ju in 2006. On behalf of China's senior leaders, Huang requested the railway ministry to "centralize all powers, overcome all difficulties, take all effective measures and fight resolutely for railway construction" (China Railway Yearbook, 2007: 5). In addition to verbal encouragement, the State Council integrated HSR development with China's national developmental strategies. Restrictive targets concerning HSR development were included in the Eleventh, Twelfth and Thirteenth FYPs (2005 to 2020); in fact, the Twelfth and Thirteenth FYPs (2011 to 2020) explicitly called for an acceleration in the construction of HSR corridors. In a mere decade, China's HSR industry became a platform for cutting-edge research and innovation—and the state's policy of "import, digestion, absorption and re-innovation" was diligently carried out by sectoral policymakers.

Supported by the Politburo, the State Council and the NDRC, HSR construction exceeded the MOR's initial planning, as the 2004 version of the MLTRP had been revised twice due to outstanding achievements—once in 2008 to reflect greater investment in railway development and again in 2016 to support the Party's efforts in building a moderately prosperous society. In the wake of the 2008 global financial crisis, the central government crafted a four trillion CNY stimulus package aimed at expanding domestic consumption. At the same time, the central government also increased its investment in railway infrastructure. At an executive meeting of the State Council in November 2008, Wen Jiabao announced the dedication of one-tenth of that stimulus package to railway projects (People.cn, 2008).

Pursuant to these moves from the central government, the NDRC asked the MOR to revise its multi-year program, as it could no longer accommodate the developmental requirements of the country. During the initial years of the BLF (2003 to 2011), while the annual GDP growth was approximately 10%, the yearly increase in railway kilometrage was only 2.2% (Gov.cn, 2008b). As a result, the MOR "obeyed the national strategy" by readjusting its developmental goals to "meet the different requirements for socio-economic development" (Gov.cn, 2008b). In 2008, to revise its development objectives, the MOR accelerated national

HSR network expansion and established a new target for 2010, to reach a total of 7,000 km. The new target was 2,000 km higher than the original goal established in the 2004 version of the MLTRP. By 2013, the national highspeed kilometrage had reached 13,000 km, with the completion of the Beijing-Shanghai HSR Corridor, Beijing-Guangzhou HSR Corridor and Harbin-Dalian HSR Corridor.

HSR development requires large-scale coordination. Once the NDRC had approved a feasibility study, the central ministry would establish a construction headquarters (*jianshe zhihuibu*) to coordinate actors from local governments, regional railway bureaus, civil engineering and construction teams, and survey and design institutes. Senior cadres within the ministry or leading cadres from regional bureaus usually assumed important leadership positions in these headquarters (SN4ML17). In the construction of the Qinhuangdao-Shenyang Corridor, 13 actors from various levels of horizontal and vertical administrative units were involved in addition to the Beijing Railway Bureau, the Shenyang Railway Bureau and local governments (Ma and Zhen 2016, 44).

Table 4: Notable actors in Qinhuangdao-Shenyang Passenger Corridor

Project	Date	Actor(s)
Ballastless Track	1999–2000	Changsha Railway University
		MOR's Third Survey and Design Institute
		MOR's Fourth Engineering Bureau
		MOR's Third Engineering Bureau
Roadbed	1999–2000	MOR's Third Engineering Bureau
		Southwest Jiaotong University
		Shijiazhuang Railway University
Railway Maintenance	1999–2000	Shenyang Railway Bureau
		Chinese Academy of Railway Science
Box Beam	1999–2000	Railway Construction Research and Design Institute

		Wuhan Institute of Mechanical Engineering

The fall of Liu Zhijun and Zhang Shuguang and the 7.23 Wenzhou train collision incident in 2011 caused an immediate reduction in railway fixed asset investment, from 744.15 billion CNY in 2010 to 591.5 billion CNY in 2011. The newly appointed minister of railways, Sheng Guangzu, took a more conservative approach to the development of the national HSR network. Under Sheng's leadership, the ministry accelerated the onset of a large-scale reduction in the operating speed (*jiangdi yunying sudu*) and standards (*jiangdi mubiao sudu*) of the CRH and HSR corridors. As a result of Sheng's unpopular moves, railway workers nicknamed him Mr. Impediment (*sheng gaozu*).

The MOR's reform and transition into the China Railway Corporation (CRC) in 2013 continued to slow HSR construction nation-wide. China's HSR program regained momentum in 2014 after the introduction of the Belt and Road Initiative (BRI). The Xi Jinping-led government and Party administration saw the program as a way to demonstrate China's economic prowess and technological competence. With increased financial support, starting in 2014, the CRC increased the level of capital investment in railway fixed assets from the previous 700 billion CNY to 800 billion CNY (see Table 5).

Table 5: Central Railway Investment after 2016

Year	Amount (billion CNY)	Increase in Kilometrage (HSR)
2016	801.5	3,281 (1,903)
2017	801	3,038 (2,182)
2018	802.8	4,683 (4,100)
2019	802.9	8,489 (5,474)

In 2016, the MLTRP was revised again, as the CRC was ahead of schedule in railway development and infrastructure building. By the end of 2015, the total kilometrage reached 150,000 km—19,000 km of which was HSR—exceeding the goals established by the 2008 version. These accomplishments were made possible only with continued financial support from

the state.[24] Therefore, the 2016 program re-evaluated the goals set in 2008 and increased the total kilometrage from 120,000 km to 150,000 km (30,000 km of which was HSR). The CRC transitioned the Four Vertical and Four Horizontal Dedicated Passenger Networks into a more ambitious Eight Vertical and Eight Horizontal HSR Network. The latter initiative would double China's existing HSR kilometrage from 19,000 km to 38,000 km by 2025, and improve existing railway infrastructure to allow highspeed trains to again reach the speed of 350 km/hr. Within the CRC, the period from 2016 to 2025 has been labelled as the "Golden Ten Years of Railway Development" (SE1MS16).

The 2016 revision of the MLTRP also called on the CRC to achieve the following reform and developmental targets:

1. Strive for supply-side structural reform and increase the sector's effective supply,
2. Play a leadership role in spatial restructuring and regional development,
3. Promote the establishment of comprehensive transportation systems,
4. Elevate the railway sector's emergency service capacity to support the country's overall security, and
5. Build a modern railway infrastructure network.

The Development of Highspeed Train Technology

The following three subsections focus on highspeed train innovation, the marked feature of China's railway equipment modernization. The first subsection examines the importation of foreign technology, while the second and third subsections focus on digesting and absorbing foreign technologies for indigenous innovation. Throughout the process, the MOR and the succeeding CRC played a crucial leadership role in coordinating and implementing the strategy of technology leapfrogging through various agencies, workgroups and expert groups.

[24] Fixed asset investment in 2011 was only at 533.678 billion CNY, making this the only year below 650 billion CNY after the global financial crisis. Fixed asset investment in 2009 was 666.01 billion CNY, 744.15 billion CNY in 2010, 612.88 billion in 2012, 669.07 billion CNY in 2013, 768/07 billion CNY in 2014.

With limited ability to influence the national strategy, these non-transport entities could be considered as mere implementers. Though recognized as carriers (*zhuti*) of highspeed train innovation, they were under the coordinating power of the central ministry, which played a guiding role (*zhudao*). Indeed, various platforms for technology and knowledge transfer and highspeed train innovation and production were directly established by the MOR. During Liu Zhijun's tenure as the minister of railways, centralization and semi-militarized management were accentuated. Sectoral development focused heavily on railway construction (*xiang jianshe yao da'an*), and such a developmental strategy further strengthened the central ministry's absolute and dominant position within the sector (*juedui huayuquan he zhudaoquan*) (Mu X, 2011).

The First Generation

The first phase of domestic highspeed train innovation focused on importing advanced foreign technologies, which became the base model for the first generation of the CRH (also known as *hexie hao*)—namely, the CRH 1, the CRH 2, the CRH 3 and the CRH 5 series. Senior leaders and railway policymakers converged on the idea of importing foreign wheel-track EMUs that could operate at a minimum speed of 200 km/hr (in 2004) and 300 km/hr (in 2005). Between 2004 and 2005, the MOR engineered two rounds of "bringing in," as foreign technologies from Japan and Europe were transferred, digested and absorbed to adapt to China's geological conditions. The first round in 2004 was conducted as a part of the MOR's preparation efforts for its Sixth Grand Speed Elevation Campaign, which had already been scheduled for 2007. The second round in 2005 was a part of the state's broader developmental plan to showcase its technological competence and modernity for the 2008 Beijing Olympics. The feasibility study of the Beijing-Tianjin Intercity Railway, with a designed operating speed of 350 km/hr, was already approved by the State Council in December 2004.

The MOR's decision to import foreign technology was announced in Liu Zhijun's 2003 speech concerning rolling stock modernization. Liu stated that the railway equipment upgrades must follow the principle of adopting advanced, mature, economical, appropriate and reliable technologies. Liu's statement signalled that China would import cutting-edge foreign technologies that had been well-tested, were cost-effective, were appropriate to China's conditions and were secure in terms of operational safety (*CNR Yearbook*, 2004: 24). Liu boldly

pointed out that there was a "great gap" between the production capacity of the rolling stock industry and other domestic manufacturing industries, and the difference between the domestic and the international rolling stock production capacity was even greater, as Chinese firms lagged far behind their foreign counterparts (*CNR Yearbook*, 2004: 24).

The central ministry supported the development of rolling stock modernization by providing funding for technology and knowledge transfer in the development of EMUs. The MOR established a Rolling Stock Modernization Leadership Group, whose mandate included working with rolling stock manufacturers on a plan to modernize the subsector, to ensure the proper use of national funds and to smooth implementation (World Railway, N.D.). To that effort, the Leadership Group prepared the *Outline on the Acceleration of Railway Rolling Stock Modernization* (Zu, 2004), which was submitted to the State Council and received support from Huang Ju and Zeng Peiyan.

At a meeting dedicated to "Discussions on Issues Regarding Railway Rolling Stock," Huang Ju and Zeng Peiyan asked the central ministry to "import advanced technology, cooperate in design and manufacturing and create a Chinese national brand" (China Railway Yearbook, 2005: 90; Yan B, 2008). The State Council explicitly defined the role of the MOR as the coordinator and leader in negotiating with foreign ventures that wanted to enter the Chinese railway market, while the NDRC would assist the central ministry in accomplishing such a goal (Xu F, 2017; Caixin 2012). The State Council also established the Technology and Rolling Stock Professional Committee to facilitate rolling stock modernization.

The MOR, as a state ministry under the State Council, enjoyed considerable political clout, as it had more persuasion and influence over the State Council and the Politburo. The railway ministry's access to the top leadership core was unparalleled by these non-transport SOEs. Considered equivalent to vice-ministerial (*fubu ji*) entities, these non-transport SOEs include the newly created China South Rolling Stock Corporation (CSR), China North Rolling Stock Corporation (CNR), China Railway Engineering Corporation (CREC), China Railway Construction Corporation (CRCC) and China Railway Signal and Communication Corporation (CRSCC). Some of these entities later emerged to become among the largest of their kind in the global market.

These newly created non-transport SOEs fell under the regulation of the MOR, which conducted annual credit and quality rating evaluations to ensure compliance with its technical and operating specifications. Additionally, the MOR could influence decision-making and business activities of the rolling stock industry, as it seemingly blocked an attempt to merge the CSR and CNR due to its interests in maintaining controlled competition (Huang DY, 2018). More subtly, in both CSR and CNR's 2004 yearbooks, the special report section featured Liu Zhijun's speech at the MOR's "Seminar on Promoting Railway Rolling Stock Modernization." Liu prioritized "import[ing] advanced technology … to realize the systematic reform and innovation and comprehensive technological elevation of the rolling stock industry" (*CNR Yearbook*, 2004: 24). According to Liu, the fostering of a national brand could be done through "importing advanced technologies from foreign countries and absorbing them" (*CNR Yearbook*, 2004: 24). Both corporations attentively responded to the statement, which requested rolling stock manufacturers to "continue to advance with the times, promote technological innovation and accelerate the modernization of railway rolling stock."[25]

The MOR's dual role as government and business allowed it to become the main point of contact and decision-maker, as it exercised absolute power over which specific domestic manufacturers could be involved in the negotiation process (L12BZ18). All foreign ventures first were required to interface with the MOR before engaging with one particular Chinese rolling stock manufacturer. In both the 2004 and 2005 negotiations with foreign rolling stock manufacturers, Liu Zhijun was the principal negotiator representing the central government. Liu's consigliere was Zhang Shuguang, who had already been promoted to the MOR to supervise railway equipment and HSR development. Zhang emphasized that foreign access to the Chinese market had barriers and could be accomplished only through the central ministry, "who represented the Chinese government in inviting bids and awarding contracts" (Jiang W, 2010). The MOR's manoeuvres turned the likes of Siemens, Alstom and Kawasaki Heavy Industries

[25] Until 2012, both the CNR and CSR yearbooks continued to prominently feature similar directives from the ministers of railways on the rolling stock industry. The central ministry's annual publications included a special section dedicated to the rolling stock industry, under the "Industries" chapter near the end of each yearbook. The cross-over in publication, with differing locations, signals the MOR's special relationship with those manufacturers, and that the central ministry had continuous coordinating and regulatory influence over them.

into suppliers that could access the Chinese market only through technology transfer and the sale of EMUs, either in whole or in part (L12BZ18).

Zhang Shuguang also organized and participated in some of the negotiations on behalf of the central ministry. He was reputed to have shattered a drinking glass to intimidate representatives from Siemens in 2004. Zhang later became known as the chief architect of China's HSR industry because of his involvement in both the research and development of highspeed trains and the building of an extensive HSR national network.

Based on the directives from the State Council, the NDRC and the MOR established four basic guidelines for rolling stock modernization. First, foreign ventures seeking access to the Chinese market must comprehensively transfer their technology to their Chinese partners. Second, Chinese rolling stock manufacturers must import core and crucial EMU technologies. Third, domestic enterprises must be the mainstay of technological advancement. Fourth, the ultimate goal of import was the localization of advanced foreign technology (Xu F, 2017). In 2004, the MOR and the NDRC agreed on an "Implementation Scheme on the Import and Absorption of Multiple Unit Technology with an Operating Speed of 200km/hr." Such cooperation is symbolic of the NDRC's involvement in HSR development—helping establish policy frameworks to be executed by the central ministry.

The NDRC and the MOR were also committed to indigenous innovation, believing that future EMUs should be manufactured under the intellectual property of the Chinese railway sector. Such intellectual property rights must cover all critical components of a highspeed train—bogies, traction and braking (W28YQ18). Throughout the process, the central ministry implemented the State Council's railway development strategies by coordinating relevant firms. It is worth highlighting that the central ministry maintained its status as an administrative and a business entity, which means that the coordination of non-transport SOEs was done through a combination of administrative, regulatory and, more importantly, market means.

By 2004, the MOR had already created the Office for Import, Digestion, Absorption and Re-Innovation and had been preparing for the "joint design and production" (*lianhe sheji shengchan*) of EMUs. The office rallied more than ten domestic rolling stock manufacturers and

laid out the political and economic considerations of HSR development while facilitating the establishment of strict market-entry barriers. In the MOR's *Bidding Invitation for the 200km/hr. Multiple Unit Project*, the central ministry declared that only domestic firms that "have obtained mature technology for the design and manufacturing of 200 km/hr. MU models" could offer bids (Gao, 2015; Kaiser International Transportation (Guangzhou) Ltd., 2012). This criterion eliminated the possibility of an independent bid from foreign rolling stock giants, as they would be required to work with a Chinese partner to gain access. Moreover, Chinese manufacturers could not bid on their own, as they lacked mature and safe EMU technologies. As a result, foreign and domestic manufacturers were required to work together to win contracts, with the former completely transferring their advanced technology to their Chinese counterparts so that the latter could obtain these technologies.

To limit the channels of knowledge and technology transfer, the MOR handpicked CNR Changchun and CSR Sifang (Qingdao) to negotiate with foreign manufacturers (Zhang TM, 2014: 272). The MOR forbade these two firms from interfacing with foreign manufacturers directly, as all negotiations must be conducted in Beijing, under the organization of the central ministry (L12BZ18). Liu Zhijun and Zhang Shuguang warned Chinese rolling stock manufacturers and other state firms in the non-transport sector that the central ministry would suspend the procurement of vehicles from those who had contacted foreign manufacturers privately. The central ministry also warned SOEs that recalcitrant manufacturers would and could be punished further and excluded from the research and development of highspeed trains—Puzhen, for example (Chen ZL, 2016).

Zhang Shuguang became more confident in negotiating with international rolling stock manufacturers. Zhang repeatedly reminded these firms that the State Council, the NDRC and the MOR were unswervingly committed to a comprehensive transfer of technology, the use of Chinese national brands and the realization of domestic manufacturing—all with "appropriate" prices (Jiang W, 2010). Despite his corruption charges, Zhang was remembered and praised for his ability to protect China's national interest by reducing the overall cost of technology transfer (People.cn, 2014a). For example, he was successful in lowering the purchase price of original EMU models and the associated technology transfer fee—up to a total of nine billion CNY. CNR

Tangshan had benefitted from the MOR's manoeuvres with Siemens, as the rolling stock plant subsequently used Siemens' parts in assembling the traction system for the CRH 380B series (Caixin, 2012).

Other than the reduction in cost, this model of organized negotiation resulted in 1) the use of a national brand—the China Railway Highspeed—in the domestic production of EMUs, 2) the signing of comprehensive technology transfer agreements between foreign and domestic rolling stock manufacturers and 3) the training of Chinese technicians and engineers by foreign manufacturers on the know-hows of EMU development (Li and Huang, 2016: 19). The MOR, with centralized decision-making power, emerged successfully from these negotiations. In a telephone and televised conference with staff members, Liu proudly announced that he had successfully "outwitted the foreigners by 'tricking' them to compete against each other for the Chinese market" (SN4MX17).

More importantly, since the MOR maintained the railway sector as vertically integrated, it legitimately became the sole buyer in both the 2004 and 2005 rounds of import. The MOR made bulk purchases and instructed its regional bureaus to sign with specific vendors on a contract that had already been predetermined. For example, in 2004, the MOR awarded a total of seven packages to CSR Sifang, CNR Changchun and BST. Each package consisted of one original EMU model made from abroad, two EMU models to be assembled in China and 17 to be produced in China (Li and Huang, 2016: 18). CSR Sifang, together with the Japanese consortium led by Kawasaki Heavy Industries, won three packages. These later became the foundation for the CRH 2 series, which were initially manufactured for the Shanghai Railway Bureau. CNR Changchun, together with Alstom, won three packages, which became the foundation for the CRH 5 series. Trains branded as a part of the CRH 5 series were initially assigned to the Beijing Railway Bureau, but later gained popularity among both the Shenyang Railway Bureau and the Harbin Railway Bureau. BST signed one package, which became the foundation of the CRH 1 series, with the Guangshen Railway Group.

Interestingly, Siemens lost in 2004 because it was unwilling to yield to the demands made by the central ministry. Siemens decided to stand firm on its pricing in light of fierce competition, especially from Alstom, which had the support of both French President Jacques

Chirac and President Hu Jintao. The central ministry favoured Siemens' technology and therefore attempted to persuade the Germans to lower their price per train and the associated technology transfer fees. During the last round of the 2004 negotiations with Siemens, Zhang Shuguang told the German representatives that they must reduce their prices on original models from 350 million CNY per train to 250 million CNY with a technology transfer fee lower than 150 million EUR (Jiang W, 2010). At the time, the MOR did not consider Alstom as a viable option. First, the central ministry had always favoured Siemens' Valero, and, second, Liu Zhijun had already punished Alstom for its secret dealings with CSR Puzhen. However, Chirac encouraged China to allow Alstom to participate in the bidding process and, in return, he helped the European Union lift its ban on weapons sales to China (L12BZ18). The imperious Germans stood firm on their pricing, and their stubbornness ultimately paved the way for Alstom's sudden return. In just two hours, in what representatives from CNR Changchun referred to as "honest and constructive" negotiation, the French sold their Pendolino and SM3 to the Chinese (Jiang W, 2010).

Having learned this lesson, the top leadership of Siemens understood that they must lower their prices, especially technology transfer fees, if they wanted to enter the Chinese market (SN22IP18). Ultimately, they did just that, as Siemens readjusted its pricing to 250 million CNY for one package of EMUs and 80 million EUR for the technology transfer fee in 2005. They successfully won the bid in this round for the 300 km/hr models with CNR Tangshan. The Siemens-CNR Tangshan product, imported for the Beijing-Tianjin Intercity Railway, was later named the CRH 3 series, which laid the foundation for the CRH 380B series.

The Second and Third Generation

After 2005, the MOR did not make another bulk purchase of highspeed trains from foreign manufacturers. By 2006, the central ministry had shifted its focus from importing foreign technologies to digesting and absorbing these technologies for indigenous innovation. The MOR, with support from the MOST, led a multi-governmental effort in the development of the CRH 380 series. The coordination of various state and non-state actors was known as "joint production" (*lianhe shengchan*) and "joint adjustments and experiments" (*liantiao lianshi*).

These two initiatives established the foundation for the research, development and production of the China Electric Multiple Unit (CEMU) by CNR Changchun and CSR Sifang.

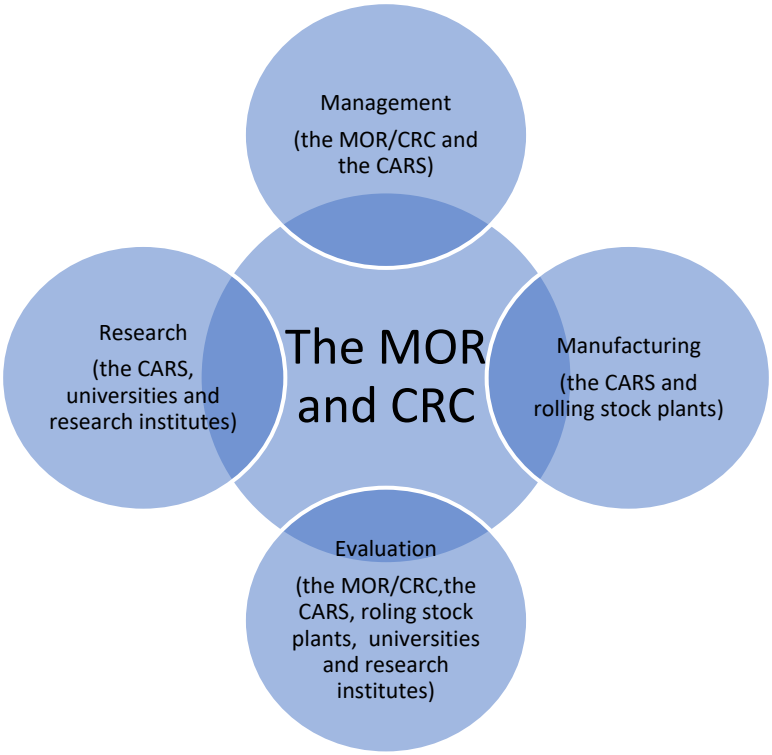
Other than playing an important leadership role in the Rolling Stock Modernization Leadership Group, Zhang Shuguang was also placed in charge of the Import, Digestion, Absorption and Re-Innovation Work Group (Shangquan Legal Defence, 2015). Between 2004 and 2010, Zhang was the primary person responsible for domestic research and development of highspeed trains (Wang and Lu, 2014; People.cn, 2014a). By 2010, he had made several technological advancements in the domestic production of EMUs. Based on the first and second generations of CRH, Zhang increased the top operating speed of the CRH from 200 km/hr to 350 km/hr, and the tested top speed of the CRH380 series reached a world record of 486.1 km/hr. In addition to increases in operating speed, Zhang improved the safety and comfort levels of the CRH (Jiao et al., 2011: 1, 3).

The Hu-Wen administration threw its unconditional support behind the central ministry's pursuit of indigenous innovation. The State Council, again, appointed the MOR as the main point of contact for all relevant domestic actors and as the coordinator of a national effort in the research and development of the CRH380 series. However, before the official start of this new project, the central ministry mainly worked with rolling stock manufacturers such as CSR Sifang, CNR Tangshan and CNR Changchun, and major research universities such as Southwest Jiaotong University. The MOR was responsible for the overall coordination and planning for the import and manufacturing of EMUs. Concurrently, the CARS, rolling stock manufacturers and universities worked together on highspeed train production.

By 2005, two coordinating agencies had been established by the MOR: the Highspeed Train Executive Office and a Highspeed Train Innovation Team. Both agencies were under the leadership of Zhang Shuguang, who had become the central ministry's associate chief engineer and the director of the Transport Division. The Executive Office was responsible for evaluating technology transfer (Yan B, 2008). During the process, the Executive Office parachuted work teams to assess domestic manufacturer's absorption of technology and knowledge about highspeed train production. These work teams toiled abreast of the Highspeed Train Innovation Team in EMU innovation.

The ultimate purpose of these two agencies was to establish a national innovation system under the coordination of the central ministry. Such an innovation system consisted of three aspects: a technological platform on which to research and develop domestic highspeed trains, a national system that consisted of four interacting parts (see Figure 11) and a team of highly trained managers and engineers. In this national system, rolling stock plants such as CNR Changchun, CNR Tangshan and CSR Sifang played an important manufacturing role. Still, they worked under the coordination of the railway ministry. The management, research and evaluation aspects of the national system were led by the central ministry and Zhang Shuguang, who frequently travelled between different rolling stock plants and universities to ensure orderly production and to troubleshoot problems with implementation due to technical difficulties.

Figure 11: Highspeed Train Innovation System



Though the central ministry received full assistance from the State Council and muscled support from within the railway sector, the decision to import foreign technology instead of building on domestic EMUs infuriated representatives of the MOST and the Chinese Academy of Engineering. In June 2005, Fu Zhihuan, who was serving on the Standing Committee of the

National People's Congress, and more than 50 members of the Chinese Academy of Engineering clamoured for the suspension of technology transfer from foreign rolling stock manufacturers. In their letter to the State Council, members of the academy requested senior leaders to foster domestic HSR technology instead (Zhang TM, 2014). In the same spirit, Jin Lüzhong from the MOST submitted another petition to the Politburo and the State Council. Jin harangued the central government and asked top leaders to correct the current path of railway equipment modernization, which focused on importing foreign brands (Tencent, 2013). Unlike Li Peng and Zhu Rongji, who had dallied over varying opinions, the new leadership was unmoved by these opposing views.

Without strong support from China's top policymakers and experts in science, technology and engineering, Zhang Shuguang and the MOR established partnerships with the Chinese Academy of Sciences and post-secondary and research institutions and matched them with rolling stock manufacturers. At a meeting on February 13, 2005, Zhang promised to donate two bogies to the Southwest Jiaotong University—one from an imported EMU and another from a domestic MU—and help the university establish a National Laboratory for Rail Transportation (The Paper, 2019). Two days later, on February 15, along with the creation of the Import, Digestion, Absorption and Re-Innovation Work Group, an Expert Group was also created to facilitate the research and development of highspeed trains. The group was led by Shen Zhiyun, a professor at Southwest Jiaotong University and, more importantly, a member of the Chinese Academy of Engineering.

The Expert Group consisted of experts from military equipment, aerospace equipment and design, and metal and welding. Academic researchers from Tsinghua University, Zhejiang University, Beijing Jiaotong University and Southwest Jiaotong University were asked to join. Shen's participation in the project revealed a divide that had existed within the academy on the necessity of importing foreign highspeed trains. At the meeting on February 15, 2005, Zhang Shuguang divided the Work Group and the Expert Group into nine project teams corresponding to nine categories of HSR technologies, including systems, carriages, bogies, traction, lines and braking. Zhang paired these groups with rolling stock manufacturers, which had been told to divide their assembly lines according to the same nine categories. The central ministry

financially supported all research and development with the national funding it had received for technology transfer and import. For the first time, national funding for technology transfer was used for the digestion and absorption of foreign technology (Zhang TM, 2014).

The primary goal of the Work Group was to prepare the second generation of CRH for the Sixth Grand Speed Elevation Campaign, which took place on April 18, 2007. In the early and mid-2000s, the need to increase transportation capacity and railway equipment modernization was the driver of research and development in railway technology (SN4MS17). The MOR's partnership with various institutions was built upon the shared understanding of "the integration of utility and research and development" (*shiyong he yanfa yitihua*) (SN4MS17). As the head of the MOR's Transport Division, Zhang was deeply knowledgeable about the strengths and limitations of the sector. Thus, his involvement in the development of China's HSR industry meant that technological advancements must serve the practical needs for speed and capacity. For example, the design speed of highspeed trains and HSR corridors was 30% higher than the intended operating speed, making future speed elevation more than possible. To ensure the safe operation of highspeed trains, railway engineers decided that the operating speed of both trains and tracks must be 10% lower than the target speed (*mubiao sudu*), which was 10% lower than the structural speed (*jiegou sudu*) and 20% lower than the top speed (*dingpeng sudu*) (Q18JH18). Therefore, while tracks were constructed with an operating speed of 300 km/hr, they must also carry trains operating at a maximum speed of 390 km/hr.

In the development of the CRH 2C—a second-generation model of the CRH based on Japanese technologies imported from Kawasaki—the central ministry helped CSR Sifang coordinate, research and comply with various sets of technical specifications that had already been established.[26] For example, the control system of the CRH 2C was harmonized with three separate sets of specifications in railway civil engineering (tracks), rolling stock and signal and telecommunication (Zhang TM, 2014). Throughout the process, Southwest Jiaotong University, for the first time, helped CSR Sifang conduct computerized experiments and simulations on prototype trains. These test results gauged the congruence of the performance of the CRH 2C

[26] These are the technical standards that an operating train must meet, whereas the CEMU is a set of complex standards that covers operational specifications, train manufacturing and civil engineering.

with regard to these complex sets of technical specifications (Zhang TM, 2014). These results would be used for future research and teaching purposes, as universities had been asked by the central ministry to work with manufacturers to improve on existing technologies. This process was called "coordinated adjustments and experiments" and was applied to the research and development of all highspeed trains.

As the sector was preparing for the Sixth Grand Speed Elevation Campaign, the NDRC worked to include highspeed train and highspeed rail development (*gaosu guidao jiaotong xitong*) as a part of the *Outline of the National Medium- and Long-term Planning for Development of Science and Technology* (2006 to 2020), which emphasized original, independent and indigenous innovation. Policy and financial support from the MOST came after a change of leadership within the ministry in 2007. This leadership change, together with greater support from the State Council for HSR development, led to a joint operation between the two state ministries in the development of the CRH 380 series. In May 2007, State Council leaders visited Tianjin and were attracted by the Beijing-Tianjin Intercity Railway. They asked Wan Gang, the new minister of science and technology, to work with the MOR on HSR development (Chen et al., 2011).

Both ministries welcomed the decision. On August 17, 2007, Vice Minister of Science and Technology Cao Jianlin, on the orders of Wan Gang, visited the MOR and discussed the possibility of establishing an innovation platform for railway equipment modernization (Chen et al., 2011). At the meeting, the two ministries agreed on a framework to create a national innovation system. The railway ministry, as the industrial representative, would play a leadership role in coordinating market and industrial actors. At the same time, the MOST would pool various research and academic resources and increase the research capacity for HSR development (Chen et al., 2011).

This state-led innovation system had two distinct characteristics. First, state actors such as the MOR and MOST played a critical leadership role in coordinating market, industrial, academic and research actors. Second, "controlled competition" was introduced and duly implemented in the research, development and manufacturing of EMUs. This form of interaction among state actors, state-owned and private enterprises and post-secondary and research

institutions became an institutional legacy that allowed for the rapid development of China's comprehensive and advanced HSR industry.

On February 26, 2008, pursuant to discussions in 2007, the two ministries signed the *Independent Innovation of Chinese Highspeed Train Cooperation Agreement and Joint Action Plan*. The MOST provided one billion CNY in research funding, while the MOR provided two billion CNY as additional funding for three research plans under the Eleventh FYP (2006 to 2010). The total amount of three billion CNY in funding was the largest in history and was used to support one project in the Eleventh Five-Year Master Plan, two in the 863 Plan and one in the 973 Plan. The overarching goal of the five projects was to tackle and master all critical technologies in the research and development, production and safe operation of domestic highspeed trains. The creation of the 226 Office followed, and it became responsible for the management of these funds and the resulting research (Zhang TM, 2014).

The director of the MOR's 226 Office was Zhou Li, who simultaneously served as the director of the Intellectual Property Bureau of the railway ministry's Transport Division. Through Zhou's work, the two ministries, together with the support from the NDRC, jointly established several national- and provincial-level laboratories at the Chinese Academy of Sciences, Southwest Jiaotong University, Tsinghua University and Zhejiang University (Zhang TM, 2014). These institutions then worked together with the MOR and rolling stock manufacturers on the research and development of highspeed trains through a process called "joint technological innovation" (Chen et al., 2011).

With the signing of the Joint Action Plan, Zhang Shuguang and his team began working with CSR Sifang and CNR Tangshan on indigenous innovation. Zhang Shuguang and the Joint Action Plan Expert Group became responsible for the implementation of the master plan (Gov.cn, 2008), and the CARS, the research arm of the central ministry, was placed in charge of the 863 Plan and the 973 Plan (Lü, 2014; W25JW18). Zhang and the CARS became key stakeholders in organizing various actors such as the Chinese Academy of Sciences and the Chinese Academy of Engineering, various universities, research centres and rolling stock manufacturers to jointly work on the development of the CRH 380 series (W25JW18).

In the process, Zhang was able to coordinate the involvement of 25 research universities, 11 research institutes, 51 national engineers and research centres and more than 10,000 researchers, professors and engineers (Anhui Science, Technology and Intelligence Research Center, 2011). State actors' active efforts in coordinating cross-sectoral cooperation resulted in rapid modernization. The State Council also forcefully coordinated and centralized relevant industries, including aerospace and military armouring, through administrative orders. Indeed, special project teams dedicated to pooling human, material and monetary resources were established by the State Council in support of the MOR's efforts (Zhen et al., 2012).

For example, in the design of the CRH380 series, Zhang Shuguang worked with Xu Bochu, a renowned sculptor and the dean of the Southwest Jiaotong University School of Fine Arts; mechanical engineers; rolling stock engineers; and rocket engineers who had worked on the exterior design of the Long March 7 carrier rocket. This unusual combination, according to Zhang, "organically combine[d] elements of modern technology and cultural heritage" and applied these elements to the manufacturing of China's national brand (Jiao et al., 2011). After extensive consultation with field experts, this research team presented 20 exterior designs from which rolling stock manufacturers could choose, based on additional advice from the Expert Group.

Though many would argue that rolling stock manufacturers and post-secondary and research institutions were the main drivers of innovation, the CARS, despite its limited role in the innovation process, served as a rule-maker and examiner (W25TS18). The academy was responsible for technology transfer and importing supporting technologies. There was a clear division of power and responsibilities between the ministry and its research arm. While Zhang Shuguang was responsible for the overall and strategic planning of the development of the CRH380 series, the CARS served to establish clear technical standards. Rolling stock manufacturers worked towards these standards set by the CARS with the help of academics and researchers, who provided the essential theoretical foundation. Private enterprises were incorporated into the industry chain as they became suppliers of EMU parts—seats and pantographs, for example (W25JW18).

The central ministry conducted the final evaluation of the CRH 380 series, and the CARS helped assemble railway experts to participate in the process (W26DJ18). On July 24, 2008, policymakers and experts met in Qingdao and conducted a comprehensive test on a prototype train. The two lead experts were Shen Zhiyun and Huang Qiang, both from the CARS. Policymakers and railway experts decided that the CRH 2C-300 and CRH 3-300 were suitable to be the two foundational models for further industrial upgrades. As a result, CSR Sifang and CNR Tangshan were tasked with the manufacturing of the CRH380A and CRH380B, respectively (Zhang TM, 2014). Policymakers and experts met three more times in December 2008, June 2009 and April 2010.

In the June 2009 meeting, Zhang Shuguang reproached leadership groups from CNR Changchun, CNR Tangshan and CSR Sifang for their slow progress, increasing safety concerns and their alleged arrogant but relaxed actions. Zhang also singled out CNR Tangshan's leaders for their failure to move quickly on localizing Siemens' technologies and their lack of mental preparedness. To prevent these problems from becoming incorrigible, Zhang asked the central ministry's Transport Division and the Railway Equipment Bureau to work with the leadership teams of CSR Sifang and CNR Tangshan and corporate executives of their parent companies, production floor managers and workshop supervisors to reflect deeply (*shenke fansi*) about these wrongdoings.

In April 2010, CSR Sifang finalized the details for the CRH 380A and CRH 380AL models, especially the front design of the train (Zhang TM, 2014). By May, a prototype had been manufactured and placed on display at the World's Expo in Shanghai. The commercial operation of the model was unveiled on September 30, 2010, and on December 26, 2010, the test speed of the CRH 380AL reached a world record of 486.1 km/hr.

On September 22, 2010, the CNR Tangshan's CRH 380BL model rolled off the assembly line. However, Zhang Shuguang was not satisfied with the product as he had recently discovered several minute imperfections. At the celebration ceremony, Zhang, for the second time in two consecutive years, scolded CNR Tangshan for having disappointed the nation and the Chinese people (Jiao et al., 2011). After the rebuke, Zhang worked with CNR Tangshan's chief engineer, Sun Bangcheng, and turned the celebration ceremony into a moment of serious self-reflection. At

a working meeting thereafter, Zhang and Sun discussed a plan to perfect the CRH 380BL. In January 2011, CNR Tangshan's CRH 380BL was tested for commercial usage and reached a new world record of 487 km/hr.

In a mere three years, between 2008 and 2010, the Chinese team of policymakers, engineers, academics and researchers mastered the critical technologies needed for the debut of the CRH 380 series. This third generation of the CRH would operate at a speed of 350 km/hr—making it the fastest operating highspeed train in the world. The central ministry claimed that the new model could adapt to China's vast climatic environments and geological conditions.

The China Standard Electric Multiple Unit

Under the consecutive leadership of the MOR and the CRC, rapid technological advancement culminated in the commercial operation of the CEMU on August 15, 2016. The CRC and China's rolling stock manufacturers co-owned the full intellectual property rights of the new model, also known as the CR 400 series. At the 39th International Organization for Standardization (ISO) General Assembly in Beijing, the CRC's Chief Engineer proudly announced that the CEMU had surpassed highspeed train technologies adopted by European and Japanese manufacturers (Lu JR, 2016).

The breadth and depth of the Chinese HSR system could be described as extraordinary. For example, an eight-coach EMU consists of more than 40,000 parts, and the manufacturing and assembling of these parts require "the comprehensive participation of societal forces" (W25JW18). Indeed, production in downstream industries required coordination for highspeed train modernization and indigenous innovation. Therefore, railway policymakers and industrial actors promoted the unification of various highspeed rail standards and systems. Though the MOR had harmonized foreign technologies with domestic railway standards through initiatives such as "joint design and production," "joint production" and "coordinated adjustments and experiments," China's highspeed train systems were nonetheless fragmented. By 2011, the central ministry and relevant actors had localized two disparate HSR systems. The absorption of the Japanese system resulted in the development of the CRH 380A series. However, the

standards of the CRH 380A series were incompatible with the CRH 380B series, which were based on the European system (from Siemens).

The Japanese HSR industry adopted a holistic or a total system approach—meaning that the increase in speed and operation of a highspeed train must be done through the improvement of all of its parts (SN22TO18). European HSR manufacturers adopted a classification approach—meaning that all sockets and linkages were standardized, making all parts interchangeable (SN22TO18). An important implication of the European classification approach was that parts manufactured by different suppliers could be assembled if the sockets and linkages had been manufactured in strict accordance with the European standard.

As a result, in 2011, the central ministry decided to continue to harmonize different technological platforms (*tongyi jishu pingtai*) and master core technologies for highspeed train service (Jiao, 2019). On April 27, 2011, the MOR and the NSFC jointly established the HSR Foundational Research Fund. The purposes of the fund were to promote the integration of industrial regulators and manufacturers with education institutes and research centres (*cujin chan xue yan jiehe*) and to attract and allocate societal resources. Through this fund, the MOR and the CRC continued to pair rolling stock manufacturers with education institutes, research centres and even private businesses. To be specific, research projects would be created by railway policymakers, funds would be administered by the NSFC, and the evaluation of these projects would be conducted by the CARS and rolling stock manufacturers (W25JW18).

In 2012, the CARS was tasked with a subsequent study on the possibility of merging the two extant HSR systems. The CARS organized one round of substantial and coordinated bargaining concerning the technical specifications and intellectual property rights of the new highspeed train program. Participants included senior leaders from the MOR and the CARS, rolling stock manufacturers, railway experts from the Chinese Academy of Science and Chinese Academy of Engineering, academics and managers of major private enterprises (W25JW18).

On the issue of intellectual property, the bargaining settled on an agreement to share intellectual ownership of the CEMU among rolling stock manufacturers and the CRC

(W25JW18; Huang DY, 2018).[27] The CRC won the battle over these rights, as it "suspended vehicle procurement and planned to reopen bidding only after [rolling stock manufacturers] signed an agreement on intellectual property rights" (Huang DY, 2018: 157). However, rolling stock manufacturers retained the intellectual property rights to the CRH 380 series.

The CRC and the CARS began drafting a master plan containing all technical specifications for the new HSR program in June 2013. After the completion of the draft, each specification was decided by a vote (W25JW18). Officials, experts, academics and manufacturers debated over the four types of technologies available, which were based on imported models from Bombardier, Siemens, Alstom and Kawasaki. In terms of increasing the speed and power of the CEMU, two solutions were presented at the meeting: 1) follow the Japanese model by increasing the number of motor coaches or 2) follow the Siemens model of increasing the power capacity of motor coaches. For example, though both the CRH 380A and CRH 380B could operate at 350 km/hr, the CRH 380A did so by having six motor coaches and two trailer coaches. The CRH 380B could perform just as fast, with four motor coaches and four trailer coaches. As for the CEMU, experts decided on a marshalling structure that consisted of four motor coaches and four trailer coaches (4M4T) for an eight-coach highspeed train. The first and last coaches, each consisting of a driver's cabin, were to be remade into motor coaches. Coaches two and seven became trailer coaches, each with a pantograph on top (CRRC, 2018a).

After several rounds of meetings, on February 11, 2014, sectoral policymakers published the *Temporary Technical Specifications for the 350km/hr. CEMU*, which covered all 13 major technological systems, including the electrification, traction, signal and communication, and network systems (Long, 2015). The CEMU's operating speed was designed to be 350 km/hr, with a maximum axle load of 17 tons, a wheel diameter of 920 mm, a seating capacity of 576 for an eight-coach highspeed train and a sleeker and improved interior design encompassing more elements and colours from traditional Chinese culture (CRRC, 2018b). Apart from full onboard Wi-Fi coverage, the width of seats was also increased (Long, 2015). One month after the publication of these specifications, the CRC and the CARS organized a meeting to establish due

[27] The MOR was reformed and split into the National Railway Administration (regulatory body, NRA), and the CRC (centrally owned state enterprise) in February 2013.

diligence and a deadline for a prototype train. At the meeting, sectoral policymakers asked all participants to "communicate and cooperate to conquer all problems and difficulties," provided suggestions and outlined new requirements for supervising and coordinating departments (CARS: Locomotive & Car Research Institute, 2014).

From September 1 to 4, 2014, the central corporation and its research arm gathered for a design review meeting and discussed two design plans from CNR Changchun and CSR Sifang. The CARS organized several additional thematic discussions and invited railway experts from Beijing Jiaotong University, Southwest Jiaotong University, Tongji University and the CRC's regional bureaus. On October 30, 2014, the CRC published all comments and suggestions from the review meeting and asked relevant parties, including the CARS and the two rolling stock plants, to proceed with the next steps in light of these suggestions (CRRC, 2018b).

Between November 2014 and October 2016, the CARS coordinated the production and evaluation of the CEMU. Two more rounds of review meetings were conducted by the CARS before the new model could be validated by the National Railway Administration (NRA). In addition to these review meetings, the CARS hosted more than 60 meetings to discuss the design and technical aspects of the two embryonic CEMU models proffered by CNR Changchun and CSR Sifang. At these meetings, the CARS matched railway experts with rolling stock plants to further improve the two prototype trains (Gao and Pang, 2019). The CRC and the CARS published a standard operating procedure for the research and development of the new highspeed train. They also established a new and more integrated network of "industry, education, and research and application" (*chan xue yan yong yitihua*) for the research and development of the CEMU (Zhang YM, 2016; Jilin-China 2015; Sohu, 2016).

Though the CARS acted as the coordinator of the "industry, education and research and application network," it was also the embodiment of the network. The academy functioned as a railway equipment manufacturer, railway technology researcher and an education institution. Indeed, the academy consists of several research institutes—such as the Rolling Stock Institute, the Metal and Chemical Institute (for the vehicle body and tracks), the Network and Control Institute and the Institute for Vehicle Technology Standards—which cover almost all aspects of railway and HSR technologies. These research institutes have dual roles as researchers and

manufacturers (W26DJ18). For example, the Rolling Stock Institute developed the traction converter and its control system for the CEMU (Gao and Pang, 2019; National Government Offices Administration, 2016).

The legitimate leadership of the CARS over other railway actors originates from the CRC's status as the sectoral regulator and sole buyer. Indeed, as the most crucial research institute of the CRC, the central corporation *and* the NRA all acted on the advice of the CARS when deciding the technical specification of China's HSR system. The academy, deeply familiar with these specifications, worked with rolling stock manufacturers to simulate and test model trains. For example, in the development of the CEMU, the academy not only helped establish the specificities of the "China standards," but heavily engaged in the research and application of the CEMU's tow, traction and control systems (Zi, 2019). For example, the CARS' Network and Control Institute, under the leadership of CARS Chief Researcher Zhao Hongwei, developed the original coding for the CEMU's control system (Zi, 2019).

After the NRA had successfully validated the CEMU as a new highspeed train model produced through indigenous innovation, on January 3, 2017, the CRC branded the CEMU as the CR 400 series, also known as the *Fuxing Hao* (rejuvenation). The new brand name contrasted with the CRH, which had been assigned the name *Hexie* (harmony). The CRC's rebranding of this new fleet of EMUs aptly corresponded to Xi Jinping's call for the "Great Rejuvenation of the Chinese Nation." The *Fuxing* model adopted a total of 254 technical specifications, 84% of which were "China standards" (Gao and Pang, 2019). As a result, the CRC proudly announced that China owned the complete intellectual property rights over the design and key technologies of the CEMU or the CR 400 series (Gao and Pang, 2019).

Power concentration was also reflected in the development of HSR infrastructure, including survey and design, civil engineering, telecommunication and operation and dispatch. These engineering platforms, together with rolling stock, were major components of the Chinese HSR industry. Each of these platforms consisted of up to three large SOEs. For example, the CREC and the CRCC, two of the largest infrastructure builders in the world, comprise only one of the six platforms. Thus, the comprehensive integration of these six engineering platforms under the CRC is the hallmark of power concentration in HSR development (Q18JH18).

Conclusion

The development of a national network could not be viewed independently from China's need for transportation capacity, especially for freight capacity. The intensification of geoeconomic pressures and evolving developmental priorities led to the adoption of power concentration under a more assertive state. In light of the state's need to rapidly overcome capacity deficiency through network expansion, HSR development became a natural solution for railway policymakers and state planners. As a result, the state demanded that the central ministry focus intently on the building of a comprehensive national HSR network and the modernization of highspeed trains (Gao, 2016). Direct central commitment allowed the MOR and the CRC to enact this "national strategy of high importance" and "trial and error on China's vast terrain" (SN2MS17; SR27ML17). Indeed, their quasi-government status and monopolistic position in the transport sector, compounded with the vertically integrated railway system, allowed them to herd and choreograph state and non-state actors toward the development of a world-beating HSR system.

In the 1990s, senior leaders such as Li Peng and Zhu Rongji failed to support the beleaguered MOR. As a result, the central ministry sank further into a quagmire of criticism and backlash. After a decade-long debate on issues such as profitability, necessity and technology, a leadership change in 2003 seemed to have provided the much-needed tonic. The post-WTO leadership—including Wen Jiabao, Huang Ju, Zeng Peiyan and Ma Kai, joined by Zhang Dejiang and Zhang Ping in 2008—provided strong policy and financial support to the central ministry. The State Council and the NDRC approved an ambitious national program in HSR development and several strategies to foster highspeed train modernization.

The developmental approach in HSR development was dominated by rapid network expansion and railway equipment modernization through power concentration. Wen Jiabao's idea of "import, absorb, digest and re-innovate" became the guiding principle in highspeed train modernization. With a clear focus on indigenous innovation, Wen's principle became the *leitmotif* in both the BLF (2003 to 2011) and post-BLF (2013 to 2019) periods.

In the pursuit of highspeed train modernization, the State Council and NDRC established several inter-ministerial committees to facilitate power concentration. Huang Ju and Zeng Peiyan became personally responsible for overseeing the initial process of importing foreign technology. In addition to national support, the MOR's monopolistic position in the transport sub-sector effectively allowed it to manage and leverage against its suppliers. Determined to make HSR a national brand through technology leapfrogging, the MOR established strict market-entry standards and limited the channels of technology transfer. The MOR, together with the CARS, coordinated the subsequent phases to digest and absorb these technologies for domestic production (emulation).

Additional sectoral mechanisms were created and strengthened to coordinate highspeed train modernization. First, under Zhang Shuguang, a national innovation system was designed to facilitate indigenous innovation. Second, during the development of the second and third generations of the CRH, mechanisms such as joint production and "coordinated adjustments and experiments were established. The new model of industry, education, research and application network was fostered for the development of the CEMU. Third, the CARS played an indispensable role in coordinating with various actors for the research and development of highspeed trains. The research arm of the MOR and CRC effectively extended the chief engineer and Transport Division's power by guiding scientific research to meet the practical needs of railway transportation.

With central commitment, a clear developmental approach and powerful developmental institutions, multi-year HSR programs were integrated as an important part of national planning. In the NDRC's Eleventh FYP (2006 to 2010), the research and development of highspeed trains became an industrial priority of the state. The NDRC integrated HSR and highspeed train development into the state's overall planning of its science and technology modernization scheme in 2006. Several sectoral strategic policies were designed to guide highspeed train modernization, including the *Outline on the Acceleration of Railway Rolling Stock Modernization,* and the *Independent Innovation of Chinese Highspeed Train Cooperation Agreement and Joint Action Plan.* In addition to these policy frameworks, the NDRC, the MOR, the MOST and the NSFC funded highspeed train modernization through the state's budget for

science and technology modernization, such as the Eleventh Five-Year Master Plan and the HSR Foundational Research Fund.

Power concentration fundamentally altered the modernization path of China's HSR development. By the end of the Hu Jintao and Wen Jiabao era, domestic transportation capacity had mainly been solved, as the construction of HSR corridors and conventional lines greatly exceeded expectations. Simultaneous to that leap, the central ministry began to search for overseas markets to export the CRH 380A and CRH 380AL models—attempting to build the sinews of regional hegemony via novel economic means. However, the fall of Liu Zhijun and Zhang Shuguang, and the subsequent sectoral reform, left a power vacuum in the international market for a short period of four years (2011 to 2014). The MOR's Overseas Project Coordination Teams, responsible for managing railway export and suppressing vicious competition, were dismantled. As a result, in the absence of a central coordinator and with the connivance of the central government, non-transport SOEs, including rolling stock manufacturers and civil engineering firms, began to engage in intense competition in the global market.

Chapter 7

Centralization for International Competition

"The top-level design, coordination and planning concerning the 'going global' of the Chinese highspeed rail industry must be strengthened."

Xu Fei, Frontiers, Volume 14, 2016

Introduction

The Chinese highspeed rail (HSR) industry is considered as one of the four new inventions (*xin sida faming*) and the only Chinese strategic sector that has surpassed its international competitors (CRC, 2016). China's comparative advantage, according to leaders of the China Railway Signal and Communication Corporation (CRSCC), comes from a complete and internationally competitive supply chain (NDRC, 2016a). Such is the defining characteristic of the China Railway Highspeed (CRH) 380 Series and the China Standard Electric Multiple Unit (CEMU). The latter has become a leading highspeed train model serving China's diplomatic missions.

Since 2015, Chinese leaders have actively sought to globalize China's HSR industry and the "China standards" in HSR development. Terms such as "railway diplomacy" and "railpolitics" were coined to highlight the prominence of the sector in serving the ambitious Belt and Road Initiative (BRI). China's "going global" of its avant-garde HSR sector carries significant geopolitical and geoeconomic implications as railway development is "a matter of political and economic policies of national governments" (Wu and Chong, 2018: 508).

Geopolitically, HSR export can be seen as an external legitimation of a country or "an exogenous expression" of a state's domestic political economy. It can also forge strong bilateral relationships, improve regional connectivity, facilitate regional integration and deepen the infiltration of the BRI. In 2013, China expressed its interest in renewing the Pan-Asia Railway (from Kunming to Singapore) at the World Conference on Transport Research (SN22JP18). The completion of this ambitious project can extend China's HSR standards into Southeast Asia

through Laos, Thailand, Malaysia and Singapore and make the regional network interoperable. These practices focusing on regional integration and infrastructure connectivity can bring those neighbouring countries into China's orbit. Geoeconomically, the globalization of China's HSR industry can improve trade, facilitate trade liberalization and enlarge China's overseas markets (Eroglu, 2017; Mattli and Buthe, 2003; Simmons, 2001). The development of a regional railway network can help synchronize developmental strategies, facilitate the transportation of people and goods and solve China's growing industrial overcapacity. Additionally, a harmonized regional railway network thwarts competition from global HSR actors by forcing them, as late-comers, to comply with China's HSR standards.

Under those circumstances, the "going global" of the railway sector received strong backing from China's top leaders. Both Xi Jinping and Li Keqiang visited key rolling stock plants of the CRRC Corporation and highlighted the importance of globalizing China's HSR industry and internationalizing Chinese standards in railway development. Li Keqiang also visited the China Railway Corporation (CRC) and repeated the same message to railway policymakers. In the export of China's HSR industry, Xi Jinping and Li Keqiang acted as global salesmen and pitched railway development projects to China's international partners, such as Belt and Road countries.

The Xi-led Party and administration developed a new approach designed to "coordinate the domestic and international situations" (*tongchou guonei guoji liangge daju*) or "two coordinations" (*liangge tongchou*) in short. The decision was made to facilitate China's "second globalization" of integrating local production networks with the global market.[28] Xi Jinping emphasized top-level design, which aimed to foster an appropriate state-business relationship through which the state could guide the "going global" of China's centrally-owned state enterprises (SOEs). The Chinese state also initiated other state-led strategies linking China's domestic development with the global economy, including Li Keqiang's call for international capacity cooperation in 2015.

[28] According to O'Riain (2000), globalization manifests in two goals. The first is to attract foreign firms of multinational corporations to invest in the domestic production network, and the second is to integrate local production networks with the global production system.

The purpose of the two coordinations was to achieve two goals. The domestic goal was to realize the "China Dream" through the "Great Rejuvenation of the Chinese Nation." The international goal aimed to build a "New Type of International Relations" and a "Community with a Shared Future for Mankind." Coordination was redefined as the careful management of four sets of relationships: the domestic economy and the global economy, China's advantage and international conditions, self-management and fulfilling international responsibilities, and China's development and the joint development of the world (Han WX, 2015).

To ride the tiger of globalization, the BRI was formulated and elevated as a national strategy. According to the *Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road*, the purpose of the BRI was to promote win-win cooperation, joint development and prosperity. As a result, the central government strengthened its centralized decision-making powers. The Chinese state began, more aggressively, to use its powers to create opportunities for its SOEs to penetrate overseas markets. Under the Xi administration, the two coordinations became the primary driver in the implementation of the BRI (Xu SS, 2015).

The choreographing of HSR export, along with the China Railway Express (*zhong'ou banlie*, CR Express), culminated in the coining of the Railroad Economic Belt (REB). Both operations became salient ways through which to internationalize domestic production networks and operational standards. By penetrating the global market, commercial actors have gradually established themselves as rule-makers in global private governance concerning international standards in HSR development and railway logistics. The REB, though an informal strategy developed by the CRC, was also designed to facilitate the expansion of the BRI. According to a senior cadre in the railway sector, the sectoral consensus is that "railroads are the precondition for connectivity" (SN17MS2).

Several institutional changes were made to strengthen the top-level design in the implementation of the BRI and the state's control over its SOEs. As China's commercial actors had engaged in vicious competition and undercutting in international bids, the main task of the central government was to bring order to the loosely regulated railway sector. At the state level, those changes were mainly reflected in the internationalization of the National Development and

Reform Commission (NDRC), which gained the new role of export coordinator. At the sectoral level, the domestic coordinator—the CRC—regained its coordinating capacities in HSR export.

State planners replicated the domestic railway development structure to serve the state's international objectives. As the domestic macro decision-maker, the NDRC emerged to become the primary stakeholder of a centralized effort to globalize China's HSR industry. The commission's international role focused on settling framework agreements with foreign countries concerning the contents of HSR export. Those framework agreements included the degree of technology transfer and terms of Chinese loan. The commission also enacted a decision to merge the China South Rolling Stock Corporation (CSR) and the China North Rolling Stock Corporation (CNR). The newly created CRRC Corporation, in late 2014, reflected the state's pursuit of a centralized style of "going global." The commission also extended the domestic coordinating capacity of the CRC. The newly established China Railway International Corporation (CRIC), a subsidiary of the CRC, was placed in charge of the globalization process.

In addition to the Made in China 2025 program, two strategic industrial policies were formulated by the state to promote HSR globalization. First, three state administrations published a report titled *Special Action Guide for Promoting Quality Upgrading of Equipment Manufacturing Industry*, which called to improve international connectivity via rail and the globalization of railway equipment. Second, the NDRC and the CRC, with support from the Ministry of Transport (MOT) and the National Railway Administration (NRA), formulated and implemented the *Railway Developmental Plan during the Thirteenth Five-Year Plan*. The plan was published as a complementary guide to the Thirteenth Five-Year Plan (2016 to 2020, FYP). Both strategies focused on fostering a centralized policy environment to export China's HSR industry. And such export became a salient task for sectoral policymakers and rolling stock manufacturers.

This chapter consists of six sections, inclusive of the introduction and conclusion. The next two sections offer an account of power concentration and operationalize the two coordinations. The fourth and fifth sections focus on the Jakarta-Bandung Highspeed Rail project, a case study to exhibit China's centralized style of HSR export. The Jakarta-Bandung HSR Corridor was the flagship project of China's HSR globalization as Indonesia became the

first country to adopt all aspects of the "China standards." In light of China's globalized HSR industry, the same structure has been applied consistently in the "going global" process, including the Bangkok-Nong Khai project and the Vientiane-Boten project. Therefore, selecting this flagship project has the potential to generalize the roles, responsibilities and actions of key stakeholders across China's overseas HSR projects.

Top-Level Design

Though the idea of the two coordinations had prematurely appeared in Hu Jintao's speech to the Seventeenth National Party Congress in 2007, profound institutional and organizational changes only took place under Xi Jinping. Seemingly, the Xi administration streamlined the five coordinations (*wuge tongchou*) of the Hu-Wen era, integrated the two coordinations into the Thirteenth FYP (2016 to 2020), and elevated it as a guiding practice for the building of a moderately prosperous society and promoting sustainable economic growth. Indeed, the Thirteenth FYP argued that China had to "keep in mind the connectivity between the domestic and the world economies and respond proactively to changes in the external environment to make better use of both domestic and international markets and resources." This line of thinking was emphasized again in Xi's report to the Nineteenth National Party Congress in October 2017.

As early as the Third Plenary of the Eighteenth National Party Congress in 2013, Xi Jinping was already looking for ways to promote sustainable economic growth by investing in international markets and establishing a top-level design in connecting the domestic economy with neighbouring countries (SN22TF18). Norris (2016) correctly pointed out that Chinese SOEs became important actors of Chinese economic statecraft. Under the arrangements of the BRI, the control of SOEs, especially their overseas business activities, through power concentration, became a priority for the Chinese state (SR18NM18).

At the 2013 Central Economic Work Conference, the top leadership requested the drafting of a strategic plan concerning infrastructure and maritime connectivity and the implementation of the BRI (Gov.cn, 2013b). Together with the Ministry of Finance (MOF) and

the People's Bank of China, the NDRC submitted a report to the Central Economic and Financial Leading Group in November 2014. At the eighth meeting of the leading group, commenting on the report, Xi Jinping called for a greater opening to the outside and argued that the Chinese economy was undergoing a significant transformation from "bringing in" to "going global." More importantly, Xi asserted that the central government must maintain its coordinating capacity to manage its relationship with commercial actors (Gov.cn, 2014). As a result, the BRI's Steering Group was created in February 2015 to supervise and guide the implementation of the initiative. Senior leaders decided to place the group's executive office in the NDRC and appointed the commission's Chairman Xu Shaoshi as the managing director.

The establishment of the Steering Group was one of the three national initiatives created to coordinate the BRI. The second initiative internationalized the NRDC's coordinating capacities. In the Thirteenth FYP (2016 to 2020), the commission was tasked to "promote mutual gain in neighbouring countries" and create a platform on which eastern and western parts of China could connect with foreign countries via land and sea (NDRC, 2016). The third initiative redesigned the "going global" of Chinese SOEs. To better serve the BRI, China streamlined the application and administrative processes for SOEs to invest overseas. Prior to the streamlining, application to and approval from the MOF, the Ministry of Foreign Affairs (MOFA), the Ministry of Commerce (MOC), and the State-owned Asset Supervision and Administration Commission (SASAC) had to be obtained before engaging in overseas business activities. Under the BRI, this process was streamlined so that an SOE would only need to apply to the NDRC for funding approval. Additional applications could be made to other relevant state ministries for record-keeping purposes (SR18NM18). For example, the China Energy Engineering Corp's 1.87 billion USD thermal power plant project in Hai Duong, Vietnam, was sanctioned by the NDRC while kept on the SASAC, the MOF and the MOC's files (Yan MC, 2018). At the moment, the NDRC and the SASAC are working on a new evaluation scheme to tighten the regulation of SOEs' overseas business activities (SR18NM18).

The commission's role in guiding, supervising and serving overseas investment was institutionalized under the *Administrative Measures for Approval and Record-filing on Overseas Investment Projects*. In the 2014 version, the NDRC had the power to approve overseas

investments worth more than one billion USD. Projects worth more than two billion USD needed to be approved by the State Council under the commission's recommendation. Overseas investment between 300 million USD and one billion USD had to be kept on the NDRC's files. Additionally, overseas investments in sensitive industries, such as telecommunications, cross-border water resources and large-scale land development, had to apply for the commission's approval regardless of the amount. In the most recent version, the commission no longer needed to report to the State Council concerning overseas investment approval, as it could make the appropriate approval by itself, regardless of the amount. The commission's Foreign Capital and Overseas Investment Department became responsible for directing both the inflow and outflow of capital under the BRI (NDRC, n.d.; Investment in China, n.d.).

In partial fulfilment of those tasks, in 2015, the NDRC mandated its administrative departments, bureaus and subsidiary work units to cooperate on the implementation of the "three big strategies" (*sanda zhanlue*), which included the BRI. The other two strategies were the integration and coordinated development of Beijing, Tianjin and Hebei and the development of the Yangtze River Economic Belt. The move to place those strategies under the commission, together with a changed mandate and a newly gained role as an "export coordinator," signalled the state's commitment to developing the Chinese economy through the expansion of the BRI.

To provide more guidance to the NDRC, in 2015, the Politburo and the State Council introduced the concept of a new open economic system. The state saw greater opening as an "inevitable requirement" for sustainable growth, which relied on "coordinating domestic development and participating in global governance" (Han WX, 2015). Consequently, the domestic economy must borrow, cooperate and interact with the global economy to meet 1) the new demands of globalization, 2) the new requirements and norms of economic development and 3) the expectations of the international society (Han WX, 2015).

Since the introduction of the BRI, the CRC and the Chinese railway sector have been expanding aggressively into the global railway market and exporting China's railway standards. More impressively, Chinese consortiums, led by the CRIC, have outbid international competitors on the global HSR market. In fact, since the reform and opening, China's HSR industry "can be

considered as the *only* domestically developed strategic industry that has the potential to change the basic landscape of international political economy of the 21st century" (Xu F, 2016).[29]

Counsellor Gao Zhenting, from the MOFA's International Economics Division, argued that HSR export could effectively facilitate the "going global" of several high-end and low-end industries, technologies and services, and absorb China's industrial overcapacity (Gov.cn, 2015a). In a subsequent meeting on January 28, 2015, the State Council committed itself to helping domestic enterprises, especially in the railway and nuclear energy sectors, overcome intense international competition, strengthen sectoral cooperation and control investment risks in foreign direct investments (Gov.cn, 2015b). These moves belonged to what Li Keqiang labelled as international capacity cooperation. On June 29, 2015, in his speech to the European Union-China Business Summit, Li highlighted the need to promote such collaboration between two major economic powers. He argued that China needed to interface with the EU's strategic investment plan by integrating the BRI with the Juncker Plan.

Li Keqiang regarded the export of railway infrastructure and HSR as two important aspects of China's diplomatic missions. According to the Made in China 2025 program, the "seizure of new industrial heights" was motivated by geoeconomic pressures from developed countries and developing countries (Gov.cn, 2015c). Chinese leaders believed that the former wanted to reorganize global production and global value chains, and the latter helped move global capital out of China. Therefore, in light of those challenges, industrial policies should aim at strengthening the international competitiveness of China's manufacturing sectors. The program also called to support state firms, research institutes and sectoral organizations to actively participate in the establishment of international standards and globalize China's national brands. Railway equipment was identified as an important sector, which could help strengthen four foundational industrial components (*si ji*): parts, crafts, materials and technology (Gov.cn, 2015c).

To further strengthen a centralized style of HSR export, one year after the launch of the Made in China 2025 program, three state administrations published the *Special Action Guide for*

[29] Emphasis added by the author.

Promoting Quality Upgrading of Equipment Manufacturing Industry. In the document, the Ministry of Industrial and Information Technology, the General Administration of Quality Supervision, Inspection and Quarantine, and the State Administration for Science, Technology and Industry for National Defence outlined the need to improve manufacturing quality and strengthen Chinese industries' brand names. More importantly, Article 20 of the document stated that the railway sector was an integral part of the BRI. Expanding the global railway equipment market was marked, again, as an essential task of the Chinese state, sectoral policymakers and industrial manufacturers, along with improving railway connectivity with bordering countries.

In 2017, the NDRC, the MOT, the NRA and the CRC jointly published the *Railway Developmental Plan during the Thirteenth Five-Year Plan*, which echoed the *Special Action Guide*. Sectoral policymakers saw the "going global" of China's HSR industry and the CR Express as national priorities (NDRC, 2017: 6). The need to improve the international influence and competitiveness of the railway sector was also elevated as a guiding thought (*zhidao sixiang*) (NDRC, 2017: 4). The NDRC approved plan reemphasized centralization and coordination as two important mechanisms in this big leap outward.

The plan outlined three strategies to improve infrastructure connectivity and overseas railway construction. First, the sector had to continue to coordinate the domestic and international markets and resources. The "going global" of the sector should be comprehensive and all-encompassing and focus on climbing the global value chain. Second, the sector should increase its international influence by setting and amending international standards in railway logistics and HSR. Lastly, the sector had to improve the service quality of and transform the CR Express into an important platform of the BRI (NDRC, 2017: 18-20).

In a report to the US-China Economic and Security Review Commission, Cheung et al. (2016: 240) argued that HSR export was a part of China's "railway diplomacy," as China had used "its state-owned rail firms … to project its global influence." From China *and* Japan's experiences with South and Southeast Asian countries, such as Indonesia, Thailand and India, government-backed loans could be "particularly decisive for winning contracts in emerging markets where governments need the support to finance infrastructure investments" (Cheung et al., 2016: 9).

Sectoral Recentralization

The Chinese state prioritized the export of "China standards," or the entire HSR industry, over the internationalization of highspeed trains and railroad infrastructure. The export of the latter meant compliance with established railway standards of the recipient country at a higher cost. Such was the case with the Budapest–Belgrade HSR Corridor. Chinese contractors had to pay six million CNY to harmonize its junction standard with the European one (Xu F, 2016). Similarly, the Inonu and Pendik Railway, a part of the Ankara-Istanbul High-speed Railway, took the China Railway Construction Corporation (CRCC) and its three additional partners eight years to complete. A majority of the time was spent on harmonizing all aspects of China's railway civil engineering standards with technical specifications outlined by the European Union, including signal and communication, and tracks and track bed (Xu F, 2016). By way of contrast, standard-setting could "lock in favourable technological conditions to thwart competition from others" (Wu and Chong, 2018: 508). The application of the "China standards" in Indonesia could establish China's position as a rule-maker in the country's HSR system. Consequently, China's peer competitors from Japan and Europe must comply with its operating standards if they wish to connect with the Jakarta-Bandung corridor. Thus, a consensus was reached among senior Chinese leaders and commercial actors that the commercial activities of the latter must serve the developmental and international strategies of the former (Vantuono, 2019).

The state's recentralization of the sector boiled down to the replication of the domestic state-industrial relationship. The domestic roles of the macro-economic planner, the NDRC, and the sectoral coordinator, the CRC, were extended and utilized for international coordination. One of the new mandates of the CRC was to support the BRI through HSR export and the expansion of the CR Express (CRC, 2017). According to Zhu Pengfei (2015), the Chief Engineer of the CRIC, the CRC "accelerated railway construction along the Silk Road Economic Belt, comprehensively pushed for the construction of railway construction abroad and fully promoted the export of CEMU." In the hitherto "going global" process, the central corporation has played an instrumental role in leading, coordinating and directing sectoral actors to establish railway projects in Belt and Road countries.

The CRC adopted several administrative and institutional adjustments to strengthen its leadership position within the sector. For example, the CRC "bolstered institutional coordinating mechanisms at the enterprise level, strengthened management capacity and accelerated institutional building in the CRIC" (China Railway, 2015a). These measures helped increase Chinese HSR's international competitiveness by forging a new, efficient and centralized "going global" mechanism.

But to be specific, first, and domestically, the CRC created the Leadership Group in Foreign Affairs and the BRI, which used the CRC's existing resources and established a mechanism for further coordination. Such a mechanism focused on overall planning in the "going global" of railway design, civil engineering, railway equipment, passenger operation, infrastructure financing and especially China's HSR industry (Yicai, 2016). The leadership group "cooperated with relevant domestic enterprises" and herded different SOEs to form a centralized style of competition (Yicai, 2016).

Second, the CRC helped the NDRC to create a new corporation for international coordination—the CRIC. As the new international subsidiary of the central corporation, the CRIC was registered on December 30, 2014, and its creation was publicly announced by the State Council's Information Office at a news briefing at CNR Tangshan on February 12, 2015. The head of the CRC's Propaganda Department, Han Jiangping, asserted that the purpose of creating the CRIC was to provide a platform for Chinese railway commercial actors to exchange ideas with their foreign counterparts (ChinaReform.net, 2015). Han also argued that the CRIC would help create better conditions for future cooperation in international railway development. The Vice President of the CNR, Yu Weiping, also attended the news briefing. Yu acknowledged that the establishment of the CRIC would play a leadership role in organizing the "going global" of the Chinese HSR industry and making the process "faster, smoother and with more confidence" (ChinaReform.net, 2015).

The CRIC's legitimate leadership has been strengthened in two ways. First, the first chairman of the CRIC, Yang Zhongmin, also held the position of associate chief engineer of the CRC, the same position that Zhang Shuguang had once held. Under the chief engineer responsibility system, the MOR's chief engineers play salient roles in planning railway

production and setting technical specifications. Second, the CRIC's international activities had the full endorsement of the NDRC (SR19KCJ18). Working with the commission's Basic Industry Department and the Railway Division, the CRIC played the leadership roles of an organizer (*qiantou*), a promoter (*tuijin*) and a regulator (*jian'guan*) of HSR export (SR19KCJ18).

Interestingly, the creation of the CRIC was not included in the NDRC and the CRC's initial recentralization plan. On August 22, 2014, during a visit to the CRC's central dispatching hall in Beijing, Li Keqiang met with leaders of the CRC and the CRCC. At the meeting, Li Keqiang excoriated the decentralized model of HSR export and asserted that the situation had to be ameliorated (*feigai buke*) (Li QY, 2014). After the meeting, the NDRC, the SASAC and the CRC worked on a plan to merge the China Civil Engineering Construction Corporation (CCECC) into the central corporation. The CCECC, established in 1979, had acted as the Ministry of Railways' (MOR) international arm before the bifurcation reform in 2000. Earlier in April 2014, the CRCC had merged its China-Africa Construction Corporation (CACC) into the CCECC to further strengthen the latter's international competitiveness. Facing a possible merger, the CRCC adroitly decided to re-establish the CACC and transferred key human, technical and financial resources to the new corporation—leaving the CCECC bereft of its business capacities. In a CRCC internal document distributed on August 28, 2014, top managers mentioned the need to restructure the CCECC and re-establish the CACC within a month. Two months later, on November 18, the CRCC officially revealed the CACC after approval from the SASAC, which saw this round internal restructuring as an effort to strengthen the "going global" of the railway sector, especially in Africa (Li QY, 2014; SASAC, 2014).

Consequently, and in light of the state's determination to recentralize the globalization of China's HSR industry, the NDRC and CRC created the CRIC. The relationship between the CRC and its international arm is a top-down one. Indeed, the CRIC "comprehensively represents the CRC and coordinates relevant enterprises to export China's HSR industry" (SR19KCJ18). As a result, in overseas HSR projects, "the state leads the way, the NDRC sets framework agreement, the CRC drafts feasibility studies and the CRIC coordinates other relevant implementing agencies" (SR19KCJ18)

By the end of 2017, the CRC and CRIC had established seven consortiums to manage seven overseas HSR projects. In each of the consortium, the CRC and the CRIC were able to "promote the development of strategic projects, avoid vicious domestic competition and strengthen the coordinating capacity among Chinese enterprises" (Chen N, 2017). In the Laos-China consortium, the General Manager of the CRIC Ju Guojiang serves as the Chairman of the Laos-China Railway Co., Ltd.

Simultaneous to sectoral recentralization, the Chinese state also made two moves to recentralize HSR export and standardize and strengthen the international cohesiveness and competitiveness of domestic commercial actors. First, the NDRC directed the merger of CSR and CNR on December 30, 2014, and the destructive events in Argentina in 2013 provided the crucial catalyst. Before recentralization, between 2011 and 2014, HSR globalization had been conducted in a decentralized manner. The fall of Liu Zhijun, in 2011, resulted in the dismantling of the MOR's Overseas Project Coordination Teams, which were established in 2009 to coordinate the ministry's global HSR activities, which included the building of three HSR corridors in Central Asia, Europe and Southeast Asia (Lu JR, 2016). Those teams, 16 in total, were assigned to facilitate HSR export in different regions of the world, including the US, Brazil, India and Iran (Lu JR, 2016). They were also established to curb internal competition over international projects as the MOR divided the global market among non-transport SOEs. Under this centralized arrangement, Argentina was awarded to the CNR (Sina, 2013b).

The dismantling of those international teams resulted in a power vacuum. Non-transport SOEs looked to globalize China's HSR industry independently and aggressively. Vicious and excessive competition between rolling stock manufacturers and civil engineering firms became egregious for Chinese leaders. Disaffected by the CSR's "invasion" into Argentina, the CNR formally complained to the China Chamber of Commerce for Import and Export of Machinery and Electronic Products. In the letter, the CNR reproached the CSR for engaging in cut-throat competition and highlighted that the CSR's proposal to the Argentinian government had included a significant and unfair price-reduction from the original of two million USD per train to 1.27 million USD (PeopleRail.com, 2014).

In light of the situation, state planners discussed two different top-down approaches to curb decentralization with field experts, policymakers and academics (L27HA19). The first strategy called for the establishment of a unified and centralized SOE dedicated to facilitating the export of China's HSR industry. By merging existing state firms, the new SOE could strengthen sectoral competitiveness through economies of scale. Under this arrangement, the central government would play a crucial role in overcoming the fragmentation of interests and herding actors in a common direction. The second strategy called for the creation of a sectoral association responsible for 1) helping the state negotiate with SOEs and 2) assisting SOEs to serve the state's bigger developmental agenda. Regional and local railway associations could be merged into one national program, which would play a similar role to the Japan Overseas Railway System Association (L27HA19).

In light of the two strategies, state planners decided to merge the two rolling stock manufacturers to create the CRRC Corporation. Initially, the CNR's complaint was brought to the attention of Premier Li Keqiang, who asked Vice Premier Zhang Gaoli to study the situation. Zhang then assigned the task to the NDRC. In light of the Made in China 2025 program, the "top-level design" concerning the merger "became connected with the national strategies" to facilitate the internationalization of the HSR industry (Huang DY, 2018: 160). Between November 19 to December 24, 2014, the State Council held three executive meetings discussing the possibility of forming "a combination of attacks in the 'going global' of the Chinese railway, nuclear energy and building material manufacturing" sectors (Gov.cn, 2015a).

Third, the state pushed the CRC and the NRA to publish a master plan concerning the "China standards." As a result, the *Highspeed Rail Design Specification* was pushed in December 2014. According to this master plan, highspeed trains in China must comply with the China Train Control System (CTCS), the heart and mind of the Chinese HSR industry. Before the development of the "China standards," three types of CTCS-3 had existed, and each type was developed by different commercial actors, such as Ansaldo STS Italy, Bombardier, the CARS, Hitachi and HollySys Automation. Consequently, each specification was applied on various HSR corridors, such as the Wuhan-Guangzhou HSR Corridor, Zhengzhou-Xi'an HSR Corridor and the Guangzhou-Shenzhen HSR Corridor. To unify the fragmented system, the CARS led a

research team and rewrote all domestic highspeed trains' registration systems so that all trains and signal stations could share the same language and coding. Effectively, the CARS harmonized all transmissions to ground and trains (W28YQ18).

Responding to the national effort, the CRRC also curbed destructive competition between its subsidiaries through one round of streamlining. In 2016, the parent company suspended CRRC Zhuzhou's subway project in Pakistan for three months due to vicious competition against CRRC Changchun. The CRRC also suspended CRRC Zhuzhou's Vice President Chen Cheng for three months and imposed "administrative warnings" (*xingzheng jinggao*) to CRRC Zhuzhou's senior business and Party officials. In 2018, the CRRC further streamlined the international activities of its subsidiaries by allowing only 17 of them to engage in international businesses.

National and sectoral restructuring led to the centralization of decision-making powers in the firm and coordinating hands of the NDRC. The commission has since negotiated with foreign countries and established the initial overarching framework agreements for HSR and railway development. State planners reiterated the need to overcome "each fighting its individual battle" and inculcated in SOEs a disposition toward cooperation and power concentration (SR19KCJ18).

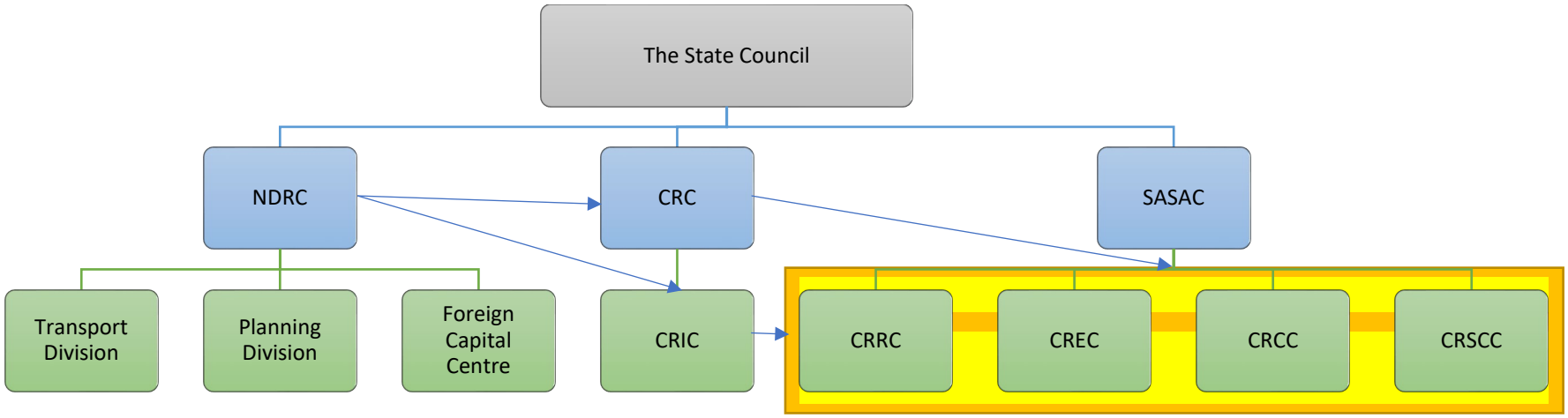
The Chinese state planners revamped their efforts in providing financial support to the globalization of China's HSR industry and the expansion of the BRI. Domestically, government subsidies kept the CRC profitable (Lu and Han, 2017). For example, in the rolling stock sector, the state planners provided 268.7 million USD to the CRRC in 2015 for rolling stock upgrades (Ker, 2017: 8). Internationally, the China EximBank provided the CRC with a line of credit up to 500 billion CNY. And this was in addition to another 490 billion CNY that had been planned for the Vientiane-Boten Railway and the Thai-Chinese HSR (Guancha.cn, 2015). In May 2017, the Postal Saving Bank of China announced another 200 billion CNY in support of the CRC's efforts to globalize China's HSR industry (The Beijing News, 2017).

As a result, some of China's most notable overseas projects have been done under such a centralized and aggressive style of global market penetration. The Kunming-Singapore Railway, also known as the Pan-Asia Railway Network, is the most notable *and* ambitious project, which consists of three routes connecting China with Myanmar, Laos, Thailand, Vietnam, Cambodia,

Malaysia and Singapore. Several segments were designed as HSR corridors, such as the Bangkok-Nakhon Ratchasima HSR. Additional overseas HSR projects include the Moscow-Kazan HSR and the Phnom Penh to Preah Sihanouk HSR. The Jakarta-Bandung HSR was noted as the most successful case, or the flagship project of HSR export as Indonesia decided to adopt the complete package of the "China standards." (See Figure 12 for an illustration of China's new HSR export structure).

Figure 12: Highspeed Rail Export Structure.

Solid arrows indicate the direction of control, while solid lines indicate hierarchy and ownership. The highlighted entities are non-transportation SOEs in the railway sector.



Indonesia's HSR Aspirations

The Dutch colonizers established the Indonesian railway system in the 19th century. The system soon became an important means of transporting people and freight and peaked in 1939. The national kilometrage reached 8,157 km, with 6,324 km on Java and another 1,833 km on Sumatra (Salim and Siwaga, 2016). The rise of air and road travel resulted in the gradual demise and decline of Indonesia's railway system since 1939. Presently, the total kilometrage is approximately 5,000 km, with 3,464 km on Java and 1,350 km on Sumatra (Salim and Siwaga, 2016).

Marching into the 21st century, a consensus was reached among Indonesian elites, academics and the populace to improve and expand the country's railway network beyond Java. Railway transport was considered a "secure, safe, fast and superior" means of transportation because of its superior loading capacity, energy and space efficiency and environmental friendliness (SR16IC18). Thus, expanding the national network naturally became the best solution in terms of diversifying the means of travel and transportation with a reduced cost at the same time (SR16IC18). These factors culminated in the issuance of Law No.23/2007 on railway transport, which called for the creation of a Directorate General of Railways by the Indonesian Ministry of Transport.

The directorate then formulated a Master Plan of National Railway. The master plan intended to remake the Indonesian railway network to become the backbone of mass transportation with "integrated, secured, safe, comfortable, reliable, and affordable of services" (Directorate General of Railways, 2013). The plan also wanted to modernize the Indonesian railway network to be "competitive, integrated, high-technology, able to synergize with industries, and responsive to development" by 2030 (Directorate General of Railways, 2013). Other goals of the plan included (Directorate General of Railways, 2013; Salim and Siwaga, 2016):

1. Increase the total kilometrage up to 12,100 km (including 3,800 km or urban railway network),

2. Increase the share of railway transportation up to 11 to 13 percent for passenger and 15 to 17 percent for freight,
3. Develop dual track and electrification systems for Java's main railway lines,
4. Establish a Trans Sumatra railway network, and
5. Establish an HSR network in Java.

As a result, the Indonesian government began to contemplate the possibility of building an HSR corridor in Java. In 2008, one year after the passing of Law No.23/2007, the Indonesian government invited the Japanese government to discuss the possibility of building an HSR corridor between Jakarta and Surabaya, two of the largest metropolitan areas in Indonesia. Indonesia's invitation was met with enthusiasm from the Japanese side, and the Japan International Cooperation Agency (JICA) prepared a feasibility study and submitted it to the Indonesian government. The detailed study on the 700 km highspeed network concluded that an HSR corridor between the two cities was neither suitable nor feasible. According to the Japanese, state intervention and large sums of capital were needed—up to a total of 2.1 trillion JPY.

In light of the high cost, the Indonesians "requested the Japanese government to conduct more practical study including the examination of the prior development route (Jakarta-Bandung section), the possibility of future extension (Bandung-Cirebon), and the project scheme" (Yachiyo Engineering Co., Ltd, 2012). This decision provided space for the Japanese to make a comeback in 2012 as Japan's Ministry of Economics, Trade, and Industry (METI) proffered a new feasibility study on a highspeed rail corridor between Jakarta and Bandung to the Indonesian government. This study was based on the 2008 study, in which the Jakarta-Bandung section was prepared by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT). The METI's decision to revisit the Jakarta-Bandung section was to support the Indonesian Master Plan for Acceleration and Expansion of Indonesia Economic Development (MP3EI), which identified the Jakarta Metropolitan Area (Jabodetabek) and the Surabaya Metropolitan Area (Gerbangkertosusila) as crucial areas that needed to be further connected via road and rail. The plan was also congruent with the National Railway Master Plan's development of a Jakarta-Surabaya HSR corridor.

In light of the setbacks in 2008, the JICA gave priority to the development of Jabodetabek and nominated the Jakarta-Bandung HSR as a priority project. Indeed, three routes had been examined and analyzed: Jakarta-Bandung-Cirebon, Jakarta-Bandung-Gedebage and Jakarta-Cirebon. After comparing the possible economic benefits of all three routes, the Japanese argued that the Jakarta-Bandung-Cirebon route would yield an economic internal rate of return (EIRR) of 13.6 percent. In contrast, the EIRR of the Jakarta-Cirebon line would be negative. The feasibility study presented by the METI also stated that the EIRR for the Jakarta-Bandung-Cirebon route would increase further if Gedebage was made the terminus of the corridor (Yachiyo Engineering Co., Ltd, 2012). As a result, the Japanese side concluded that the Jakarta-Bandung-Cirebon route, with a cost of 726.37 billion JPY, would be beneficial to Indonesia's national economy.

To the Indonesians, the 2012 Japanese study was very sensible as it could reduce the travel time between the two large Indonesian cities by more than half. The existing mere 140 km of travel took three hours via conventional train and four to eight hours via toll-road. Japan's feasibility study galvanized a national debate in Indonesia on different plans to improve transportation capacity between the two cities (SR16TA18). Though a consensus on the reduction of road transport and improvement of the country's logistics system was reached, Indonesian parliamentarians, academics and journalists debated on the priority of moving people via HSR versus moving goods via conventional rail (SR17YR18). This round of national debate forced the Indonesian government to delay the project further.

During the 2014 election, Joko Widodo and his running mate Jusuf Kalla announced their nine priorities program, also known as the Nawacita (or Nawa Cita). The program became the blueprint for the *2015-2019 National Mid-Term Developmental Plan*. Two of the nine priorities included 1) improving Indonesian people's productivity and competitiveness in the international market and 2) fostering strategic industries in the pursuit of economic independence. As a result, building roads and improving transportation capacity became important means to realize those visions, and a program was created to strengthen the Indonesian railway network, especially in East Indonesia (SR19KCF18). Naturally, the Jakarta-Bandung HSR project became a part of Jokowi's mandate to improve and upgrade Java's transportation capacity.

Indonesia's quest for connectivity and infrastructural upgrade could be argued as an absolute necessity for improving all areas of the national economy and especially the rural economy, not just on Java and Sumatra (SR18CL18; SR19KCF18). With more than 17,000 islands across the country, and almost as wide as Canada, the Indonesians needed different ways to move their wealth of-, but dispersed, natural resources from one place to another. Jokowi's ambitions required long-term and intensive capital and resource investment—some could only be afforded by the Chinese, the Japanese and, to a degree, the South Koreans (SR18CL18).

Jokowi's presidency has shown characteristics of a strong executive with the ability to push through national projects. His decision to establish a new Ministry of Maritime Affairs (MMA) signalled his vision to transform Indonesia into a global maritime fulcrum (SR17YR18). The newly created ministry has held a key and strategic position in the Indonesian government and has been responsible for coordinating and promoting industrial development (SR17YR18). Moreover, the creation of the MMA coincided with the announcement of the BRI in China. Since the announcement of the Nawacita program, Indonesia has committed itself "to building 24 ports, 14 airports, 18 special economic zones and nearly thousands of kilometres of railroads" (Lu JR, 2016: 379). These infrastructure projects, together with other developmental goals, will cost Indonesia around 450 billion USD.

Attracted by the developmental approaches taken by the BRI and the Asian Infrastructure Investment Bank (AIIB), President Joko invited China and Chinese businesses to invest in Indonesia and help the country develop. Indonesia and China became committed to cooperating on both maritime and economic matters, as Xi Jinping "promised to support investment in Indonesia's maritime infrastructure" through loans from the AIIB and the Silk Road Fund (Sambhi, 2015). For example, Indonesia accepted a Chinese loan package, worth 50 billion USD, for infrastructure development, including projects in railways, electric power and metallurgy (Lu JR, 2016).

With support from China, President Joko decided to put the Jakarta-Bandung HSR project on the fast track. According to Jokowi, the project was about "vision … looking far ahead beyond the condition today" (Jakarta-Bandung HSR, 2017: 1). Once completed, the project could

become the “backbone for industrial development, trade, supporting human movement and tourism … [and the] mobilization of people and goods” (Jakarta-Bandung HSR, 2017: 2).

The Jakarta-Bandung HSR project was considered an “exclusive and special project” by President Joko, only involving a few selected national ministries and parliamentary committees (SR16IC18; SR16TA18). Indeed, Jokowi placed the project under his most trusted state administrations—the Ministry of State-owned Enterprises (MSOE), the MMA, the Economic Planning Ministry and Committee V of the Indonesian Parliament. To facilitate smooth implementation, Jokowi weakened the Ministry of Transport, the domestic regulator of the national railway system, as he decided to minimize the said ministry’s involvement in his HSR program. The Ministry of Public Works’ participation and knowledge in the project were also limited, and the Indonesian Parliament only received scattered and limited information (SR16IC18). Under the special attention of the Indonesian president and a few powerful state ministries, the Indonesians adopted a top-down approach in implementing the HSR project.

China’s Re-entry into Indonesia

For China, the Jakarta-Bandung HSR Project was an opportunity to “re-enter” Indonesia under the cloak of the BRI. China and Chinese SOEs’ involvement in Indonesia’s infrastructure upgrade and economic development started in the early 2000s—certainly shorter than Japan’s involvement, which had begun during the late 1960s. China’s pre-BRI relationship with Indonesia had focused on developing joint programs in energy, roads and metallurgy. For example, in 2006, the China Energy Engineering Group (CEEC) and the Indonesian SOE Perusahaan Listrik Negara (PLN) signed an agreement to develop Indonesia’s First 10,000 Megawatts Fast Track Program (FTP-1). However, many Indonesians, including political elites and academics, are unsatisfied with the quality and progress of the project. Thus, the Jakarta-Bandung project, the first case of railway cooperation between the two countries, became the flagship project for both the BRI and the export of the “China standards” (SR19KCJ18).

Since the announcement of the BRI, China has been thinking about different ways to expand its cooperation with Indonesia and improve the bilateral relationship to "something substantial" (SR19YS18). Moreover, though China is an active player in Southeast Asia, its influence in the region remains limited and controversial. Countries with territorial disputes with China, such as the Philippines and Vietnam, see the rise of China as a threat rather than an opportunity; they have sought help from India, Japan and the US to balance against China's increasingly assertive posture (Zhao H, 2013). Countries such as Malaysia and Cambodia are experiencing debt issues as a result of Chinese investments. Therefore, Indonesia, especially in areas of infrastructural upgrades and economic development, is an ideal location for China to expand its sphere of influence in the region (SR19YS18).

Forging a strong relationship that can increase China's influence and displace other powers such as Japan, South Korea and the US has been an important strategy for the Chinese (SR19YS18). The formation of the Jakarta-Bandung project was reflective of the new organization, supervision and streamlining of Chinese SOEs' overseas business activities (SR17NM18). In this form of economic statecraft, the Chinese state astutely coordinated its commercial actors to pursue its international objectives.

The Jakarta-Bandung project can be divided into three phases—top-level decision-making, intergovernmental cooperation on a framework agreement and business-to-business cooperation for project implementation. The Indonesian case also shows a clear chain of command in the export of the HSR industry. The project began with President Joko's trip to China in 2015 when he met with Xi Jinping and Li Keqiang.

On March 6, 2015, Chinese President Xi Jinping met with Indonesian President Joko Widodo. In the meeting, Xi told Jokowi that China would actively participate in Indonesia's infrastructural development—especially in HSR development (Xinhuanet.com, 2015a). Immediately after the meeting, under the witness of both heads of states, the NDRC and the MSOE signed the *Memorandum of Understanding on Cooperation on the Jakarta-Bandung High Speed Rail Project*. The next day, in a meeting with President Joko, Li Keqiang reiterated China's position concerning deepening the two country's cooperation on infrastructure development. On March 9, 2015, the Indonesian Minister of SOE Rini Soemarno met with

NDRC Chairman Xu Shaoshi again. Xu invited Rini to visit the Hongqiao Transportation Hub in Shanghai via the Beijing-Shanghai HSR Corridor. During their trip to Hongqiao, Xu comprehensively introduced China's HSR industry—from manufacturing to operation and services.

After the signing of the memorandum of understanding, an Indonesian consortium—PT Pilar Sinergi BUMN Indonesia (PSBI)—was formed by four Indonesian state-owned enterprises. The leader of the Indonesian consortium was PT. Wijaya Karya Tbk, and the three other SOEs were PT. Jasamarga Tbk, PT. Perkebunan Nusantara VIII and PT. Kereta Api Indonesia. In China, the CRC established a research institute to study the trend of all projects and strengthen quality control and asset management for the entire Indonesian project (CRC, 2017).

On April 22, 2015, Xi Jinping visited Indonesia and witnessed the signing of a six billion USD project between Indonesia and China on railway cooperation (People.cn, 2015a). On the same day, the NDRC signed a cooperation framework on the Jakarta-Bandung HSR project with the MSOE. The two parties agreed to adopt the "China standards" and use Chinese equipment in the design and operation of the HSR corridor (People.cn, 2015b). Afterward, the NDRC requested the CRC to draft a feasibility study to be presented to the Indonesian government. To facilitate the process, the NDRC commissioned a 90-day research trip in Jakarta so that engineers from the central corporation's Third Railway Survey and Design Institute (CRDC) could conduct the necessary fieldwork (Wang and Li, 2018).

The NDRC's Planning Department and Foreign Capital and Overseas Investment Department worked with the CRC and the CRDC as they prepared the final version of the feasibility study (W25JW18). After three months of evaluation and fieldwork, the above parties drafted a proposal that included a comprehensive transfer of the "China standards" to Indonesia (An, 2015). Indeed, China agreed to train Indonesian engineers and staff members on the manufacturing and operation of the CRH 380 series—so the Indonesians could localize the production of this highspeed train. The Planning Department also approved a plan to purchase local construction material and employ local staff up to 60% of the entire operation. The CRRC was also asked to probe the possibility of establishing a rolling stock plant in Purwakarta, a town

located between Jakarta and Bandung. The ultimate goal of the project was to access the Indonesian market and develop the ASEAN market with Indonesia (An, 2015).

On August 10, 2015, Xu Shaoshi presented the feasibility study to President Joko. The feasibility study included a 142.3 km dual-track and electrified HSR corridor, with a top design speed of 350 km/hr, connecting Halim (East Jakarta), Karawang, Walini and Tegal Luar (Southeast Bandung). A highspeed train storage base and maintenance base would be established in Tegal Luar. Trackwork, tunnelling and bridging were identified as three critical points due to technological difficulties (CRIC, 2018).

After Xu's visit, the NDRC mandated the CRIC to create a Chinese consortium to interface with the Indonesians. Upon receiving the request, the CRIC, based on the instructions from its parent company, *handpicked* four additional SOEs to participate: the China Railway Engineering Corporation (CREC), CRRC Sifang, Sinohydro and the CRSCC (SR19KCJ18). Sinohydro's previous experiences in building hydroelectric stations in Indonesia and its knowledge in working with different levels of Indonesian governments were deemed valuable to the Chinese enterprise group, as the CRIC believed that Sinohydro could help navigate Indonesia better. As the organizer and platform builder, the CRIC had the most voting power, a dominant number of shares, and was responsible for leading, pushing and supervising the entire project, despite limited monetary investment (SR19KCJ18). The Indonesian consortium, PT Pilar Sinergi BUMN Indonesia, helped facilitate the bidding process and prepared the Chinese consortium on the Indonesian market and its competitors (SR19KCF18).

However, the Jakarta-Bandung project faced backlashes from Indonesian parliamentarians, academics and the general public. Political elites and parliamentarians regarded the project as China's first step to reconstruct the world order and threaten Indonesia's national security. Opposition leaders also cautioned against borrowing from China (SR16TA18). Local governments' responses to the project were lukewarm, as both Bandung and Purwakarta expressed concerns over land acquisition and residential relocation due to high population density (SR16TA18).

Indonesian academics took the view that the project was another case of Chinese foreign aid, and the general public claimed that Indonesia was not yet ready to enter the age of HSR. Indeed, a one-way trip on the proposed project would cost 200,000 IDR, which was "very expensive for commoners" (SR16TA18). Many also questioned the necessity, safety, environmental impacts and technology of the HSR network (Pan, 2017: 112-116).

To deal with those doubts, the NDRC and the CRC played similar roles as lobbyists and attempted to influence key stakeholders in the Indonesian government and the general public. During Xu Shaoshi's visit to Indonesia in August 2015, Xu met with several key political stakeholders, including Vice-President Jusuf Kalla, and held three press conferences. Xu presented the feasibility study in detail and highlighted some of the positive aspects of the project on the Indonesian economy. Xu helped clarify some of the concerns that Indonesian politicians had had over the project (Zhao CL, 2016).

On August 14, 2015, the CRC held a press conference and meticulously explained some of the positive effects—social and economic—of HSR. The CRC used China as an example and illustrated that the building of an HSR corridor would make inter-city travel much more convenient. The CRC also asserted that railway modernization could help accelerate the process of urbanization, promote economic growth and lower logistical costs (CRC, 2017). At the same press conference, the CRC also introduced some of the core technologies of the CRH 380 series. Additionally, for the first time in a foreign country. The CRC hosted a week-long exhibition on China's HSR industry after the press conference. Indonesian railway experts and related personnel were invited to the exhibition, and the Chinese exchanged ideas on the HSR project with their Indonesian counterparts. The exhibition was also open to the general public, as the CRC prepared pictures, promotional videos, presentation booths and models to comprehensively showcase China's HSR industry chain and technological prowess (CRC 2017).

Concurrent with the Chinese lobbying efforts, Joko and Rini also worked to assuage opposing views from both within their cabinet and the Indonesian Parliament. The Minister of Transport, Ignasius Jonan, was cautious and had concerns "about the [Chinese] contractor's ability to provide the required supporting documents" (Lu JR, 2016). Indonesian parliamentarians also criticized Jokowi for focusing only on the development of Java instead of

other islands. After intense negotiations and debates, two criteria were established for the proposed HSR project. First, it must be done through a business-to-business model. Second, the project must not use money from the Indonesian national budget (SR19KCF18). Those criteria were later announced in the President's Decree No. 107/2015 and President's Decree No. 3/2016 titled *Acceleration of National Strategic Projects*.

On October 16, 2015, the Sino-Indonesian consortiums signed a formal agreement to establish the Kereta Cepat Indonesia China (KCIC). Jokowi then awarded the project to the KCIC, which had incorporated those new policy changes in their bid. The Sino-Indonesian consortium consisted of five board of directors. The president director, a post held by Indonesians, was directly appointed by Jokowi. The Director of Finance, Zhang Chao, and the Director of Engineering Xin Xuezhong, were appointed by the CRIC. It was expected that the Jakarta-Bandung HSR network would take 40 years to cover all the expenditure, with ticket sales alone (SR19KCF18).

Upon hearing this news, Japan expressed its deep frustration and disappointment, as some Japanese railway engineers threatened to sever railway cooperation with Indonesia altogether (SR17YR18; SR19KCF18). Indeed, while poised to win this project from the Chinese, Japanese railway operators were left chagrined as they had stood firm and pushed for government-to-government cooperation (see Table 6 for a detailed comparison between two competing offers from Japan and China). The Chinese side did not succeed with ease. The NDRC had significantly altered the traditional Chinese practice of infrastructure export—seeking profit from infrastructure building without considering the broader economic impacts. As a result, the NDRC and the CRIC pushed to co-share the HSR corridor with the Indonesians for 30 years. This proposal meant that the Chinese team was willing to share the risks and operate the corridor with the Indonesians by forming "a community bound by interest and fate" (Zhao C, 2016).

Though labelled as a business to business project, the involved parties had strong support from both governments and state leaders. For example, Minister Rini and Minister Luhut, supported by President Joko, were the main coordinators on the Indonesian side, including the coordination of transport policies. Thus, the Indonesian-Chinese consortium, under enormous pressure from both governments, must update the Indonesian MSOE via monthly reports, while

the CRIC must provide regular updates to the CRC. Since 2015, the president director has changed three times due to slow progress.

Table 6: Sino-Indonesian and Japanese Offers

Parameter	**KCIC**	**Japan**
The Bid Value[30]	- 5.13 billion USD	- 6.2 billion USD
The Government Commitment	- No government underwriting, funding and tariff subsidy are required. - Cost overrun: Joint Venture Company's liability.	- Government underwriting is required, funding from the state's budget and tariff subsidy. - Cost overrun: the government's liability.
Business Concept	- Joint Venture Company: Indonesia (60%) and China (40%). - Project risk: Joint Venture Company.	- Engineering, Procurement and Construction (EPC) Financing (regular contractor). - Risk/liability: Government.
Land Acquisition	- There is no government obligation to acquire land.	- The government is obligated to provide land acquisition.
Local Content	- 58.6%	- 40%
New Jobs Creation	- Construction period: 39,000 workers per year. - Only Chinese engineers and supervisors will be employed.	- Construction period: 35,000 workers per year. - Expatriates from Japan are required.
Technology	- Siemens technology developed in China since 2003. - Speed: 350 km/hr and a maximum speed of 380 km/hr. The technology in tropical areas of China is similar to Indonesia.	- Since 1964, HSR in Japan has been developed to suit the four seasons climate. - HSR technology is a closed-door one.

[30] The bid value submitted by the Indonesian-Chinese consortium included associated costs on land acquisition, whereas the Japanese bid did not include costs associated with land acquisition.

	- HSR technology is an open one.[31]	
Technology Transfer	- Opening of a rolling stock factory in Indonesia.	- No tangible technology transfer program.

This table is adapted based on a document presented by the KCIC.

The KCIC had gained all relevant permits by August 6, 2016, from the Indonesian Ministry of Transport and the right to operate the corridor for fifty years (CRIC, 2018). The engineering, procurement and construction contract was awarded to another Chinese-Indonesian consortium, the HSR Contractor Consortium (HSRCC), which was created on October 13, 2016. The total value of the contract, signed on April 4, 2017, was 4.7 billion USD, and the length was 36 months. On May 14, the KCIC successfully signed a loan agreement with the China Development Bank. The loan accounted for 75% of the total investment. Thirty-seven percent of the loan would be distributed in Renminbi with a fixed annual interest rate of 3.46%. The decision to include Renminbi in the loan was in accordance with a bilateral currency swap agreement, and the amount was decided by the Chinese to promote the internationalization of its currency (SR19KCF18). CRRC Sifang will manufacture the first five CEMUs for the HSR project.

Concerning the smooth transfer of the "China standards," the NDRC organized three training sessions at Beijing Jiaotong University between 2016 and 2019. The commission asked the CRC to manage those sessions and invite Indonesian engineers, technicians and staff members to participate (SR19KCF18). The shared focus of these training programs was on the application of China's HSR standards in Indonesia. The first session focused on familiarizing the Indonesian delegation with the technological, operational and legal aspects of China's HSR industry. The delegation split time between course work at Beijing Jiaotong University and fieldwork in the MOT, the NRA and the CRC. The second session was oriented around network construction and rolling stock manufacturing. Indonesian contractors visited non-transport SOEs

[31] During the bidding process, as the China Standard Electric Multiple Units was still being developed, the Chinese side exported the CRH 380B models. After the development of the CEMU, China has since upgraded its commitment to Indonesia and swapped the CRH 380B models with the CEMU.

such as the CREC and CRRC. The third session focused on passenger service and ticketing (SR19KCF18).

In attempts to influence the Indonesian government for swift implementation, the CRC's President, Sheng Guangzu, invited President Joko to take a highspeed train with him to Shanghai from Hangzhou on September 3, 2016. During the trip, Sheng comprehensively introduced the CEMU and updated President Joko on the Jakarta-Bandung project. In March 2017, the CRC invited an Indonesian delegation, including President Joko, Minister of Economic Affairs Sofyan Djalil, Minister of Foreign Affairs Retno Marsudi and Minister of Trade Rahmat Gobel, to visit its headquarters in Beijing. The Indonesian delegation also visited the CRC's central dispatching hall, where all operating trains in China were being controlled and dispatched. A CRC staff member introduced China's HSR industry, railway network and management systems to these Indonesian leaders, who were deeply impressed by China's achievements (China Railway, 2015b).

Additionally, the NDRC closely monitored the implementation process. Between 2016 and 2019, the commission dispatched four delegations to Jakarta, all accompanied by the president of the CRIC. The purpose of those missions was to investigate and push for the orderly construction of the HSR corridor. In 2017, Li Xuedong, the Associate Director of the commission's Department of International Cooperation and the Leader of the Steering Group's External Affairs Team, visited Jakarta and held a seminar with relevant implementation agencies. Li reminded them that the project "had caught the attention of the world [so they] would need to garner support from the Indonesian society" (PowerChina International Group, 2017). In 2019, Associate Director Li Bin visited Jakarta to "coordinate and solve implementation problems" and accelerate the pace of construction (Li L, 2019).

The combinations of lobbying, parachuting work teams and administrative guarantees failed to ensure swift implementation. The project was delayed due to suboptimal progress in land acquisition. Since the beginning of the project, the Indonesian government has been actively involved in the land acquisition process. It also organized several negotiations between the Indonesian national railway company with the KCIC with regards to the transfer of land ownership (SR16IC18). Though the state budget was not required for the purchase of national or

local land, the Indonesian parliament's budget committee nonetheless noticed traces of financial support. Other than issues over the amount of compensation, confusing and multi-layered ownership were the main reasons for the delay. For example, a piece of land could be co-owned by multiple levels of government and individuals. Japanese enterprises and their local allies also worked together to stymie land appropriation, and this problem was only amended after Jokowi won his second term in 2019 (Camba, 2020). Despite those efforts, only 76% of the required land had been acquired by late 2018. Fortunately, the construction of four "choke points" and Walini Station began on time. Understandably, the swift implementation of any large-scale infrastructure projects could be difficult in a country that lacked the Chinese Party-state's implementing and coordinating capacities.

Conclusion

Power concentration was adopted to strengthen China's export of its HSR industry. The globalization of China's HSR system aimed to expand its geoeconomic and geopolitical influence, especially in Southeast Asia and Indonesia. By prioritizing the export of the "China standards" in HSR development, the state favoured setting international standards in foreign countries instead of complying with existing ones. China's global drive was also designed to overcome domestic industrial overcapacity and maintain domestic economic development.

To facilitate the "going global" of China's SOEs and the Chinese economy, Xi Jinping stressed the importance of top-level design in the implementation of the BRI. In 2015, Li Keqiang highlighted the importance of linking domestic development with the global economy through international capacity cooperation. The "going global" of the railway sector received endorsement from top leaders as both Xi Jinping and Li Keqiang acted as global salesmen pitching railway projects to foreign countries. The subsequent domestic reorganization and recentralization of the sector were guided by the NDRC, under the direction of Li Keqiang and Zhang Gaoli. The commission ensured that HSR export could be connected to the domestic Made in China 20205 program and the globally-oriented BRI.

The approach of "coordinating the domestic and international situations" was adopted to facilitate the integration of domestic development with the international economy. It affected the ways through which the BRI and the REB were implemented. The state planner's inclination toward power concentration resulted in the replication of the domestic state–industry complex in the international realm. In the globalization of China's HSR industry and the associated "China standards," the Party-state created opportunities for its commercial actors to win contracts abroad and supervised project implementation.

With the introduction of the BRI, the supervision, regulation and financing of Chinese SOEs' overseas activities have been centralized within the NDRC. The commission's domestic macro-planning role was also internationalized as it became responsible for settling framework agreements with foreign countries. The NDRC's coordinating signals were transmitted through the CRC—a statist monopoly that could coordinate non-transport railway actors with its organizational and market leverage. To curb internal competition, the NDRC and the CRC agreed to merge the CNR and the CSR to create the CRRC. Additionally, a new platform building SOE, the CRIC, was designed to reverse the decentralized nature of China's HSR export and end the otherwise active non-transport SOEs' activities in HSR globalization. Consequently, the creation of the CRIC reinstated and extended CRC's domestic coordination capabilities into international realms.

Several strategic industrial policies were implemented to facilitate the "going global" of the "China standards"—the Made in China 2025 program, the *Special Action Guide for Promoting Quality Upgrading of Equipment Manufacturing Industry* and the *Railway Developmental Plan during the Thirteenth Five-Year Plan*. The latter, published as a complementary guide to the Thirteenth FYP, mainly focused on fostering a centralized policy environment within the railway sector, encompassing both transport and non-transport subsectors.

The Indonesian case showed a clear chain of command and demarcated responsibilities in China's export of its HSR industry. First, top leaders, such as Xi Jinping and Li Keqiang, provided the ground for a framework agreement to be reached by the NDRC. Second, the NDRC pushed HSR export through government to government meetings—which resulted in the signing

of two framework agreements with the MSOE. While the commission remained focused on facilitating HSR export and establishing government-to-government frameworks, it was up to the two sectoral organizers to herd non-transport SOEs during the implementation phase. The CRC and the CRIC, with policy support and financial backing, led a team of Chinese SOEs and negotiated with its Indonesian counterparts on the terms of project implementation (Shi and Wu, 2017: 137).

This very same structure has been applied in other cases of HSR export. In 2016, the NDRC and the Thai Ministry of Transportation signed two agreements concerning HSR cooperation. Similarly, the commission established and tried to establish framework agreements with the Lao and the Malaysian governments. In the Lao and Thai cases, the CRC and the CRIC played a coordinating role in ensuring that proper domestic firms could be matched with international projects. While the CRIC picked the CREC for the Indonesian project, the Thai HSR project was awarded to the CRCC.

The ambition of building an intercontinental and cross-border railway network has become Xi Jinping's novel approach to foreign policy—though such policies have been done through the old way of power concentration. The Jakarta-Bandung project was designed to be the beginning of durable and comprehensive cooperation between China and Indonesia. However, a recent trend may suggest otherwise as Indonesia has awarded the Jakarta-Surabaya Medium-Speed Train project to Japan, to ease Japan's disappointment over losing the Jakarta-Bandung project. This action indicates a kind of economic hedging on the Indonesian part.

The broader story of China's HSR export is an optimistic one, as many projects have been restricted in Southeast Asia. China's entry to developed markets has met considerable backlashes from traditional HSR actors based in Japan and Europe. The Japanese government, especially, responded to China's growing influence in Southeast Asia by revamping its infrastructure export capacities. Indeed, the Japan Revitalization Strategy and the Partnership for Quality Infrastructure can also be viewed as strategic responses to China's BRI. Moreover, the Japanese government also bolstered the role of the Prime Minister's Office and the Cabinet Secretariat, as they joined Japanese railway operators, suppliers and civil associations to

globalize the Shinkansen system. For example, the Management Council for Infrastructure Strategy was established to serve as a platform for information exchange and coordination.

Chapter 8

Conclusion

"Concentrating power to accomplish big things has become our magic trick to success."

Xi Jinping

Introduction

This dissertation surveyed the development of the Chinese railway sector since the late Qing dynasty with a particular focus on sectoral development after the founding of the People's Republic in 1949. Under seven decades of Party rule, sectoral development did not progress in a linear fashion. During the Mao era (1949 to 1976), railway modernization accelerated during the First Five-Year Plan (FYP, 1953 to 1957) and the Third Front Movement (1964 to 1980). Revolutionary movements such as the Great Leap Forward (1958 to 1962) and the Cultural Revolution (1966 to 1976) paralyzed central planning and aspects of railway modernization. In the first 25 years of China's reform and opening (1978 to 2002), railway policymakers experimented with decentralization, deregulation and marketization. Though these initiatives failed to expand the national network and improve transportation capacity, the introduction of the "Chief engineer responsibility system " and sub-national innovation networks paved the way for rapid highspeed rail (HSR) modernization after China had joined the World Trade Organization (WTO). Under the national Big Leap Forward (BLF), state planners and railway policymakers centralized decision-making powers in the pursuit of rapid network expansion and upgrades and railway equipment modernization.

Against this backdrop, this dissertation asked four analytical questions: 1) Why did China's railway dream only thrive in the early 2000s? 2) What were the obstacles to sectoral modernization, and how were they overcome? 3) What political and economic factors, both internal and external, shaped the evolution of China's railway system? 4) Finally, what do the distinctive patterns of railway development tell us about the broader political economy of industrial development in China?

In light of the principal research question concerning railway development in post-1949 China, this dissertation tested two hypotheses. First, sectoral development accelerated during times when the Chinese state pursued power concentration. Second, sectoral development slowed in the absence of power concentration. Centralization in the sector could be understood at the state and the sectoral levels.

The concluding chapter is divided into four sections, inclusive of the introduction. The next section provides a key summary of the theoretical framework and empirical findings. The third section presents the contribution of this dissertation to the study of Chinese political economy. The final section discusses some of the possible avenues for future research.

Concentrating Power to Accomplish Big Things

This dissertation analyzed the famous maxim "concentrating power to accomplish big things" (*jizhong liliang ban dashi*) as the principal reason for sustained and rapid sectoral development in the post-WTO era (2003 to 2019) and moderate growth during the First FYP and the Third Front Movement. I defined power concentration as an institutionalized *and* centralized means of shaping and supporting a particular approach to sectoral development to meet the Party-state's developmental challenges.

This particular definition of power concentration highlighted three salient aspects of the study of Chinese political economy. First, institutionalized and professionalized planning organs could make durable industrial policies. Second, state leaders' policy attention and financial commitment ensured the successful implementation of those industrial policies. Lastly, state planners engineered an oligopolistic market structure that allowed the state to coordinate market-oriented SOEs and state firms to achieve its developmental objectives.

Therefore, power concentration manifested as direct central and top leaders' attention and commitment, which translated into macro-economic and comprehensive planning, substantial financial backing, organizational and policy support and clear and restrictive development targets. It also evolved from the Maoist styles of command and control toward one that helped

advance the role of the state in managing resource distribution for industrial development and the increasingly market-oriented national economy.

The following three subsections will summarize key findings in the three crucial post-1949 periods along the following three developmental perspectives of power concentration:

1. The presence or absence of developmental approaches,
2. The institutionalization of planning agencies,
3. The presence or absence of strategic industrial policies.

The Mao Era

During the Mao era, the nascent Communist regime was haunted by constant geopolitical pressures. The unbalanced distribution of the Chinese economy made China's industrial and transportation hubs vulnerable against perceived invasions. As a result, the "Great Helmsman" focused on modernization, industrialization and self-sufficiency. Mao did so by breaking down geographical barriers and integrating national defence with economic modernization. However, the Maoist developmental approach oscillated between centralized planning and mass mobilization.

The Soviet Union's experience in central planning and economic management established a precedent for the founders of the People's Republic. Under the tutelage of Soviet planners, the Chinese developed their own central planning organs, such as the State Planning Commission (SPC), which oversaw medium- and long-term planning, and the State Economic Commission (SEC), which was responsible for annual planning. Both commissions were in charge of coordinated development, and flashes of institutionalized power concentration occurred during the First FYP and the Third Front Movement. However, Mao's implacable distrust of bureaucracies resulted in inexorable attacks on both state organs as well as those who were in charge. The Great Leap Forward and the Cultural Revolution left central planning agencies bereft of their powers.

As a result, railway development during the Mao era was uneven. Under the Soviet Union's tutelage, Maoist FYPs included restrictive sectoral targets and became important tools to

coordinate cross-sectoral development and ensure the sound implementation of industrial policies. Under the First FYP, sectoral achievements exceeded national planning. Between 1953 and 1957, the railway sector was highly centralized under the Ministry of Railways (MOR), and railway production was characterized as highly concentrated, greatly coordinated and semi-militarized. The central government also adopted the Soviet Union's planned transport and one-man management System to strengthen national planning, which meticulously planned railway production from road construction to locomotive manufacturing and loading capacity. However, during the Great Leap Forward, the national railway system became fragmented due to a decentralization of planning capacities. While a clear industrial policy focusing on restructuring the national economy and railway development was introduced in the early 1960s, the onslaught of the Cultural Revolution plunged the national system into a state of anarchic chaos.

Interestingly, railway construction under the Third Front Movement continued without much interruption. Under direct central attention and commitment, the Southwest Third Front Construction Commission secured uninterrupted policy implementation in the construction of arsenals, steel mills and railway projects in Sichuan, Guizhou and Yunnan. Several central administrative and military organs devised a detailed plan to complete the Railway Third Front. Those plans were also integrated into the Third FYP (1966 to 1970), which outlined the sequence of railway construction in southwestern China and the amount of capital investment. The Railway Corps of the People's Liberation Army (PLA) played a key role in the construction of those railway projects that extended the Party-state's reach into China's frontiers.

The Post-Mao Era

Post-Mao Chinese leaders understood well the need to improve the living standards of ordinary Chinese people. However, state planners lacked a teleological approach as market reforms were driven by situational needs. The second and third generations of Chinese leaders searched for "magic potions" to stimulate economic growth and looked to their neighbours for answers concerning economic growth and social stability. In the 1980s, influenced by experimental and pragmatic styles of thinking—crossing the river by groping the stones—China's reform was guided by two loose coalitions: the cautious reformers and the bold reformers. Full commitment

to economic reform began after Deng Xiaoping's Southern Tours as the third generation of Chinese leaders started to embrace a more marketized economy.

The Party-state initiated a series of rebuilding and reform initiatives. One of the most important motivators of reform was incompatibility—that China's administrative institutions were no longer suitable for a more marketized economy. As a result, four structural reforms took place between the 1980s and 1990s to professionalize and institutionalize the Party-state. The Party was transformed from a revolution-making clique into a ruling Party dominated by technocratic cadres. The government gradually reduced the salience of its national planning agency, the SPC, and simultaneously empowered the SEC and its reincarnation, the State Economic and Trade Commission (SETC), to guide structural reforms. In the 1990s, the real value of the SPC was to balance macro-economic development, not national planning, as the latter had been decentralized. Under Zhu Rongji, national planning and multi-year programs became redundant, if not obsolete, as targets of the Ninth and Tenth FYPs (1996 to 2005) only established guiding and suggestive targets.

Sectoral industrial policy oriented around the idea to develop on the cheap. The MOR was forced to engineer developmental strategies based on situational needs as well. For example, funding diversification was sought to solve the MOR's debt problem, select network expansion and railway equipment modernization were implemented to overcome capacity issues concerning freight, especially coal, transportation in coastal regions, and different reforms were introduced to make the central ministry more market-oriented.

As a result, decentralization, deregulation and marketization were the marked features of railway development during the 1980s and 1990s. The MOR gained more autonomy vis-à-vis the central government as a result. Railway reform began with the decoupling of railway production and national defence. Deng Xiaoping decided to reduce the military and state budgets by dismantling the Railway Corps. Therefore, the Railway Corps integrated into the MOR's Engineering Bureaus, which then transitioned into a contract responsibility system. The central ministry transitioned to the said system in 1986, which marked the beginning of official decentralization at the state level.

Two more rounds of reforms were implemented to grant the MOR and its regional bureaus and non-transport units more autonomy. At the state level, the State Council and the SPC promised to reform and increase passenger and freight tariffs. The MOR was allowed to borrow foreign capital and fundraise through the Railway Construction Fund. At the sectoral level, regional bureaus and non-transport units were pushed into the Chinese socialist market and gained budgetary autonomy vis-à-vis the central ministry. New operating mechanisms and profit-sharing schemes were implemented to stimulate growth and efficiency within the sector. Those market reforms resulted in the decision to bifurcate the non-transport units from the central ministry in the late 1990s and vertically separate the central ministry in the early 2000s.

The Post-WTO Era

At the turn of the 21st century, senior leaders raised the Two Centenaries. They called for an improvement in the livelihood of the Chinese people and the establishment of a strong nation. China's integration into the free trade world, ironically, led to a recentralization of state powers. Chinese leaders realized that further integration into the global economy could threaten China's economic security and national sovereignty.

China's post-WTO leadership readjusted the country's developmental approach. Two crucial economic metavisions emerged as a result of rising geoeconomic challenges: a tiered economy and controlled competition. In addition to building national champions, those metavisions were introduced to strengthen the competitiveness of China's strategic sectors and centrally-owned state enterprises (SOEs). But more importantly, those developmental approaches were designed to preserve and advance the role of the state. They were also introduced against the backdrop of an emerging statist consensus, which focused on strengthening the role of the state in macro-managing the Chinese economy and providing public goods through medium- and long-term programs.

As a result, the central government strengthened its planning capacities by fusing several planning and macro-economic organs to create the National Development and Reform Commission (NDRC). Wen Jiabao stressed the importance of multi-year programs, national planning with restrictive targets, top-level design and overall planning—all of which became the

core responsibilities of the NDRC. The commission's roles were strengthened in 2008 as it was placed in charge of the national stimulus program.

Intensified geoeconomic pressures also propelled the central government to contemplate new paths to sectoral modernization as over two decades of nonplussed development led to a profound capacity deficiency. The top leaders scrapped plans concerning market reforms and turned the MOR into an administrative entity under the direct control of the State Council and the NDRC. Financial and organizational support insulated the central ministry from implementation problems.

The MOR engineered a new developmental approach. The national BLF focused on rapid network expansion and upgrades and railway equipment modernization through power concentration and technology leapfrogging. Vertical separation was reversed, and the integration of construction and operation was strengthened so that the central ministry could maintain control over those newly created non-transport SOEs. The need to centralize passenger and freight transportation led to the dismantling of regional bureaus' sub-branches. Three new national champions were created in the freight sector to compete against foreign firms and joint-ventures, and seven were created in the rolling stock sector to pursue technology leapfrogging. The BLF was a product of the thinking that produced the national champion strategy and comprehensive planning.

The central ministry drafted a multi-year program with clear and restrictive targets to complement the implementation of the BLF. The Medium- and Long-term Railway Program (MLTRP) was approved after one round of comprehensive coordination led by the NDRC, which integrated railway development with national economic planning. The ultimate purpose was to build a modern and advanced railway system capable of solving domestic transportation problems as well as compete internationally. Despite the 2013 reform to separate government and business, the newly created China Railway Corporation (CRC) has carried the same mission in terms of advancing rapid network expansion and highspeed train innovation through centralized means.

Highspeed Rail Development

The hallmark of the BLF was the development of a comprehensive highspeed rail (HSR) industry. Such development could not be viewed independently from the need for freight transport. Indeed, the initial pursuit of HSR modernization was meant to increase both passenger and freight capacities so that the sector could provide quality and reliable transportation services to sustain China's export-led economy. During the initial phases of HSR development, power was concentrated in the MOR's chief engineers and the Transport Division. Through a national innovation system established by Zhang Shuguang, the MOR controlled other railway commercial and state entities through market mechanisms, administrative directives and regulatory orders. In the subsequent research and development of domestic highspeed trains, the Chinese Academy of Railway Science (CARS) played the key coordinating role. The CARS helped with the integration of several HSR systems by establishing harmonized technical specifications and making six engineering systems interoperable.

Since the introduction of the Belt and Road Initiative (BRI), the export of China's HSR industry has become an important vehicle for China's diplomatic missions. The globalization of China's HSR industry was meant to strengthen China's place in the global economy as a rule-maker and to solve domestic problems of overcapacity. To improve the coordination of the domestic and international situations, the NDRC replicated the domestic state-industrial relationship to facilitate the globalization of the "China standards" in HSR development. Indeed, the new and recentralized export structure reflected the domestic model of "integrating railway construction and operation." The extension of the CRC's domestic coordinating capacity led to the creation of the China Railway International Corporation. Its creation was concurrent with the merger of two independent and internationally active rolling stock groups—the China South Rolling Stock Corporation and the China North Rolling Stock Corporation. These moves established a centralized export mechanism and mitigated and suppressed cut-throat competition between Chinese firms.

Contribution to the Study of Political Economy

This dissertation project made two contributions to the study of political economy in China. The theoretical contribution was the introduction of power concentration as a concept to understand railway development. First, centralized sectoral planning and state-guided industrial development

signalled a rational state that could be purposeful and selective in implementing a clear developmental approach, which focused on building the sinews of a comprehensive national transportation network. Moreover, this project disaggregated China's developmental actors. Chinese leaders and China's planning organs played a crucial role in crafting a top-level design policy environment in which to provide macro-economic, policy and monetary support to sectoral policymakers. Railway policymakers became responsible for coordinating, organizing, mitigating, negotiating and even suppressing sub-central and cross-sectoral action. This state–industrial relationship saw states as facilitators, whereas sectoral policymakers as implementers and coordinators of development.

The empirical contribution was in the chosen case study: the railway sector. This dissertation explored the sectoral macro-developmental story, including two chapters on highspeed rail development, in modern and contemporary Chinese history. I tracked the ups and downs of sectoral modernization and argued that railway development, while important in its own right, served vital state interests. I also traced institutional evolution within the sector, including the establishment and dismantling of the PLA's Railway Corps, the transition from the one-man management system to the chief engineer responsibility system, and the dismantling of regional railway bureaus' sub-branches and less-than-container-load centres.

Moreover, as a lens through which to understand the transformation of China, this dissertation tracked key institutional development of the central government since 1949. I documented the effects of the Great Leap Forward, the Cultural Revolution, the introduction of the contract responsibility system, the Asian Financial Crisis and WTO accession on governmental reforms and the evolving roles of the central government and its planning agencies. More importantly, this dissertation explored the effects of such institutional development on sectoral management—how the central ministry, sandwiched between the central government and the Chinese society, balanced state-led projects and railway modernization and service provision.

This dissertation offered a developmental narrative of the rise of a comprehensive national HSR network and industry. It served as an important empirical addition. Indeed, those who had examined HSR development in China often restricted their analysis in the post-2004

period on important themes such as the role of the state and the socio-economic, geopolitical and geoeconomic implications of HSR development. And for those who had examined the internationalization of China's HSR industry, they overlooked the important structure through which China's HSR standards were exported.

Future Research

This dissertation is the starting point for three related research projects in the immediate future. The first project, possibly a book-long study, will thoroughly examine China's HSR development. To be specific, I will continue to investigate how the concentration of power has been achieved not only to strengthen China's geoeconomic positioning, but also to establish a "vehicle" through which to carry China's diplomatic mission. Some of the key themes that have been highlighted in this dissertation can be the starting point for more in-depth analyses. For example, the evolving relations between the central ministry and regional bureaus and the politics of railway construction, all under an international setting, are two possible avenues for further investigation. Theoretically, this project helps identify the twin goals of globalization (O'Riain, 2000) as impetuses behind the adoption of economic statecraft as a way to promote innovation domestically and abroad. This book-long study can offer key insights concerning the domestic drivers of the BRI and the "going global" of China's HSR industry: something lacking in the extant literature.

The second project takes a local perspective on the theme of railway development. Indeed, a thorough analysis of the relationship between the central ministry and its local actors, such as regional bureaus and sub-branches, can unpack how central policies have been carried out locally. Moreover, the local perspective, looking at successful and unsuccessful reform initiatives, provides key insights into future policy-making. The examination of this central-local relationship also helps understand the nature of China's railway system—a crisscrossed network that embodies both vertical and horizontal administrative units. In addition, a comparative study of the Shenyang Railway Bureau, the Beijing Railway Bureau and the Guangzhou Railway Group helps understand the impacts of reform on different regions of China. A horizontal

comparison of developmental paths between traditional administrative units and a modern corporation is of interest to scholars of political economy.

The politics of railway construction is another interesting departure. On the one hand, the socio-economic implications of railway construction have not been intensively studied by China scholars. On the other hand, how strategic groups emerge in the form of Construction Headquarters is worth examining in light of a more restive society. Building on the conceptual works of "fragmented authoritarianism" and "strategic groups," a future project can shed light on how the (local) state mitigates and negotiates with various actors for the construction of HSR corridors. In addition to policy implementation, labour organization is another perspective that can provide insight into the mechanisms through which "coordinated production" takes place.

Appendix

A: Research Design and Methods

This dissertation project is a single sector study on the Chinese railway sector, which is both archetypal and atypical of Chinese super-ministerial and centrally owned state enterprise reform. This study focuses on the factors and actors behind China's push for railway modernization and reform since the founding of the People's Republic. Through cycles of centralization, decentralization and recentralization, the evolving character of the MOR and the railway sector are good examples through which to understand the bigger CCP nation-building, modernity, and economic development challenges. From the perspective of top-level design, accelerated railway development and modernization only took place under a policy environment marked by professional and institutionalized macro-economic planning and direct central attention and commitment.

Therefore, the choice of methods has primarily oriented around the idea of matching politics on the ground with concepts of top-level design. Research methods must facilitate in identifying and analyzing the factors and actors behind each critical juncture of centralization and the ensuing institutional changes. As a result, this dissertation project is qualitative in nature. Methods include archival research, semi-structured interviews, and process-tracing – all of which were done during extensive fieldwork in China (from 2016 to 2019).

Process tracing

Process tracing "gives greater attention to description as a key contribution, and emphasizes the causal sequence" (Collier, 2001: 823). Bennett (2010) argues that this is a useful tool to investigate whether a hypothesis could explain events and processes within the case study. This method scrutinizes within-case comparison as well as temporal comparison. Further, process tracing could help identify the independent, dependent, and intervening variables. The identification of these variables helps gauge the effects of the independent variable and intervening variable – changes in the international environment and grand strategy - on the dependent variable – centralization.

The goal of the dissertation is to explain and understand the role of external factors on the acceleration of railway development through centralization, and through process tracing could help identify important factors other than the domestic drivers of reform in the railway sector. While those domestic drivers are important, the mix of external factors as necessary causes would offer a nuanced understanding of the constraints and pressures that the Chinese state planners face when formulating developmental strategies or economic and industrial policy frameworks.

Having undergone process tracing, it is evident that geopolitical and geoeconomic pressures helped accelerate railway development in the forms of network expansion and railway equipment modernization. Indeed, as a necessary cause of centralization, process tracing helped identify critical junctures when the external environment factored into senior Chinese leaders' decision-making process concerning national development and transportation modernization.

Furthermore, process tracing as a technique allows me to capture exactly *how* the Chinese state changed its economic policy, concerning railway development and reform, in light of external challenges. Therefore, I have examined some of the tools that are at the state's disposal – including political tools and economic tools. Moreover, apart from those tools and regulations, process tracing helps unpack monitoring and enforcement capabilities of the state, especially with the case of the railway sector whose purpose and the goal is to supplement China's developmental strategies. To be specific, process tracing helps understand how these capabilities become state power to herd the sector to support the broader state agenda.

Data collection

The fieldwork component of the dissertation project was done across three academic years starting in September of 2016 and ended in July 2019. While I was in the field, I visited China, Latvia, Germany, Indonesia, and Japan. During those three years, I've split most of those times between Guangzhou and Hangzhou. The time spent in Guangzhou helped shape the general direction of this dissertation project. Many thanks to senior cadres of the Guangzhou Railway Group, the Guangzhou Railway Station, and the Guangzhou South Railway Station. I learned about the "bigger picture" of the railway sector in China and a brief history of its modernization

process from exchanges with those cadres in the railway sector. Such knowledge helped shape the dissertation proposal, which was passed in May 2017. I returned to China as a Canada-China Scholars' Exchange Programme fellow to Zhejiang University in Hangzhou. During my stay at Zhejiang University, from February 2018 to July 2019, I conducted the final interviews and archival work across the country. Some additional interviews were conducted in Indonesia and Japan. Interviews are coded in the form of "Month/Day/Nickname/Year." For example, an interview that took place on October 19th, 2018, with Mr. F at Kereta-Cepat Indonesia China (KCIC), is noted as "SR19KCF18."

The composition of data comes mainly from four sources: 1) field interviews in China, Indonesia, and Japan, 2) archival work on governmental documents and industry publications and yearbooks, 3) existing literature on the railway sector and 4) media and news sources. Most interviews were done between May to November 2018, and most interviewees were recruited via the snowball method. Three groups of interviewees were recruited – academics, people in the business community (including cadres in Chinese SOEs), and civil servants. Those semi-structured interviews largely orient around the interviewees' understanding of the railway sector and the relationship between the railway sector and the state. I've mainly asked academics to comment on factors and actors that shape railway policies. People in the business community were interviewed on the subject of government-business relations, as in how the state has exercised control over the railway sector and other state-owned enterprises. Lastly, civil servants were asked to identify China, Indonesia, and Japan's foreign policy goals and the pursuit of those goals through policy tools. Most of the interview contents have been cross-verified to ensure validity. Thus, I've made the decision not to include interviews that could not be cross-verified.

Apart from the interviews, archival work on governmental documents, industry publications, and sectorial yearbooks were relevant sources of data. Most of the statistics were taken from the National Bureau of Statistics, the NRA, and yearbooks published by the MOR and CRC. A small percentage of data were included from yearbooks published by the China North Rolling Stock Corporation and the China South Rolling Stock Corporation. Official publications such as *The Selected Works of Deng Xiaoping, Important Documents on the Development and Reform of the Railway Sector,* and other ones published by state publishing

houses were consulted. Indeed, many important speeches, high-level visits, and policy documents could be located from those official publications. Those are important to document as they show the ups and downs of China's railway policy evolution. Archival work was helpful in terms of comparing policy evolution.

Existing literature on the railway sector helped shape the general understanding of China's railway modernization. Journal articles and edited volumes from the Highspeed Rail Research Centre at Southwest Jiaotong University and books published by China Railway Publishing House were especially useful in terms of understanding the detailed and chronological events of highspeed rail modernization as well as the different actors involved in that process. This set of literature gave a detailed account of the relationship between the Chinese state and the railway sector – how the state has controlled the sector in meeting some of the state's developmental targets.

Lastly, news and media sources, from state media such as People.cn or Gov.cn or commercial news outlets such as Phoenix New Media or Sina, were good additional sources. Publications by official state agencies will be treated as a standalone and verified source. In contrast, publications from commercial sites will be cross-verified – by locating three other independent reporting of the same event. These are good additional sources as they complement governmental and industrial archives. Most of the sources provide some insight into government policy formulation as well as a brief historical evolution of state policies.

Furthermore, statements (official publication or through media conferences) made by state leaders, such as Xi Jiping or Li Keqiang, members of the Politburo, or officials in the railway sector, are valuable sources of information. Therefore, a considerable amount of time was spent on gathering statements and speeches concerning economic and industrial policy changes or challenges in China's modernization efforts, especially those concerning railway transportation. Moreover, an in-depth cross-examination of government documents and news sources could shed light on the policy orientation and alignment behind the implementation of specific state policies.

B: List of Acronyms

ADB – Asian Development Bank
BLF – Big Leap Forward
BRI – Belt and Road Initiative
BST – Bombardier Sifang (Qingdao) Transportation Ltd
CACC – China-Africa Construction Corporation
CARS – Chinese Academy of Railway Sciences
CCECC – China Civil Engineering Construction Corporation
CCP – Chinese Communist Party
CDRC – Third Railway Survey and Design Institute
CEMU – China-standard Electric Multiple Units or China Standard Highspeed Rails
CFEAC – Central Finance and Economic Affairs Commission
CMC – Central Military Commission
CNR – China North Locomotive and Rolling Stock Industry Corporation
CNY – Chinese Yuan
CR – China Railway Model (*fuxing hao* – the Rejuvenation Model)
CR Express – China Railway Express
CRC – China Railway Corporation (the MOR after 2013)
CRCC – China Railway Construction Corporation Ltd.
CRCTC – China Railway Container Transport Corporation
CREC – China Railway Engineering Corporation
CRH – China Railways High Speed (*hexie hao* – the Harmony Model)
CRIC – China Railway International Corporation
CRPEC – China Railway Parcel Express Corporation
CRRC – CRRC Corporation Ltd
CRS – Contract Responsibility System
CRSCC – China Railway Signal and Communication Corporation
CRSCS – China Railway Special Cargo Service Corporation
CSR – China South Locomotive & Rolling Stock Corporation Limited
CTCS – Chinese Train Control Systems
DRC – State Council's Development Research Center
EMU – Electric Multiple Unit Trains
ETCS – European Train Control System
FYP – Five-Year Plans
HSR – Highspeed Rail
HSRCC – Highspeed Rail Construction Corporation
IMF – International Monetary Fund
ISO – International Organization for Standardization
JICA – Japan International Cooperation Agency
JPY – Japanese Yen
KCIC – Kereta Cepat Indonesia China
KMT – Kuomintang
METI – Japanese Ministry of Economics, Trade, and Industry
MLIT – Japanese Ministry of Land, Infrastructure, Transport, and Tourism
MLTRP – Medium- and Long-term Railway Program

MMA – Indonesian Ministry of Maritime Affairs
MOC – Ministry of Commerce
MOF – Ministry of Finance
MOFA – Ministry of Foreign Affairs
MOR – Ministry of Railways
MOST – Ministry of Science and Technology
MOT – Ministry of Transportation
MSOE – Indonesian Ministry of State-Owned Enterprises
MU – Multiple Unit Trains
NDRC – National Development and Reform Commission
NRA – National Railway Administration of the PRC
NSFC – National Natural Science Foundation of China
OECD – Organization for Economic Cooperation and Development
PLA – People's Liberation Army
PRC – People's Republic of China
REB – Railroad Economic Belt
SASAC – State Asset Supervision and Administration Commission
SEC – State Economic Commission
SETC – State Economic and Trade Commission
SOE – Centrally-Owned State Enterprises
SPC – State Planning Commission
SDPC – State Development Planning Commission
USD – US Dollar
WTO – World Trade Organization

C: List of Ministers of Railways

Name[32]	Tenure	Background (after 1949)
Teng Daiyuan	1954-1965	Lieutenant General of the PLA
Lü Zhengcao	1965-1970	General of the PLA
Wan Li	1975-1976	Party Administration
Duan Junyi	1976-1978	Party Administration
Guo Weicheng	1978-1981	Major General of the PLA
Liu Jianzhang	1981-1982	Railway Administration
Chen Puru	1982-1985	Party Administration
Ding Guan'gen	1985-1988	Railway Engineer
Li Senmao	1988-1992	Railway Engineer
Han Zhubin	1993-1998	Railway Engineer
Fu Zhihuan	1998-2003	Railway Engineer
Liu Zhijun	2003-2011	Railway Engineer
Sheng Guangzu	2011-2013	Railway Administration

[32] Those who had served in the PLA's Railway Corps prior to becoming Minister of Railways are bolded.

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