

Note to readers: The World Bank contributors to this article (Lou Thompson, Railways Adviser, Hennie Deboeck, Task Manager, and Richard Spero, Transport Consultant) have been uniquely privileged to work with MOR over a number of years on issues of railway reform. This article was prepared as a background paper dealing with issues which have emerged during discussions with Chinese experts on the options available to restructure railway infrastructure and operating services in China. The article offers no simple or absolute solutions; instead, it offers some ideas about how to start the long and difficult process of reform.

“A journey of a thousand li must begin with a single step.”

RAILWAY REFORM IN CHINA: THE GREAT RAILWAY CHALLENGE

- MOR IN PERSPECTIVE.** The Ministry of Railways of China (MOR) is one of the world's two largest railway passenger carriers (measured by passenger-kilometers) and is second only to the entire US railway system in freight traffic (measured by ton-kilometers). MOR's labor force (3.3 million in total, about 1.5 million transport-related employees) is about twice that of India and is ten times larger than the US network. In physical productivity terms, the density of traffic over the MOR network (measured in ton-km and passenger-km per km of line) is about twice as high as the next highest railway system (India) and is nearly three times the density in the US, while the annual outputs per locomotive, per freight wagon and per passenger coach are among the highest in the world. In its historical role as the backbone of the transport network in a centrally planned economy, MOR is performing with distinction. (See [Tables 1 and 2](#)).
- THE TRANSITION TO MARKET.** MOR's strengths in the centrally planned economy (high physical efficiency, production focus, centralized planning and control) could become potential weaknesses in the socialist market system that is gathering strength in China. Railways in other formerly centrally planned countries are finding that major reforms in structure and objectives are crucial to finding a stable role in market-driven economic systems. In addition, though the effect may not be quite the same in China, railways in other formerly planned economies are facing dramatic changes in both the levels and types of railway traffic demanded of them (see [Figures 1,2,3 and 4](#)). MOR needs reform to face the future.
- The Government of China has been aware of the need for reform of all of its State Owned Enterprises (SOE's) and production ministries, of which MOR is one of the most important. A series of gradual reforms have been applied at MOR, and some changes have been made in MOR's organization and management. As China's move to market gathers speed, though, it is clear that the pace and the depth of railway reform will now need to be deepened and accelerated. To date, much of the reform discussion at MOR has been narrowly focused, looking at various pieces of the reform issues in isolation. Also, MOR has instituted a series of experiments which, though undoubtedly useful, have been sufficiently fragmented that it is difficult to draw broadly applicable conclusions. The next stages of reform will need a more integrated approach.
- MAJOR ISSUES IN FUTURE REFORM.** The upcoming stages in railway reform in China will need to address (over a period of time, of course) three broad issues:

a change in the Government/Railway relationship, with the railway becoming a commercially driven enterprise and the Government assuming the policy, regulatory and social responsibilities; **an evolution in enterprise organization** driven by the structure of China's transport markets and the Government's competition objectives; and, **a relocation of the boundary between the public sector (national/regional/local) and the private sector**, again in response to Government policies as to the appropriate roles for public and private entities in infrastructure planning, finance and management, and in the provision of operating services. Experience also shows that these issues need evolving, not fixed solutions. Railway reform takes time, and issues of transition can be as important as the final objectives. More important, transport markets, and the role of railways within them, are usually moving targets, generally with railways losing market share (see Figure 5) as their role changes.

5. Government/Railway relationship. In broad terms, experience suggests that MOR needs to be separated into a government function and an enterprise function. The **Government** oversees transport policy and the railway role within it. It supervises the safe operation of railway infrastructure and services, and regulates those aspects of the railway network that cannot be left to market forces to control (for example, infrastructure access charges, freight tariff limits and anti-competitive behavior). It is also a government responsibility to identify railway infrastructure and operating services which market forces will not provide (social passenger tariffs, light density rural freight and passenger services, services to strategic areas) and to provide adequate support for these services. The corresponding **enterprise** function is to respond efficiently to market forces and to provide whatever social services are required (and compensated) by government. In market economies, enterprises work best when given maximum pricing and operating flexibility, consistent with safe and efficient services and without abuse of market power.

6. There are **no** Ministries of Railways in market economies; instead railway policy, system planning, regulatory and support functions are the responsibility of traditional government agencies (usually ministries of transport, though other functions such as communications or environment are sometimes added). Transport operation and management responsibilities are transferred to enterprises having a corporate form with government exercising its role through its ownership of the shares of the enterprise: in many countries, the transport enterprises, including railways, are partly or wholly owned by private investors (See Figure 6).

7. Thus, part of today's MOR needs to become explicitly governmental, the other part explicitly market-driven. For various reasons, the transfer or creation of the governmental function may not have received the same degree of attention that the reform of the enterprise function has received. One of the clearest lessons of the reform experience in formerly planned economies has been that enterprise reform, by itself, is simply not enough: corresponding changes in governance (regulation, planning and oversight) are also vital. **The discussion below of enterprise reform assumes, and depends on, appropriate and timely formulation of the Government functions.**

8. Enterprise Restructuring and Competition. Enterprises that go to market must be organized in accordance with the market segments they face. To the greatest extent

consistent with social policies and objectives, markets function best when competition **in** the market (or competition **for** the market) is the basic determinant of enterprise behavior. Over time, these two principles – enterprise organization determined by market segments, and enterprise behavior driven by competitive forces – should be the basis for shaping the railway sector in China.

- (a) **Passenger market segments.** Data are not available on the geographic segments of railway passenger demand in China, but it is clear that the Chinese market contains both a long haul component and a series of shorter haul markets (<400 Km) between cities having more than one million population. The long haul component may correspond generally to the markets of the four or five large domestic air carriers while the 25 or so short haul air carriers may partly reflect the needs of the shorter haul railway market as well. In addition, rapidly growing bus carriage indicates the need (and the competition) for the shorter haul passenger services where railways currently have a stronger market niche . **If China already functions without a monolithic air or bus carrier, it is highly unlikely that it will continue to need a single, national railway passenger carrier.** Instead, railway passenger services might better be organized as a series of local companies along with several longer haul carriers with inter-regional or even national service areas (which appear to be primarily North-South in orientation). The average length of a passenger trip on China railways (over 360 km – see [Table 2](#)) is quite long relative to other railways, but it is not clear whether this is the result of many long trips in a large country, or is instead the result of the absence of large amounts of short haul suburban traffic common on most other railways (compare China with Indian Railways on [Table 2](#)).
- (b) **Freight market segments.** Only limited data have been provided on the structure of Chinese railway freight transport markets (see [Table 3](#)). The information available suggests that railway freight is highly concentrated in a few commodities (particularly coal moving generally West to East). Less than 10 percent of the railway freight tonnage appears to originate **and** terminate within a single Administration (that is, over 90 percent of tonnage crosses **at least one** Administration boundary) and the average length of freight movements (slightly over 800 km – see [Table 2](#)) is long. Without more detailed shipment data, it seems safe to conclude that the freight market structure may support a few special-purpose operators (containers, for example) as well as general carriers and that freight carrier(s) should be inter-regional or even national in scope. Reliance on the existing 14 Administrations as the basic units of freight carriage would clearly threaten China with fragmented freight service requiring many transactions (including-Administration boundary effects and revenue divisions) among shorter haul carriers. Experience elsewhere has shown that inter-carrier freight exchanges increase costs and significantly degrade service quality.

- (c) **Competitive forces in passenger services.** Competition from automobiles and buses in shorter haul markets, and from buses and air in the longer markets is already significant, and will only get stronger as China's highway and airport/airway system develops. If there were adequate oversight of the Chinese passenger transport needs (that is, an appropriate Ministry of Transport with responsibility for transport planning), national or interregional railway passenger transport carriers could be designed so that competition **in** the market can carry much of the control burden, with only limited regulation needed. In addition, with appropriate policies for support of social services (a Public Service Obligation, or PSO, system, as is now required in the European Union), competition among potential operators **for** the local service market could also be used to control costs and improve service.
- (d) **Competitive forces in freight services.** In principle, governments can choose whether to intervene in markets through regulation (or planning), or to rely on competitive forces to shape enterprise behavior. Competition is not a full substitute for regulation, particularly where market imperfections exist (especially degrees of monopoly position) and some form of market oversight is always required. This said, over the past two decades, the US and Canada, and more recently the European Union, have decided to reduce the amount of direct regulatory intervention by Governments, and to rely on enhanced competitive forces. The balance (which can evolve over time) between competition and intervention is a policy choice which China must make as its transport sector is reformed.

Depending on the measure used, China's railways today carry between 45 percent (of all ton-km including urban freight) and 70 percent (of all inter city ton-km excluding urban freight) of the surface freight traffic in China. Whatever the precise figure, this is a powerful position. It is clear that efforts to promote competition in China's surface freight market will have to consider development of **intra** modal (railway versus railway) competition as well as **inter** modal competition. Furthermore, available data suggest that railway versus railway competition will be most effective at the inter regional or even national level, and not at the local level (though some commodities, particularly coal, may require analysis of the potential for localized, railway-versus-railway competition). Equally important, given the dominant role of railways in China's freight market and the limited extent of the high quality highway system, it seems certain that significant and continuing regulation of pricing and anti-monopoly behavior will be required for a number of years: this is a critical point in designing the Government reform which must go hand-in-hand with enterprise reform.

- (e) **The boundary between public and private providers.** As recently as twelve years ago, reliance on the private sector to own and operate railways was confined to the US and Canada, and a few single-purpose railways (including smaller passenger railways in Europe and Japan).

Today, in all of the Americas only Amtrak, VIA and the Cuban Railway remain as totally government-owned, inter city railway operators: even the suburban passenger and Metro systems in Argentina and Brazil have been concessioned to the private sector for operation. Many railways in Africa have been concessioned and many more are in the process (see Table 4). Most of the Japanese system has now been privatized, as have the railways in the UK, New Zealand and parts of Australia. Sweden now has private operators competing with its publicly-owned national railway carrier – and many other EU railways are opening their systems to private operators. Even Indian Railways has a specialized carrier, Container Corporation of India, which has sold 30 percent of its shares to a private investor. By any reasonable measure, these efforts to involve the private sector have been successful in improving the quality and reducing the cost of railway services: in addition, more competitive railway services have forced trucks and buses to lower their tariffs and improve their services.

As with competition policy, reliance on private investors and operators is neither a panacea nor an end in itself, but neither should it be foreclosed just because railways are important in the transport sector. The Government of China has recently announced intensified plans to increase the role of the private sector in many areas of the economy. China railways have already begun to experiment with private involvement in the Guangshen Railway Corporation, for example. China also has increasing experience with regional and local investment in railways, including bond issues to support local investment. It may not be possible to decide at the outset what degree of private operation will be desirable, but it will be important to design a market-oriented system structure so that future private participation will be possible.

9. **OPTIONS AND DIRECTIONS FOR ENTERPRISE STRUCTURE.** Broadly speaking, the options come down to three issues: **geography** (local, regional or national), **markets** (markets and sub-markets of passenger and freight) and **functions** (infrastructure versus operations, for example). The potential options and combinations for Chinese railway structure are limitless, but several broad possibilities emerge from Chinese priorities plus experience elsewhere.

10. **“Integral” Models.** In the integral models, all operations are integrated with the infrastructure providers. There could be an **Administration-based integral model** in which all infrastructure and services are basically managed at the Administration (or even sub-Administration) level with traffic (and revenues) interchanged at Administration boundaries in accord with MOR oversight. For many purposes, this model represents MOR as it actually operates today (see Figure 7 -- Map showing the current Administration structure of MOR). There could be a **nationally-based integral model** in which the Chinese railway enterprise would become one, integrated national infrastructure and operating company. This company could follow a “line of business” (profit center) or “sector” organization in which there would be an accounting separation between passenger, freight and even infrastructure. This approach represented the “state of the art” in railway organization as of the mid 1980s in most countries (see, for

example, [Figure 8](#) which shows the BR organization before privatization), and it was the method recommended by the Bank as a way to start railway restructuring. China could examine the US model in which there are five (or so) integrated freight railways that compete with each other in some territories and on selected tracks while also having some exclusive territories and shippers. All of the railway concessions in Latin America and Africa are regionally-based integral models.

11. **“Predominant Enterprise” Models.** In these models, the predominant operating enterprise controls the infrastructure, and “secondary” operators are allowed access to the infrastructure for a fee. In principle, this could be applied either at the Administration level or at the national level. With China railways, freight is the predominant enterprise, so this would suggest formation of a series of “secondary” passenger companies (local and national level) which could operate over integral freight enterprises. Amtrak and VIA in the US and Canada are good examples of national passenger “secondary” operators operating over different (mostly) integral freight enterprises. The former Japanese National Railways are now organized into six regionally-based, integral passenger-predominant enterprises where JR freight is a national “secondary” freight operator. Where no type of enterprise is predominant (as in Europe), this model is not applicable. In the US and Canada, railway versus railway competition usually occurs as competition between parallel lines; but, both also use a variant of the integral, predominant enterprise model in which one freight carrier allows (or is required to permit) another freight carrier to operate over its tracks (this is called “trackage rights”). In fact, about 25 percent of the US trackage has some competition among freight operators on the same tracks, and well over 30 percent of the US track has multiple operators when Amtrak’s railway passenger service is taken into account ([see Figures 9 and 10](#)).

12. **“Separation” Models.** In these models, control over track and other fixed infrastructure is separated from operations with the various operators being granted access under controlled conditions and charged an access fee. Access can either be “open” in which any operator can operate in any market from anywhere to anywhere, or it can be limited through geographic or service franchises. The UK approach, for example, is “open” for freight, but is geographically delimited for the passenger franchises. In principle, the EU Order 91-440 describes an “open access” regime for certain types of freight and inter city passenger, but leaves high speed passenger and local passenger services under national or local control.

13. Separation models are not the traditional way to run a railway. Separation involves costs of developing and administering the access agreements among the users, and it can aggravate conflicts among users when capacity is limited. For example, in the case of a single-purpose railway hauling a single commodity from a mine to a port, separation of infrastructure would be pointless. Instead, separation is chosen for a number of possible reasons: a) to protect equal access to infrastructure when there are conflicting users; b) to foster competition in particular markets on the same tracks; c) to increase the clarity of the costs and benefits of particular services by improved separation of accounts and operations so that government can decide what it should, and should not, pay for; or, d) to begin to split up the railway monolith so that some operations can be shifted to the private sector while others remain in the public sector.

14. The two crucial issues in infrastructure separation are the access charges and the control over scheduling and dispatching of trains. The access charge regime (particularly the share of government versus user payment of infrastructure investment and operating costs, the fixed versus variable structure of access charges, and the reliance on cost-based versus demand-based access charges) will ultimately determine whether the infrastructure is used in the right way by the right operators. Worldwide experience to date suggests that access fees are complex and difficult to formulate, and often generate unexpected incentives for provider and users. Because infrastructure is usually a monopoly, government regulation of train path allocation and infrastructure access fees is usually a necessity. When infrastructure and operators are separated, scheduling and dispatching becomes the critical linkage between provider and operators: it is the single most important factor in ensuring smooth operation of the system as a whole. Continuing and centralized control over dispatching is probably the most critical determinant of the ability of governments to control the possible disruptions during the transitional phases of railway restructuring.

15. **Other “Separations.”** Although most attention has been focused on infrastructure separation, other forms of functional separation are also possible. In particular, for example, wagon or even locomotive ownership and maintenance can be separated from operations with highly beneficial results. In the US and Canada, all tank wagons and many coal wagons are owned and maintained separately, as are most container flat wagons, automobile carrying wagons and special purpose wagons. In total, about 46 percent of all freight wagons in the US railway system fleet are owned by non-railway parties. In the UK model, coach ownership was separated from the franchises in order that the operating passenger franchises could have periods short enough to permit strong and frequent government oversight (see Figure 11).

16. **Separation in China.** Infrastructure separation in China would likely occur either on an Administration or a national basis. So long as access is open, access charges are relatively uniform, infrastructure quality and safety rules are uniform across Administrations and scheduling and dispatching are centralized (at least for inter-Administration or inter-regional traffic), the Administration versus national decision on infrastructure organization will not affect railway operations. China has the further choice of keeping infrastructure as a government agency (in Sweden, the infrastructure provider, Banverket, is an agency like the highway agency while the operators are enterprises) or making both infrastructure and operators take enterprise form as in the UK or Germany. If infrastructure providers take the enterprise form, then public regulation of infrastructure access charges will be a necessity.

17. **HOW TO DECIDE – THE POLICY AND ANALYTICAL APPROACH.** Table 5 illustrates in a qualitative way how the options for China could be related to the possible objectives of reform. To some extent, there will always remain qualitative considerations because there are tradeoffs between political and economic objectives. This said, at least part of the debate over the existing proposals for reform continues because there has been no attempt to describe, or measure, the potential effects. Some of the important questions **can** be analyzed more closely.

18. **Benefits and costs of commercialization.** MOR's freight tariffs and passenger fares are mostly a result of central planning, in which no effort was made to relate tariffs or fares either to costs of service or to demand factors. Commercialization will eventually require two changes: railway service enterprises will (and should) ask to be allowed to raise charges for services that are provided below cost (or government should provide a PSO payment); railway freight tariffs will become more closely related to cost and demand factors, with lower tariffs on price sensitive commodities and services, and with somewhat higher tariffs on price-insensitive services and commodities. The principle of special prices for special services, and specific prices for new lines has already been recognized in China: under commercialization the approach will be applied to the entire freight system, with particular force wherever there is railway versus railway competition.

19. The effects of commercialization can be estimated using two approaches. First, the freight tariff structure in China can be compared with that of the US, where the demand and cost factors have been fully incorporated in railway freight pricing. US data are already available and some Chinese data are now available (see Figure 12): comparison of the two pricing structures shows the great difference between US and Chinese practice, especially when the freight construction surcharge is included (as it must be if the effect on shipper demand is to be considered). Making reasonable assumptions about the degree to which a market-driven Chinese freight tariff structure will change, it will be possible to estimate how Chinese freight tariffs, and total revenues and costs, might change. It is important to emphasize that this does not imply that Chinese railway freight tariffs in total are too high; instead, it would estimate the beneficial impact of "Ramsey" pricing which permits the infrastructure providers and railway operators to recover both their fixed and variable costs while at the same time maximizing net revenues and minimizing the total prices charged to operators and users.

20. Second, MOR has been developing "Point-to-Point" freight and passenger traffic costing models. These models will permit an analysis of all of MOR's traffic to identify traffic where tariffs and fares are below variable cost (and thus eligible for an increase in tariff, public support, or termination), along with an estimate of the impact of commercialization on MOR's, and the government's, performance. This is likely to lead to some increases in charges, and some termination of services: it will also encourage government to assess whether the railway is the most effective way to deliver socially needed transport services. This analysis will also help to identify services that might be able to bear an increase in charges without reducing traffic demand.

21. The basic source of Chinese data for these analyses is the traffic figures now becoming available from the Transport Management Information System (TMIS). TMIS can provide access to the files of all Chinese freight shipments including commodity, tonnage, origin and destination, wagon type, revenue, routing, etc. A simple "look-up" table, which may already exist from other analyses (discussed below), would provide distances for each passenger or freight movement. TMIS also can provide access to about 80 percent of passenger ticket data, which is large enough to permit accurate estimates of total passenger flows. As is done in the US (see Table 6), the Chinese data can be applied to the costing models to develop variable cost estimates of traffic types and commodity groups.

22. **The effects of enterprise structures.** There is no grand computer model that would automatically identify the optimum system of infrastructure and operating company organization. It is possible, though, to use models, versions of which already exist in China (though they may need updating and improvement to the particular purpose), to analyze the impact of various approaches to achieving agreed-upon objectives such as reduced inter-Administration transfer costs or enhanced competition due to separation options.
23. For example, TMIS-based freight traffic data, along with a system simulation and traffic routing model (from the Railway Investment Study – RIS -- and the Coal Transport Study – CTS -- models which MOR already has, and can modify if necessary) can be used to estimate the volumes and costs of shipment interchanges for any specified set of boundaries. Combined with methods for line flow visualization using line colors and/or widths to show flow levels (see [Figure 13](#) for an example of such a presentation), these models would permit localized passenger or freight markets to be identified and served appropriately while at the same time helping to design boundaries which minimize interchange losses. As an example, US railway experts have estimated that the cost of railroad to railroad interchanges is about \$100 per wagonload as a result of switching costs, wagon hire costs, and losses in shipment time and locomotive utilization. This does not include losses to shippers. In principle, the larger the service areas of regional carriers, the smaller these interchange costs can be made. With roughly 28 million wagonloads per year in China, and 90 percent of those wagons experiencing at least one interchange, wagon interchange costs in China are in the range of US\$3 billion (over Yuan 24 billion) per year – a significant share of the total costs of freight movement in China, and a cost to be minimized if possible.
24. Competition results in lower costs to users and better service. The models described above can also identify markets (national passenger or freight) having flows large enough to support intra-railway competition (see the multiple user US map discussed in Figures 9 and 10). Based on experience elsewhere, assumptions on the results of competition on service and tariffs can be applied to the competition created by various system structures, and the results compared with other potential systems. For example, enhanced competition in the US transport market resulting from deregulation of railways and trucking resulted in a reduction in railway tariffs (US\$/ton-km) of nearly 50 percent in real terms between 1980 and 1998 while at the same time making railway companies much more profitable because of market demand growth and efficiency improvements.
25. There is a concern in China that railway versus railway competition will either be impossible as a result of inadequate capacity, or that competition will somehow lead to “wasted” capacity. Both of these arguments can be tested as well. In doing so, however, a series of questions have to be raised. First, two operators could easily compete, even on a fully used line, simply by competing on the basis of price or quality of service and then dividing the available train paths on the basis of customer demand. Second, capacity is not immutable: if there is truly a market-based demand for more capacity under competitive operation, then this is the best possible signal that capacity on that line should be expanded (and not on some other line). Third, “capacity” is only definable against a particular set of conditions: throughput on coal lines, for example, can be

significantly increased when coal is washed before shipping, if higher axle loads are used along with more reliable and powerful locomotives, if higher capacity but lighter coal wagons are used, and if signaling or operating rules are changed, among other possibilities. Wagon “capacity” is limited because prices for wagon use and detention do not adequately reflect wagon costs, because shippers are not allowed to use wagons for short term storage or to reduce loading or unloading costs, and because some capital sources such as the construction surcharge, are not available for wagon finance. The wagon fleet could and would be expanded very quickly, from public and private sources, if these restrictions were modified. In fact, there is much about the existing system that is market **inefficient** because of a lack of competition, and properly structured competition is probably the best way of identifying and reducing these inefficiencies of operating costs and investment capital. The very best way to decide where and how to increase (or decrease) capacity is market demand based on appropriate pricing.

26. In estimating the effects of competitive structures, the best approach at this stage would be to evaluate a few broad approaches. The baselines should be the regional monopolies with their high transfer costs, and a national monopoly carrier with no competition either in or for markets. Against these the TMIS-based flow models could identify major markets where competition could be justified (as well as markets where competition probably is not supportable). Following the UK model (in China for freight as well as passenger), the flow data could establish a set of regional service enterprises (franchises) which service their entire territory as a single operator, but which could also compete over designated parts of adjoining enterprises using carefully defined trackage rights (see Figures 10 and 11 for the US system). Depending on how the service boundaries are drawn, and on the areas of competitive trackage rights, various amounts of competition can be provided and analyzed. For example, the earlier RIS studies (see China’s Railway Strategy, Report No. 10592-CHA, World Bank, February 25, 1993, MAP section, Map entitled “Total Freight Transport Demand Between Regions in 2000”) identified seven regional groupings: Northwest, Southwest, South, East Coast, Coal Base, Center and Northeast. The analysis could start with these groupings as a way of determining where competition would have an impact on freight flows and costs. Improved groupings and competitive areas would emerge from these analyses.

27. The analysis of regional structures and of effects of competitive possibilities is not simple. The best example is merger analysis in US railroads where systems maps are drawn, traffic flows are represented on these maps, areas of potential competition are identified, and outcomes are tested by trial and error (heuristics). The same can be done in China, but proper use of the analysis requires a great deal of interaction between analysts and decision-makers.

28. **Shifting the Public/Private boundaries for the operating companies.** There is now available considerable experience in the effects of allowing the private sector to provide rail infrastructure capacity and operate railway services, both in terms of reduced costs and improved services and in terms of dealing with the costs resulting from (for example) paying for labor redundancies. (See [Figure 14](#) showing productivity in Argentine, Brazilian and Bolivian railway concessions before and after concessioning, and [Figure 15](#) showing changes in railway productivity in the US after deregulation). The

primary question would be to decide which services would be candidates for private sector operation.

29. **Issues in Transition.** At one level, it is difficult to talk about how to manage transition until it is clear what MOR will transition **to**. Whatever structure is adopted, though, China will face almost unique threats in transition because the sensitivity of the Chinese economy to potential disruptions in railway service is much higher than in many other countries. In practice, controlling disruption will focus on control over train scheduling and dispatching: if these are carefully controlled (or at least supervised) by MOR or its successor government agency, most of the risks of transition can be managed. Another risk of transition will be the instability that could result from badly designed access charges or inappropriate control over operating slots. China should clearly experiment with access charges in a controlled setting (the Nanchang experiment could be highly useful if it is broadened to cover infrastructure charging and freight performance as discussed below). Another transitional risk will be possible disruptions due to traffic interchanges among regionally-based integral companies: this risk will be compounded if the methods of dividing revenues among the companies create conflicting or perverse incentives. Experience in the US has shown that poorly planned or implemented railway restructuring actions can impose high costs on the economy and on the railway industry.

30. **A transitional organization.** It is never easy to divide an organization into its components. Other countries have controlled the restructuring process by creating a supervisory body, or a holding company, which is charged with coordinating all of the parts while the new roles and responsibilities are being implemented. The holding company also permits identification and resolution of initial disputes (for example, distorted access charges) so that transition to more separated operations can be controlled and smoothed. The Deutsche Bahn (DB) holding company structure, or the Romanian holding company approach, are good examples of managing transitions safely. (See [Figures 16 and 17](#) showing the transitional structures of Deutsche Bahn and the Romanian State Railway). The holding company approach appears to hold considerable promise for China's restructuring process.

31. **THE ROLE OF THE REFORM COMPONENT OF NATIONAL RAILWAYS I AND THE TECHNICAL ASSISTANCE COMPONENT OF RAILWAY VI AND VII LOANS.** MOR has decided to experiment with separating passenger companies (with the predominant freight services initially remaining integral with infrastructure) in four "minor" Administrations (Nanchang, Hohhot, Liuzhou and Kunming). Two additional Administrations, Shanghai and Jinan were added to the list of experimental areas. In the light of the options discussed above, the Nanchang experiment should be extended to include at least a "pro forma" indication of the effects in Nanchang (and Shanghai if possible) of an accounting identification of infrastructure costs and freight operations. In fact, it will not actually be possible to have a passenger company without allocating the costs for infrastructure use, and allocating some infrastructure costs to passengers will automatically determine the allocation of freight infrastructure costs as well (whatever passenger services do not pay, freight services will have to cover). Given the interaction between passenger and freight, it would be best to look at both when deciding on access charges. And logically, after separating passenger companies and

infrastructure costs, the results of freight operations are the remainder. Unfortunately, unless a broad view of all of the cost allocations is taken, erroneous conclusions may well be drawn as to the relative profitability of the various services: it is critical that they be formulated simultaneously, even if (at the outset) only the passenger companies are **separated**. MOR is considering a second stage in which infrastructure and freight separations are attempted and that work will be much better planned if the Nanchang and Shanghai experiments are used to yield maximum information.

32. The analytical work described above suggests a much broader effort than that contemplated under the Nanchang and Shanghai experiments. MOR should review the opportunities for use of available funding which might otherwise be canceled, or possibilities to obtain outside grant funding to support these analyses. Given that the issues involve the performance of one of the largest sectors of the Chinese economy, the ability of minor amounts of analytical effort to support reform is very high and the payback potentially enormous.

33. In addition, as reform planning proceeds, MOR may wish to explore the creation of an advisory group similar to the one identified for the Bank-funded CETE studies. This would be a small group of experts who could comment on plans and on experience as it emerges.

SELECTED REFERENCES

Wu, Jian Hong and Chris Nash, "Railway Reform in China", Institute for Transport Studies, University of Leeds, Working Paper 524, March, 1998

Watanatada, Thawat, Peter Cook and Louis S. Thompson, "China's Railway Strategy", Report No. 10592-CHA, World Bank, February 25, 1993

Thompson, Louis S, "Infrastructure Separation: What Are We Learning?", Railway Business International, January, 1998.

Winner, John H., "Future Structure of the North American Rail Industry," Prepared for US DOT, Office of the Secretary, Federal Railroad Administration, Washington, DC, June, 1998. JHWinner, Inc, Potomac, MD.