

## The Organizational Roots of State Capacity

*Comparing Railway Bureaucracies in China and India*

### ABSTRACT

How does state structure affect state capacity? The long-standing debate over centralization versus decentralization overlooks the broader organizational complexity of states and state bureaucracies. To address this problem, this article proposes an alternative typology of state organizational forms: nodal versus diffuse. Nodal forms concentrate decision-making power in a limited set of key actors at intermediary levels of the state hierarchy. Diffuse forms distribute decision-making power across many overlapping lines of authority. Nodal forms contribute to state capacity by combining the coordination advantages of centralization with the accountability and autonomy of decentralization, whereas diffuse forms make these processes more challenging. Empirically, this article compares two paradigmatic cases—China’s and India’s railway bureaucracies—to show how their nodal and diffuse forms, respectively, shape their ability to complete railway projects. These findings suggest that the organizational structure of state bureaucracies is an important yet underexplored factor underlying state capacity.

**KEYWORDS:** China, India, state capacity, bureaucracy, infrastructure

### 1. INTRODUCTION

How does the organizational structure of the state affect its ability to carry out official policies? This question has long been dominated by the debate over whether more centralized or more decentralized structures make states more effective. Some forms of centralization can improve state cohesion and

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leverage economies of scale, but they can also create information and decision-making bottlenecks (Chibber 2002; Evans 1995; Kohli 2004). Some forms of decentralization can empower local institutions, which may be more responsive to local demands and conditions (Besley and Coate 2003; Oates 1972; Tiebout 1956), but this can also lead to counterproductive forms of competition (Cai and Treisman 2006; Treisman 2007). This debate has reached an impasse because it relies on a narrow center-versus-local view of state structure, overlooking the complex, interconnected array of bureaucratic organizations that are integral to policy implementation.

This article proposes an alternative typology of state organizational forms that better accounts for the important role of bureaucratic structure in shaping state capacity: nodal versus diffuse forms. *Nodal* state organizational forms are characterized by a concentration of decision-making power in a limited number of key actors at intermediary levels within the state hierarchy. *Diffuse* state organizational forms are characterized by a dispersion of decision-making power across many overlapping lines of authority. Nodal forms of state organizational structure tend to enhance state capacity because they combine the coordination advantages of centralized structures with the accountability and autonomy of decentralized structures. Diffuse forms, in contrast, tend to undermine state capacity, because an overabundance of veto-wielding actors makes coordination more challenging and accountability less clearly defined.

These two contrasting types of state organizational form can enhance or constrain state capacity through three primary mechanisms. First, bureaucratic *goal alignment and accountability* are greater in nodal structures because policy outcomes can be more clearly tied to a limited number of key actors. In a diffuse structure with many decision-making actors and a profusion of overlapping ties among them, assigning credit or blame for policy outcomes to any single actor is more challenging. Second, the *coordination* of policy work across actors from local governments to other state agencies is facilitated by a small number of nodal actors in a nodal structure, while the lack of any such coordinating actor within a diffuse structure leads to organizational bottlenecks and conflicts. Third, *autonomy* is greater in a nodal structure, where midlevel actors are empowered to make implementation-level decisions, whereas the many decision-making actors in a diffuse structure constrain the ability of lower-level officials to problem-solve on their own.

To show how this typology works in practice, this article compares two paradigmatic empirical cases: the state railway bureaucracies of contemporary China and India. China's railway bureaucracy is a paradigmatic example of the nodal form of organizational structure: decision-making power is concentrated in a limited set of key actors across the bureaucratic hierarchy. For most railway projects, a single nodal actor—the state-owned project corporation—is responsible for coordinating work and seeing the project through to completion. India's railway bureaucracy is a paradigmatic example of the diffuse form: decision-making power is distributed widely across many overlapping authority structures, including regional bureaus, functional divisions, and informal tenure-based hierarchies.

To be clear, I do not argue that the Chinese state is more effective at developing railway infrastructure than the Indian state solely due to differences in bureaucratic structure. The Chinese state has indeed managed to build the world's largest high-speed rail network in less than a decade, while the Indian state has struggled to modernize its own overburdened railway system. However, the Chinese and Indian contexts differ along many important dimensions, making it impossible to disentangle the effects of confounding factors such as regime type and financial resources. Instead, this article uses a comparative approach to clarify the specific mechanisms through which each type of organizational form shapes state capacity. Tracing the structure and operations of China's and India's railway bureaucracies in a detailed side-by-side manner allows for a more precise articulation of key processes than would a single case study.

This article draws on 24 months of fieldwork in China and India, including more than a hundred semi-structured interviews with railway officials and industry experts. I begin by summarizing the centralization–decentralization debate and show that this framework has reached the limits of its theoretical utility. I then outline an alternative typology of nodal versus diffuse state organizational forms and show that this typology better addresses the relationship between state structure and state capacity. The rest of the article compares the empirical cases of China's and India's railway bureaucracies. I show how their differing organizational structures affect their ability to complete railway projects. I conclude by discussing whether and how these findings might generalize to other contexts, with implications for future research on state capacity.

## 2. THE ORGANIZATIONAL STRUCTURE OF THE STATE

### 2.1 The Centralization–Decentralization Debate

Existing work on state organizational structure has long been dominated by the debate over whether centralized or decentralized states are more effective at providing public goods and carrying out official policies (for an overview, see Mookherjee 2015). Work on the “developmental state” has emphasized the need for certain centralized state institutions to ensure cohesiveness in policy formulation and implementation across the state apparatus (Chibber 2002; Evans 1995; Johnson 1982; Kohli 2004). Centralization can also offer greater economies of scale and concentrations of resources not possible at more local levels (Bardhan 2002; Besley and Coate 2003). However, excessive centralization can diminish state capacity by creating decision-making and informational bottlenecks (Chibber 2002).

On the other side of the debate, certain forms of decentralization may improve the state’s ability to implement policies on the ground because local institutions are more responsive to heterogeneous local conditions and needs (Besley and Coate 2003; Oates 1972). Decentralization can also streamline decision-making by reducing the need to wait for authorization from higher-level actors. Moreover, decentralization can foster experimentation and productive competition among local jurisdictions, an argument often associated with Charles Tiebout (1956). However, these purported benefits of decentralization are not always realized. For example, Hongbin Cai and Daniel Treisman (2006) have argued that competition among local jurisdictions can also be counterproductive by encouraging local protectionism and a “race to the bottom” in tax incentives (see also Treisman 2007).

An alternative line of scholarship has challenged this centralization–decentralization dichotomy. Some scholars have argued that effective decentralization depends on the existence of certain centralized political institutions (Bardhan 2002; Blanchard and Shleifer 2001). Work comparing the divergent trajectories of Russian and Chinese decentralization has emphasized the need for a strong central authority that can push local governments to pursue growth-enhancing rather than rent-seeking forms of competition (Blanchard and Shleifer 2001; Montinola, Qian, and Weingast 1995). Even advocates of limited government have argued that successful decentralization requires strong centralized institutions for the enforcement of property rights (North 1990).

Ultimately, the centralization–decentralization debate suffers from two related problems. First, it assumes an overly narrow view of state organizational structure, primarily oriented along a vertical center–local axis. In reality, the distribution of power and the structure of authority relations within modern states are far more complex and multidimensional. Certain ministries, such as the finance ministry, may exercise outsized influence over others. Some institutions, such as central banks or intelligence agencies, may enjoy greater autonomy or have more direct ties to the president or prime minister’s office. A second and related problem is that the centralization–decentralization debate fails to take into account the broader array of bureaucratic organizations that are largely responsible for actual policy implementation. How these vast portions of the state apparatus are structured and interact with one another is critical to the state’s ability to realize its overarching policy objectives.

## 2.2 Bureaucratic Structure and State Capacity

A large body of scholarship has examined the structure of state bureaucracies and their effect on state capacity. The literature on bureaucratic politics has demonstrated the role that internal rivalries and bargaining among bureaucratic actors play in shaping policy decisions (Allison and Halperin 1972). Later work sought to understand how the organizational structure of these bureaucracies, including the relative positions of actors in authority structures and information flows, shapes how interagency dynamics manifest as policy actions (Bendor and Moe 1985; Hammond 1986).

Scholarship on China’s modern state bureaucracy has shed light on a major organizational problem facing many state bureaucracies around the world: functional versus vertical organizational structures. During the Mao era, much of China’s state bureaucracy was organized along dual “vertical” and “horizontal” authority structures, known as *tiao* and *kuai*, respectively (Mertha 2005). Local government departments, such as civil works bureaus, reported to their local governments as well as to higher levels of their functional area, up to their corresponding central government ministries (*ibid.*). However, this structure led to problems that are typical of such “matrix” organizational structures, including conflicts between overlapping reporting lines.

Starting with the reforms of the 1970s, parts of the Chinese state began a gradual shift away from the matrix structure to a “multidivisional” or “M-form” structure (Qian and Xu 1993). This structure, which came to dominate large American firms in the mid-twentieth century (Fligstein 1985), is characterized by a shift of authority away from the organizational center to more autonomous, parallel organizational subdivisions. Indeed, some scholars have argued that China’s shift toward a multidivisional structure contributed significantly to its rapid economic growth by encouraging competition among local jurisdictions (Qian and Xu 1993). However, a characterization of China’s bureaucracy as multidivisional overlooks the important role of strategically positioned actors within the bureaucratic hierarchy who can coordinate and problem-solve across regional jurisdictions and functional domains.

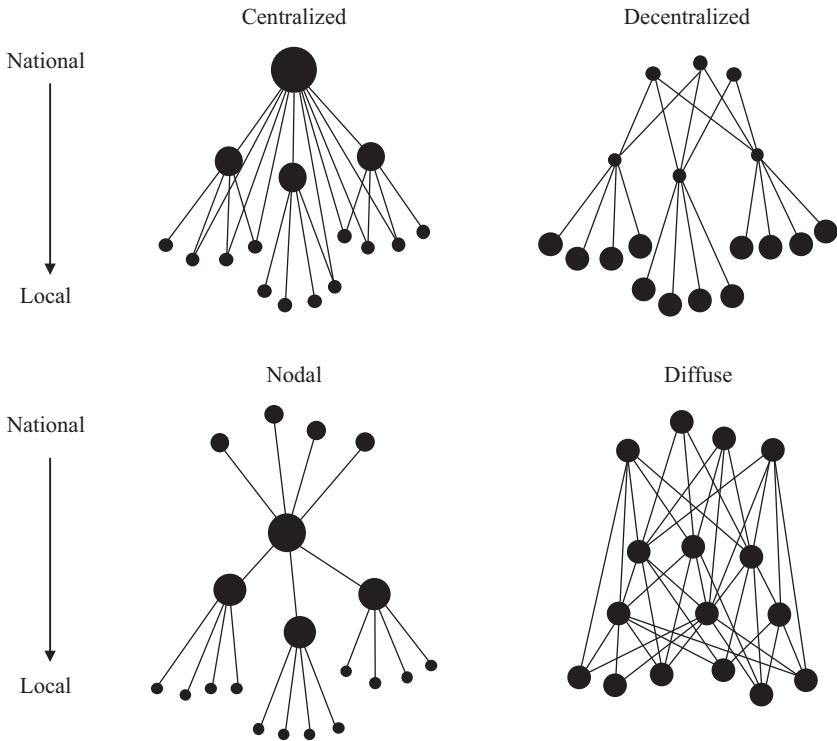
### 2.3 Nodal versus Diffuse Organizational Forms

To address these issues, I propose an alternative typology of state organizational forms that better accounts for the structural complexity of modern states and their bureaucracies: *nodal* versus *diffuse* forms (Figure 1).

*Nodal* forms of state organizational structure are characterized by a high concentration of decision-making power in a limited set of key state actors. These *nodal actors* are state entities or even individual officials that operate with a high level of autonomy within a given policy domain and retain extensive connections across the broader bureaucracy, including with other nodal actors. In contrast with centralized state structures, such as Vivek Chibber’s (2002) notion of a top-level “nodal agency,” nodal forms of state structure concentrate authority not at the very top of the state hierarchy but rather among nodal actors at the middle levels of the state apparatus, such as ministries, departments, agencies, and state-owned enterprises. It is these underappreciated “middle managers” that occupy a crucial position within the state, close enough to the ground to understand the challenges of implementation yet high enough to reach across many parts of the state simultaneously.

*Diffuse* forms of state organizational structure, in contrast, are characterized by a dispersion of decision-making power across dense, overlapping lines of authority. Where the dual reporting structure of the matrix organizational form can yield an overlap between functional and vertical reporting lines,

FIGURE I. Stylized Representations of State Organizational Forms



NOTE: Circle sizes indicate degree of decision-making power for policy implementation.

diffuse organizational structures can lead to areas of overlap among many cross-cutting reporting lines. As a result, each decision or task in the policy implementation process frequently requires the approval or cooperation of many state actors. This leads to a proliferation of “veto players” who each have the power to effectively block action (Tsebelis 2002). Because successful policy implementation often requires the joint execution of many smaller steps, the existence of many veto-wielding actors renders the implementation process highly susceptible to disruption, along the lines of Michael Kremer’s (1993) “O-ring” model of production. Importantly, the diffuse form is not merely political fragmentation, where power is divided among competing groups, but rather a structural condition of extreme interdependence among state actors.

While the effectiveness in practice of these nodal and diffuse forms likely depends on a range of factors, nodal forms of state organizational structure

offer several general advantages for state capacity over diffuse forms. First, nodal organizational structures provide better mechanisms for *goal alignment and accountability*, because the success or failure of policy implementation efforts can be clearly tied to a limited number of key actors. In diffuse organizational structures, the large number of actors involved for each decision or task in the implementation process makes it difficult to ascribe credit or blame for outcomes to any particular actor. In the case of failure, state actors can resort to blame-trading, leading to a diffusion of ultimate responsibility (Weaver 1986).

Second, nodal organizational structures offer better mechanisms for *coordination* across the state. Nodal actors can integrate information and activities across multiple parts of the bureaucracy and help resolve conflicts as they arise. Diffuse organizational structures, in contrast, lack any such mechanisms for coordination or conflict resolution. A lack of coordination between state organizations, or outright conflict between them, makes the execution of complex policy tasks even more challenging. Bureaucrats may find their greatest source of bottlenecks to be *other bureaucrats*, even within their own agency. Deeper conflicts can persist unresolved and impede bureaucratic functioning, requiring interventions by political leaders. Moreover, the coordinating role of nodal actors differentiates the nodal bureaucratic structure from the multidivisional form. Cross-functional and cross-jurisdictional nodal actors, which are absent from the multidivisional model, help coordinate the implementation of policies and projects that span multiple jurisdictions, such as regional infrastructure projects.

Third, nodal organizational structures provide greater *autonomy* to lower levels of the bureaucracy, resulting in more streamlined and responsive decision-making. Rather than waiting for approval from higher authorities, nodal actors at intermediary levels of the state can quickly adapt to changes in conditions on the ground. Diffuse organizational structures, in contrast, can produce many overlapping layers of rules and instructions that limit the autonomy of state actors. An overabundance of detailed rules and instructions, particularly from high-level actors far removed from the day-to-day problems of implementation, not only slows down administrative work by increasing compliance costs but also reduces risk-taking actions by bureaucrats who fear individual sanctions for potential rule violations.

Taken together, this nodal–diffuse typology offers several improvements over existing theories of the relationship between state structure and state



capacity. The debate over centralization versus decentralization has shown there are trade-offs in adopting extreme versions of either approach, suggesting a possible inverted-U relationship between the degree of decentralization and state capacity. The nodal structure offers a useful middle ground, combining the flexibility of greater decentralization with the coordination advantages of greater centralization. In addition, the nodal–diffuse typology marks a shift away from a top-down or bottom-up view of state action toward a more nuanced understanding of how power is distributed throughout the state more broadly, including across state bureaucracies. Building on work on bureaucratic politics and the rise of multidivisional organizational forms, this typology links the problem of bureaucratic structure with the problem of state structure. Lastly, this typology offers examples of the ways in which not only institutions but the very organizational structure of the state itself can be either “checking” (in diffuse forms) or “power-deploying” (in nodal forms), to borrow from Francis Fukuyama’s (2013) framing.

Two important qualifications must be made to this nodal–diffuse framework. First, these bureaucratic forms are not static but variable over time along a number of dimensions. For example, China’s political system has seen considerable shifts in power between central and local governments, between ministries and departments, and between Chinese Communist Party and state organizations over time. A primarily nodal bureaucratic structure can become more centralized over time, and vice versa. I discuss some factors that may drive these changes in the conclusion.

Second, the scope conditions for this nodal–diffuse framework are limited by policy area. Specifically, policy domains that involve the implementation of relatively “linear” projects—such as railways, ports, power plants, and physical infrastructure more generally—may benefit the most from the flexibility and coordination advantages of a nodal bureaucratic structure. Nodal structures may not work well in policy domains where constant feedback and dynamic readjustment are critical. For example, in regulatory policy spaces, such as environmental protection and financial regulation, a diffuse structure may be more effective for sharing information across state entities and providing internal checks against corruption and regulatory capture. Indeed, the Chinese state’s nodal structure in other sectors beyond railways may contribute significantly to its general strength in infrastructure development and its weaknesses in areas more susceptible to regulatory capture. Conversely, the Indian state’s diffuse structure in sectors beyond railways, such as municipal

utilities and power generation, may partly explain its broader weakness in infrastructure development, among other factors. A broader assessment of the bureaucratic structure of the Chinese and Indian states lies beyond the scope of this article but merits further investigation.

The rest of this article shows how these state organizational forms shape state capacity in practice through a comparison of the Chinese and Indian railway bureaucracies.

### 3. CASE SELECTION AND METHODS

Railway infrastructure projects provide an excellent test of state capacity due to their scale, cost, planning complexity, and need for a high degree of coordination across many parts of the state, spanning both functional departments and governing jurisdictions. China's and India's railway bureaucracies, in particular, share several useful similarities that offer a degree of comparability. The railway sector in both countries is almost exclusively state-controlled. The railway bureaucracies in both countries are massive central-state organizations. Both share many Weberian features, including meritocratic systems of recruitment and promotion, officials with high levels of technical expertise who are motivated by long-term career incentives, and an operating model based heavily on formal rules and procedures.

However, I do not use a conventional "most similar" comparative research design (Lijphart 1971) because this article's aim is not to advance a monocausal explanation for differences in railway outcomes between these two cases. Instead, the primary aim of this article is to explain how organizational structure shapes state capacity through a comparison of two empirical cases. Thus, I have selected China's and India's railway bureaucracies as cases because they represent paradigmatic examples of nodal and diffuse forms of state organizational structure, respectively. I use a two-case comparison to refine and articulate the salient features of each organizational type, both theoretically and empirically. To further leverage this comparative perspective, I conduct a parallel side-by-side comparison of the two cases at the level of specific causal mechanisms and pathways (Skocpol and Somers 1980).

This study draws on 24 months of fieldwork in China and India from 2017 to 2019, where I conducted over a hundred semi-structured interviews with current and former Chinese and Indian railway officials as well as industry experts. I interviewed railway officials at their workplaces and accompanied

them on site visits. I was invited to present my work at India's Ministry of Railways. (No such invitation was extended to me in China.) During fieldwork, I reviewed thousands of pages of primary source materials, including detailed project documentation volumes, technical engineering manuals, procedural handbooks, state budgets, planning reports, environmental impact studies, bond prospectuses, and corporate filings. Most of these materials are publicly available. This study also uses a range of secondary sources, including international and domestic media reports as well as specialty railway publications.

#### 4. STATE RAILWAY BUREAUCRACIES IN CHINA AND INDIA

This section provides an overview of the Chinese and Indian railway bureaucracies, highlighting key features that make them paradigmatic cases of the nodal and diffuse forms, respectively. Section 5 provides a parallel comparison of these cases across three types of mechanisms that influence state capacity: goal alignment and accountability; coordination; and autonomy.

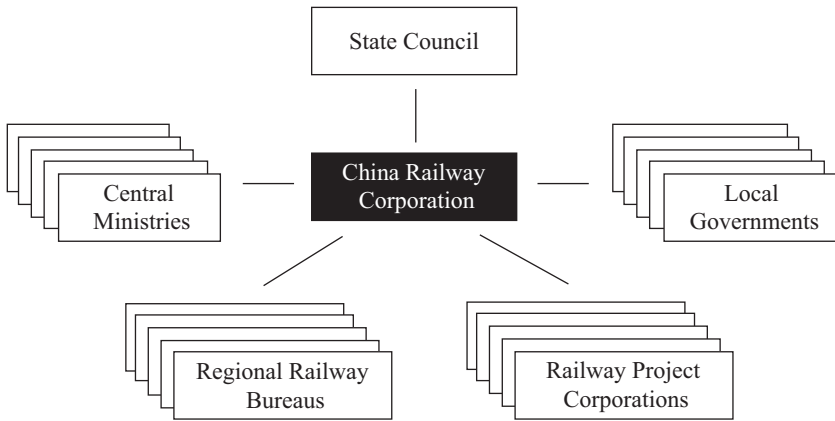
##### 4.1 China's Nodal Railway Bureaucracy

China's railway bureaucracy exemplifies the nodal form of state organizational structure. At first glance, it may resemble a traditional bureaucratic hierarchy, with cross-cutting functional and regional subdivisions. However, a closer examination reveals a network structure where certain organizations and individual officials at the intermediary levels of the bureaucracy act as nodes of concentrated decision-making power and information flows. In many cases, a single key actor, such as a specific project corporation or China Railway Corporation (CRC) itself, serves as the principal nodal actor in coordinating work across the bureaucracy. This subsection describes these nodal actors and their role within China's bureaucratic structure in more detail.

The primary organization in the Chinese railway bureaucracy is CRC, a ministry-level state entity that operates China's national railway network (*People's Daily* 2013).<sup>1</sup> CRC's headquarters in Beijing is responsible for overseeing train services and setting national policy in conjunction with the National Railway Administration, China's railway regulator (Figure 2). China's national railway network is divided into 18 geographical regions, each

1. The names of Chinese railway organizations may have changed since research was conducted.

FIGURE 2. China Railway Corporation as a Nodal Actor within the Chinese State



administered by a CRC regional railway bureau (Lawrence, Bullock, and Liu 2019, 8–9). These regional bureaus are responsible for day-to-day operations, and regional bureau chiefs enjoy a significant amount of decision-making power and autonomy within their sections of the network.<sup>2</sup>

Railway construction projects in China are carried out by a separate set of state entities called railway project corporations (Figure 3).<sup>3</sup> Typically structured as a joint venture between CRC and local governments, each project corporation acts like a general contractor, managing all aspects of a given railway project, including interfacing with higher-level ministries and officials, selecting and monitoring contractors, coordinating with local governments, managing project finances, and meeting project deadlines and budgets (China Railway Corporation 2015a). Each project corporation is led by a project manager, who oversees a tightly knit team typically consisting of 40–50 core staff.<sup>4</sup> Project team members typically remain with the project from start to finish and reside onsite, often apart from their families, for the four-to-six years normally required to complete a project.<sup>5</sup>

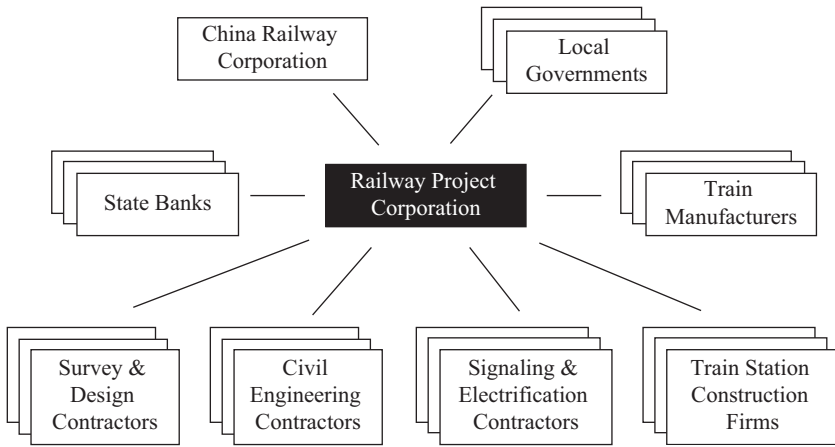
2. Interview, Chinese railway engineering manager, December 22, 2018.

3. In Chinese these are called railway joint-stock limited corporations (*tielu gufen youxian gongsi*). For clarity, I refer to them simply as project corporations.

4. Interview, Chinese railway planning official, September 22, 2017.

5. *Ibid.*

FIGURE 3. Chinese Railway Project Corporations as Key Nodal Actors



The archetype of a Chinese railway project corporation is the Beijing-Shanghai High Speed Railway Corporation, created in 2008 to manage the construction of the 1,300-kilometer high-speed rail line between China's two largest cities (Beijing-Shanghai High-Speed Railway Corporation 2014). It was formed as a joint venture between CRC and the province-level governments of Beijing, Shanghai, Hebei, Shandong, and Jiangsu (National Railway Administration of China 2014). The project corporation itself comprised approximately 100 staff who were responsible for coordinating all aspects of the project, from obtaining environmental approvals, to working with local governments for land acquisition and resettlement, to managing the bidding process for contractors (Beijing-Shanghai High-Speed Railway Corporation 2014). Primary construction work was divided into six major contracts awarded to state-owned civil engineering firms through a competitive bidding process managed by the project corporation (*ibid.*). Ultimately, it was the project corporation that was responsible for completing the project according to the ambitious three-year timeline set by China's State Council.

State-owned contractors are another important set of nodal actors in the Chinese railway ecosystem. Contractors who work on railway projects are divided by functional specialty, such as survey and design work or civil engineering (Ministry of Railways, China 2009). Within any given functional

area, state contractors tend to be limited in number (yet more than one, to avoid monopolies) and comparable in resources and technical capabilities (Chan, forthcoming). These contractors operate with a high degree of autonomy and compete for project work.<sup>6</sup> Contractors act as nodes by allocating work among their subsidiaries, coordinating with local government agencies, and reporting progress and challenges to the project corporation.<sup>7</sup> Once a project is underway, contractors are monitored and evaluated by the railway project corporation (China Railway Corporation 2018).

To summarize, China's railway bureaucracy is structured not simply as a top-down, centralized hierarchy but rather as a set of concentrated nodes of decision-making power and information flows. Nodal actors such as railway project corporations, state contractors, and CRC itself play a crucial role in integrating project work across many parts of the railway bureaucracy and the Chinese state more broadly.

#### 4.2 India's Diffuse Railway Bureaucracy

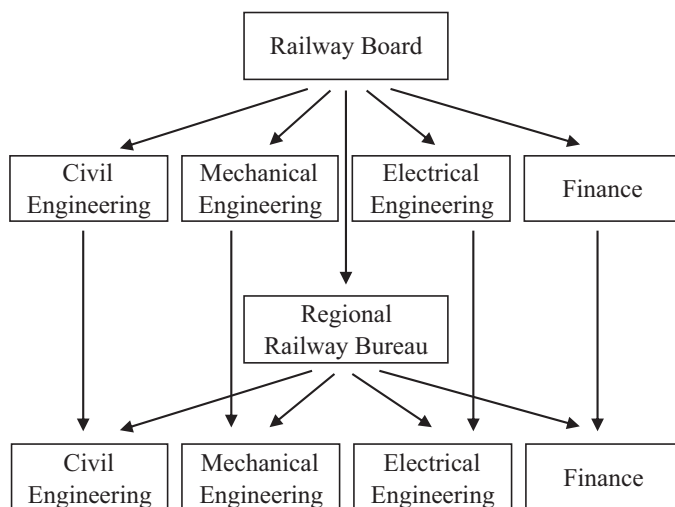
India's railway bureaucracy epitomizes the diffuse form of organizational structure, with many cross-cutting layers of authority. Even routine decisions and tasks often require buy-in from a wide range of departments, agencies, and individual officials up and down the bureaucratic hierarchy, each of whom can effectively block or delay action. This subsection outlines several of these cross-cutting authority structures that together lend India's railway bureaucracy its diffuse form.

The primary organization in India's railway bureaucracy is state-run Indian Railways, which operates India's national railway network under the auspices of the Ministry of Railways. The Railway Board in Delhi serves as the organization's bureaucratic leadership, working with India's politically appointed railway minister to oversee national railway policy and planning. Like the Chinese system, India's national railway network is divided into 18 geographical regions, each administered by one of Indian Railways' regional railway bureaus. Each regional bureau is led by a bureau chief who oversees departments specializing in train operations, maintenance, and construction projects within their section

6. Interview, former Chinese railway manager, September 18, 2017.

7. Interview, Chinese railway project manager, January 22, 2019.

FIGURE 4. Functional Divisions within India's Railway Bureaucracy



NOTE: For clarity, not all functional divisions are included in this figure.

of the network.<sup>8</sup> Regional railway bureaus in India are also further divided administratively into sub-bureaus and train stations.

In addition to this “vertical” geography-based hierarchy, India’s railway bureaucracy is organized “horizontally” across functional divisions, which include civil engineering, electrical engineering, and finance (Figure 4). Indian railway officials serve for the duration of their careers in one of these functional divisions, which originally stemmed from a need to ensure sufficient levels of technical expertise (Debroy et al. 2015). These functional divisions have been increasingly blamed for creating organizational “silos” and forming competing interest groups within the bureaucracy (90–92).<sup>9</sup> Indian railway officials tend to prioritize the interests of their functional division over the goals of their regional bureau for a simple reason: individual promotions and transfers are determined by superior officials within one’s functional division, not by one’s bureau chief.<sup>10</sup> Chinese railway officials, in contrast, are promoted based on the overall success of projects and can move

8. In the Indian system, regional railway bureaus are called zonal railways, and bureau chiefs are called general managers. For clarity, I have simplified country-specific nomenclature.

9. Interview, senior advisor to India’s prime minister, July 6, 2018.

10. Interview, Indian railway deputy manager, August 22, 2017.

relatively freely across different parts of the bureaucracy, as long as they have a background in engineering.<sup>11</sup>

Alongside these geography-based and functional structures, India's railway bureaucracy also follows an informal hierarchy of tenure-based seniority, per each official's recruitment year.<sup>12</sup> While seniority status retains some formal significance due to rules for promotion and retirement, its true importance lies in conditioning the interpersonal relations between railway officials in daily interactions. Indian railway officials are loath to challenge or confront their own subordinates when their subordinates have a longer service record in the bureaucracy.<sup>13</sup> Bureau chiefs occasionally find themselves in a position of authority over railway engineers with more years of service. This awkward dissonance between formal authority and informal seniority makes bureau chiefs reluctant to issue orders to some of their own engineers.<sup>14</sup> The Chinese railway bureaucracy, by comparison, maintains relatively unambiguous lines of authority, as will be discussed in more detail later.

Each of these authority structures—geographical, functional, and tenure-based—offers a rational means of organizing India's railway bureaucracy on its own. But layered together, they form a dense thicket of power relations that intersect and, in many cases, clash. Individual officials are frequently torn between competing obligations or stymied in their work by other railway officials with opposing professional goals. The next section shows how these differing state organizational structures affect the abilities of the Chinese and Indian railway bureaucracies to implement railway projects.

## 5. THE EFFECT OF ORGANIZATIONAL STRUCTURE ON STATE CAPACITY

### 5.1 Goal Alignment and Accountability

The Chinese and Indian railway bureaucracies both have vast arrays of organizational subunits, each with its own objectives and areas of expertise. Ensuring that the goals of these organizational subunits align with overall state objectives while tying outcomes to specific actors is essential for the successful completion of railway projects.

11. Interview, Chinese railway researcher, December 13, 2018.

12. Interview, former Indian railway manager, April 17, 2017.

13. Interview, former Indian Planning Commission official, July 4, 2018.

14. Interview, Indian railway chief engineer, April 14, 2017.



In China's case, the nodal structure of its railway bureaucracy helps align the goals of various officials and agencies with the overarching goal of completing railway projects. Ultimate responsibility for Chinese railway projects lies with a handful of key nodal actors who are able to weigh trade-offs between various project goals, such as increasing expenditures to accelerate construction work or decreasing expenditures to remain within budget. Moreover, these nodal actors are able to integrate work across disparate groups into a coherent project-wide effort. In the end, this nodal structure enhances accountability by clearly tying a project's overall success or failure to a limited number of sufficiently empowered key actors.

The Beijing-Shanghai High-Speed Railway Corporation is a good example of how the nodal structure helps with goal alignment. As the primary state organization responsible for implementing the Beijing-Shanghai high-speed railway project, the project corporation served as the principal nodal actor across local governments, state banks, and contractors (Beijing-Shanghai High-Speed Railway Corporation 2014). Each of these actors had its own goals: local governments wanted to minimize their own costs associated with the project; state banks wanted to ensure the timely repayment of loans; and contractors sought to keep their own operating costs low and construction delays to a minimum (*ibid.*). The project corporation played a central role in balancing these often-competing demands to achieve the overarching goals of the project.

China's nodal structure also strengthens accountability by placing ultimate responsibility for a project's success in the hands of a single actor: the project corporation. This plays an important role in the management of contractors, which may number in the dozens: bridge engineering contractors, tunneling firms, electrical signaling specialists, and so on. As several international experts with experience working on Indian railway projects explained to me, Indian Railways and its contractors often trade blame for construction delays.<sup>15</sup> Such blame-trading is not possible in Chinese railway projects because Chinese project corporations have the authority to select or remove contractors. Thus, even when a contractor is the direct cause of a delay or a safety problem, this is treated as a management failure on the part of the project corporation for choosing an unqualified contractor in the

15. Interviews, railway specialist at a multilateral lending institution, April 14, 2017; railway specialist at a multilateral lending institution, March 14, 2018.

first place.<sup>16</sup> For example, in the Shanghai-Kunming high-speed railway project, quality issues with a tunnel segment caused by several contractors resulted in harsh sanctions not only for the contractors but also for the project corporation itself, which was charged with “management failures” (China Railway Corporation 2017).

Chinese railway project corporations are linked directly to the success or failure of their projects through formal and informal means. Formally, each project is assessed by CRC along a set of standardized performance measures, including engineering quality, construction safety, adherence to project timelines, financial management, and adherence to environmental policies (China Railway Corporation 2015b). A project’s overall score, weighted across these metrics, is then used to determine the financial compensation and promotion prospects of every member of the project corporation. Quality and safety issues are weighted particularly heavily, and major problems (such as a train accident resulting from subpar construction) can result in the barring of entire project teams from railway work. Informally, members of project corporations are tied to their projects through their professional reputations. Members of successful project teams are actively recruited for new projects, often with higher positions.<sup>17</sup> For particularly challenging types of projects, such as ones involving tunneling through mountainous terrain in southwest China, entire teams from previously successful projects are sometimes requested.<sup>18</sup>

The diffuse structure of India’s railway bureaucracy, in contrast, generates conflicting interests across different parts of the bureaucracy and reduces accountability by dispersing responsibility across a wide array of actors. Without nodal actors to weigh trade-offs between project goals, different departments and individual officials unilaterally pursue their own organizational subgoals at the expense of the overall project. Furthermore, overlapping authority structures make it difficult to resolve conflicts between competing interests within the bureaucracy. With many actors able to block project work but few able to resolve disputes, accountability for project outcomes is weakened as blame for problems or delays is shared across many actors.

16. Interview, Chinese railway manager, December 22, 2018.

17. Interview, Chinese railway planning official, September 22, 2017.

18. Ibid.

This is most clearly seen in the conflict between Indian Railways' functional divisions. Railway infrastructure projects in India are carried out by regional railway bureaus, which in turn divide project work among their various functional departments. However, these functional departments have their own interests and goals. For example, civil engineering departments are evaluated on their ability to complete projects as quickly as possible, while finance departments are evaluated on their ability to keep project costs within budget.<sup>19</sup> These two goals are often in tension: meeting project deadlines may require greater spending on personnel and equipment, thereby risking going over budget. In a nodal structure, there would be a single nodal actor to whom both departments report that would settle such conflicts. In the Chinese case, this is the role of the project corporation and its head, the project manager.

The diffuse structure of India's railway bureaucracy, in contrast, provides no clear mechanisms for resolving conflicts between departments, frequently resulting in organizational gridlock and project delays. In theory, the regional bureau chief would be the logical "nodal actor" with the authority to manage such disputes. However, in practice, regional bureau chiefs are often powerless to intervene in interdepartmental disputes because their authority is undermined by the functional division system. Performance evaluations by superiors in the same functional division carry far more weight in promotion decisions than evaluations by regional bureau chiefs.<sup>20</sup> As a result, bureau chiefs lack the authority to stop their own finance officials from blocking budget requests from engineers. Because the entire railway bureaucracy is divided into functional divisions—even the Railway Board has seats allocated by functional division—there is almost no higher authority who can usefully mediate these disputes, except at the highest levels of the bureaucracy.

Indeed, some divisional conflicts within Indian Railways reach the highest levels of the organization. A well-known example is the long-standing tension between the electrical engineering division and the mechanical engineering division. The electrical engineering division has played the lead role in India's effort to convert existing railway lines from diesel to electric. However, this work was deliberately obstructed by mechanical engineers, who felt increasingly marginalized and lobbied against funding for

19. Interview, Indian railway finance official, August 22, 2017.

20. Interview, former Indian railway manager, July 11, 2018.

electrification projects.<sup>21</sup> The mechanical engineers ended their opposition after they were given a prestigious project of their own: India's first high-speed railway.<sup>22</sup> Electrical engineers then retaliated by delaying the launch of a new train model developed by the mechanical engineers (Das 2019). In the end, without a clear mechanism for aligning goals and resolving conflicts, India's railway projects suffer from frequent and persistent organizational disputes.

## 5.2 Coordination

Railway projects require a high degree of coordination across a wide array of actors. This includes coordination not only within the railway bureaucracy but also across ministries, departments, and agencies throughout the state more broadly.

In China, railway project corporations play a crucial role in coordinating project implementation across many state entities (Figure 3). Project corporations coordinate financing with state banks, land acquisition with local governments, and construction work with contractors (China Railway Corporation 2015a). They obtain permits and approvals in close cooperation with environmental agencies and local utilities (see e.g., China Railway Engineering Design and Consulting Group, 2016). For the Beijing-Shanghai high-speed railway, the main project corporation had to coordinate with a lengthy list of government bodies: the National Development and Reform Commission, Ministry of Science and Technology, Ministry of Public Security, Ministry of Finance, Banking Regulatory Commission, Ministry of Land Resources, Transportation Ministry, Ministry of Information Industry, State Grid Corporation, and more (Beijing-Shanghai High-Speed Railway Corporation 2014, 25).

Work across all these areas must be finely synchronized given their interdependency and the heavy financial cost of even minor project delays. For example, project corporations must ensure that bridge and tunnel construction by contractors is completed at the same time as land acquisition work performed by local governments.<sup>23</sup> This ensures that tracklaying, electrification, and signaling can be completed as a single step. If a project encounters

21. Interview, former Indian Railway Board member, August 11, 2018.

22. Ibid.

23. Interview, Chinese railway manager, December 22, 2018.

delays in land acquisition along one segment, the project corporation must quickly redirect contractors to continue work on a different segment.

CRC also plays a crucial coordinating role within the railway bureaucracy and across the Chinese state more broadly (Figure 2). Within the railway bureaucracy, CRC manages the allocation of resources and personnel across regional bureaus and railway project corporations.<sup>24</sup> While these organizations operate relatively autonomously, CRC occasionally intervenes to ensure that competing interests, such as the distribution of shared maintenance costs, do not undermine the overall functioning of the railway system.<sup>25</sup> CRC also plays a coordinating role in research and development. During the early years of China's high-speed rail program, China's then Ministry of Railways (CRC's predecessor) arranged partnerships between Chinese firms and foreign suppliers to facilitate the transfer of high-speed rail technology from industry leaders such as Siemens and Alstom (Gao, Li, and Zhen 2016; Wang 2012). The Ministry of Railways also worked with the Ministry of Science and Technology to establish specialized railway research centers at Chinese universities (Gao, Li, and Zhen 2016; *Xinhua News* 2008).

One of CRC's most important roles is coordinating railway project work with local governments. During the planning stage, CRC's managing director personally meets with the party secretary of each affected province to agree on future railway projects.<sup>26</sup> In face-to-face, closed-door meetings, the managing director and local government leaders negotiate project terms, including track alignment, station locations, and each province's financial contribution.<sup>27</sup> To monitor progress and resolve interagency conflicts, CRC often creates a project steering committee, known as a "leading small group" (*lingdao xiaozu*), from key stakeholders such as local government leaders and department heads. Once project work is underway, much of these coordinating responsibilities with local governments shifts to the railway project corporation. High-profile disputes do still emerge, such as a widely covered disagreement over land acquisition for the Wuhan-Guangzhou high-speed railway (*People's Daily* 2009). Yet overall, the nodal structure of China's railway bureaucracy reduces the risk of disruptive conflicts and facilitates the integration of project work across many parts of the Chinese state.

24. Interview, Chinese railway researcher, September 12, 2017.

25. Ibid.

26. Interview, Chinese railway researcher, September 18, 2017.

27. Ibid.

The diffuse structure of India's railway bureaucracy, in contrast, makes coordination across state actors difficult and prone to delays. This can be most clearly seen in the fragmented process for environmental approvals. In India, railway projects typically require environmental permits from numerous central, regional, state-level, and local environmental agencies, including the Ministry of Environment and Forests (Singh 2009). The diffuse structure of the bureaucracy prevents any single official or set of officials from being sufficiently empowered to convene or liaise directly with these various environmental agencies.<sup>28</sup> Instead, this work is delegated to lower-level railway bureaucrats, who must submit applications sequentially and wait months for each decision.<sup>29</sup>

This diffuse structure makes coordination difficult even among railway entities. Rather than meeting formally to coordinate project work, Indian railway officials often resort to ad hoc bargaining with their colleagues, offering favors or promises of future accommodations within their areas of discretion. In many cases, however, they lack any meaningful leverage and are reduced to "begging" their colleagues to cooperate.<sup>30</sup> In interviews, Indian railway officials frequently expressed frustration at being powerless to convince other railway officials to complete tasks critical to their jobs.<sup>31</sup> This lack of coordination slows project implementation, as vital steps are mired in lengthy negotiations or blocked entirely.

Examples of this bargaining and begging can be found throughout the Indian railway bureaucracy. Finance officials wield outsized influence through their power to approve or deny spending requests. Other railway officials, even bureau chiefs, are mindful of the power of the finance officials within their own bureaus and thus careful to maintain good working relationships.<sup>32</sup> But in interviews, many railway officials from other functional divisions expressed resentment over needing to personally beseech financial officials for approvals, which frequently caused project delays.<sup>33</sup> In some cases, this lack of coordination within the railway bureaucracy leads to problems with safety. In one incident in 2017, failure to coordinate a suspension of

28. Interview, Indian railway project manager, April 17, 2017.

29. Interview, Indian railway infrastructure director, April 21, 2017.

30. Interview, Indian railway chief engineer, April 14, 2017.

31. Interview, Indian railway manager, July 11, 2018.

32. Interview, former Indian railway manager, August 10, 2018.

33. Interview, Indian railway deputy chief engineer, August 22, 2017.

train operations with maintenance work caused a train derailment that resulted in 23 deaths (Hasan and Hizbullah 2017). In this case, as in many others, the diffuse organizational structure of Indian Railways kept parts of the bureaucracy separated, without any regular channels for feedback and communication.

### 5.3 Autonomy

Railway projects often require modifications and improvised problem-solving during the course of implementation. Sufficient autonomy among key actors allows faster and more flexible decision-making in response to unforeseen project challenges.

The nodal structure of China's railway bureaucracy provides significant autonomy for key actors at the middle levels of the bureaucracy. An industry-wide framework of rules and procedures formulated by CRC and China's National Railway Administration emphasizes standardized management practices and technical specifications that serve as implementation "blueprints" for railway projects. Within this general framework, nodal actors enjoy significant leeway in making project-level decisions, guided by these project "blueprints" and high-level goals rather than detailed rules and commands.<sup>34</sup>

This high level of autonomy applies to several sets of nodal actors in China's railway bureaucracy. Project corporations enjoy significant scope in project-level decisions, such as selecting and removing contractors, altering track alignment, or modifying budgets, all within a prescribed range.<sup>35</sup> In many cases, final authority rests with the individual project manager, which enables more responsive decision-making without a wait for higher-level approvals.<sup>36</sup> Besides conducting project evaluations and inspections, CRC rarely intervenes in day-to-day implementation work, leaving project corporations relatively free to problem-solve on their own.<sup>37</sup>

Chinese state-owned contractors also act as nodes that enjoy significant autonomy for their sections of projects. For example, civil engineering contractors are typically awarded construction work for sections of track ranging

34. Interview, former Chinese railway manager, September 18, 2017.

35. Interview, Chinese railway researcher, September 12, 2017.

36. *Ibid.*

37. Interview, Chinese railway project manager, January 22, 2019.

from 50 to several hundred kilometers in length. Each contractor has the freedom to complete its section however it deems fit, as long as overall specifications and timelines are met.<sup>38</sup> These contractors often further subdivide work across their own teams and act like project corporations “writ small.” Project corporations do closely monitor their contractors through specialized supervisory firms and a standardized performance evaluation system.<sup>39</sup> But in general, they refrain from meddling with the day-to-day work of their contractors, except in rare cases when an emergency intervention is deemed necessary.<sup>40</sup>

The diffuse structure of India’s railway bureaucracy, in contrast, creates many overlapping layers of detailed rules, even for trivial tasks, leaving railway officials little room for autonomous decision-making. This can be seen most clearly in the intricate sets of rules that govern India’s regional railway bureaus, known as the Schedule of Powers.<sup>41</sup> These rules, printed in volumes running hundreds of pages in length, delineate in exacting detail the legal scope of authority of each category of railway official for each task within the bureau.<sup>42</sup> Authority for routine spending decisions is tightly controlled, down to the level of individual food items and office supplies. For example, spending on catering equipment is capped at \$6,800 per year, and purchases of milk and eggs must not exceed \$1,300 per event (Ministry of Railways, India 2018, E26–29). Spending on rubber stamps and embossing seals is limited to \$14 per item (C7). Each of these spending limits is further segmented by officer grade.

Certain departments within India’s regional railway bureaus also have their own similarly exhaustive Schedule of Powers. One such schedule lays out itemized spending limits for flower vases, pen stands, and ink cartridges, differentiated by officer grade (Northeast Frontier Railway 2014, 53). Layered on top of these rules are a set of industry-wide General Rules from the Ministry of Railways that are also overly detailed and constraining. They even include *rules about rules*, such as rule 2.02(b), which specifies that all railway officials must be able to produce a copy of the General Rules when

38. Interview, Chinese railway researcher, March 29, 2018.

39. Interview, railway specialist at a multilateral lending institution, March 14, 2018.

40. Interview, Chinese railway accountant, December 20, 2018.

41. Interview, Indian railway chief engineer, April 20, 2017.

42. Examples in this paragraph are drawn from the Model Schedule of Powers published by India’s Railway Board (2018), which serves as the template for India’s regional railway bureaus.



ordered by a superior officer. Together, these many layers of detailed rules ultimately stem from, and further exacerbate, a climate of distrust and concern about corruption, which will be further discussed later.

As a result, Indian railway officials are often forced to either seek time-consuming approvals from higher authorities or follow these intricate rules and procedures, which not only causes delays but also compromises project quality. One railway official explained that he often felt compelled to “do the correct thing rather than the right thing,” rigidly adhering to bureaucratic rules rather than making decisions he knew would be more beneficial to the project.<sup>43</sup> When selecting contractors, officials stick to formal procurement rules that require contracts to be awarded to the lowest bidder even when the quality and value of other suppliers are known to be superior.<sup>44</sup> In land acquisition work, Indian railway officials follow a statutory formula for compensation rates even when they know it grossly underestimates land values—which often triggers protests and causes project delays.<sup>45</sup> Limited autonomy results not only in exasperated bureaucrats but also in difficulties with completing railway projects.

Before concluding this section, the issue of corruption must be addressed. More space for autonomous decision-making also means more room for the potential abuse of power. Corruption is known to be widespread in both the Chinese and Indian railway bureaucracies. In China, a large-scale corruption investigation and a major high-speed train accident in 2011 culminated in a lifetime prison sentence for then railway minister Liu Zhijun and the dissolution of the Ministry of Railways (Tjia 2016). In India, the railway sector consistently ranks near the top for number of corruption-related disciplinary actions, even after accounting for its size (Central Vigilance Commission, India 2018).

While both countries have institutions for combatting corruption in the railway sector, in India these institutions are frequently abused in ways that undermine the functioning of the bureaucracy. Corruption investigations in India’s railway bureaucracy are often “weaponized” to carry out personal vendettas among officials.<sup>46</sup> Anyone targeted by a corruption probe becomes “a passenger in his own position,” in the words of one interviewee, effectively

43. Interview, Indian railway project manager, April 21, 2017.

44. Interview, Indian railway construction engineer, April 14, 2017.

45. Interview, Indian railway infrastructure director, April 21, 2017.

46. Interview, former Indian railway manager, August 9, 2018.

sidelined for the duration of the investigation.<sup>47</sup> Other officials avoid working with that person for fear of becoming targets themselves. The “fear of being questioned” hangs like a sword of Damocles over every Indian railway official, producing a “chilling effect” that stifles risk-taking and reinforces rigid rule-following.<sup>48</sup>

China’s railway bureaucracy, in contrast, appears to be relatively effective despite widespread corruption, mirroring the paradox of high corruption and high performance found in China more generally (Ang 2020; Rothstein 2014; Wedeman 2012) as well as other parts of East Asia (Khan and Sundaram 2000; Wedeman 2002). The Chinese railway bureaucracy’s nodal structure may partially explain this puzzle in the railway sector. Clear lines of accountability, as described earlier, force actors in China’s railway system to ultimately deliver on concrete project results, even if there is some diversion of resources along the way. In addition, China’s anti-corruption institutions, such as the Central Commission for Discipline Inspection, seem more concerned with high-level graft and rarely interfere with day-to-day project work.<sup>49</sup> While a more precise discussion of the relationship between performance and corruption lies beyond the scope of this article, the cases of China’s and India’s railway bureaucracies suggest that organizational structure may play an instrumental mediating role.

## 6. CONCLUSIONS

This article has presented a new typology of state organizational structure—nodal versus diffuse forms—and has shown how these contrasting organizational forms affect the ability of states to carry out policy goals. I examined the specific mechanisms by which this occurs through a study of two paradigmatic empirical cases: the state railway bureaucracies of China and India. Using a side-by-side comparison, I showed how the nodal structure of China’s railway bureaucracy facilitates the completion of railway projects by providing mechanisms for coordination and accountability while the diffuse structure of India’s railway bureaucracy hinders railway work by making these same processes more difficult. These findings suggest that the organizational

47. Interview, former Indian railway manager, September 19, 2018.

48. Interview, Indian railway manager, August 22, 2017.

49. Interview, Chinese railway accountant, December 15, 2018.

structure of state bureaucracies plays an important yet under-studied role in shaping state capacity.

This article also sheds light on the important mediating role that bureaucratic organizations play in center–local state relations. State bureaucracies often span multiple levels of governance and serve as important sites of interaction between the central state and local governing institutions. As the Chinese and Indian cases show, the relationship between central and local state actors can vary dramatically in their bureaucratic configuration, ranging from a more top-down approach, as in Indian Railways, or a set of center–local joint ventures, as in China’s railway project corporations. Future work on center–local state relations would benefit from a closer examination of bureaucratic organizations as a key area of interface.

Several related questions must be raised. First, how do state organizational forms interact with the broader structure of the state? The Chinese state is “unitary” in structure: nearly all lower levels of government are appointed by the next-higher level in the state hierarchy, culminating in central party-state control in Beijing. This unitary state structure supports China’s nodal railway bureaucracy by providing instruments, such as personnel appointments, for ensuring cooperation by local governments and other state agencies. In contrast, the Indian state is a “federal” political system, where subnational governments are elected locally rather than appointed centrally. This exacerbates the problems of India’s diffuse railway bureaucracy by limiting channels for compelling cooperation by other state actors.

Second, where do state organizational forms come from, and how do they spread between and within countries? Scholarship on policy diffusion (e.g., Dolowitz and Marsh 2000) points to imitation and learning as one such set of processes, such as China and India’s imitation of the Soviet planned economy or late Tokugawa and Meiji Japan’s careful study of European institutions. Coercion is another, such as legacies of colonial rule. State organizational forms can also emerge through less directed processes, such as the gradual accumulation of many layers of political compromises (Mahoney and Thelen 2009).

Finally, state structure itself is endogenous to state capacity. The creation, adoption, or spread of new state organizational forms often encounters staunch resistance from existing stakeholders, and the Chinese and Indian railway bureaucracies are no exception. China’s former Ministry of Railways famously resisted reform efforts by Chinese Communist Party leaders for

years, until a major train accident and corruption investigation finally ousted the railway minister. While many of the structural problems of India's railway bureaucracy described in this article are widely recognized by the Indian railway officials I interviewed, efforts at organizational change face resistance at every level of the bureaucracy. Ultimately, a deeper form of state capacity—the ability of the state to change itself—requires further research.

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