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Introduction

The world economy has changed rapidly in the later decades of the 20th Century. Continuing economic growth (with a few fall-backs along the way) has led to higher incomes, which has in turn led to shifts in all economies toward higher-value products and to an emphasis on services rather than production of goods. A significant part of this growing economic wealth has been invested in improved transport infrastructure, especially highways and airways. This investment, combined with secular economic changes, has caused transport modal shares to shift toward the modes (autos, trucks and airlines) that offer higher quality of service and more responsiveness to shipper needs. Though the impact of this pattern varies from country to country, it has occurred in every country and has had a worldwide impact.

Again in broad terms, there have been parallel shifts in political philosophy concerning the roles of open markets as opposed to command-and-control management and in the responsibility and role of the private sector as compared with the public sector. Countries vary, of course, in their position on the market/planning and private/public spectrum; but, the role of markets has generally increased, as has the role of the private sector. Most of the world's major economies are now more liberal and commercially-driven than they were several decades ago. Concepts and methods of regulation have had to change accordingly, albeit with lags because the political process, which determines regulation, adjusts more slowly than economic change.

Economies drive the demand for transportation, both in total and in modal share. Economic growth is based on an increased supply of transport overall, but the composition of that supply changes, assuming the infrastructure permits. Other things being equal, economic growth has led to more demand for air and highway (autos and buses) for passenger transport and to more freight demand for trucking and even air as compared to rail.

As a result, the world's railways were forced to undergo a dramatic series of adjustments during the last two or three decades of the 20th Century and the opening decade of the 21st. Nearly every country experienced its own version of what the World Bank called "The Railways Problem."[1] As a result of years of mis-regulation and political interference, railways were unable (and usually unwilling) to adjust to economic and political change. They could not respond to changing market forces, and generally lacked any commercial motivation. One result was that most had become financially and physically decrepit. Although railways were still seen as somehow "essential" to the economy, neither the exact role they should play nor the cost of having them play that role were clear.

The "role of the railway" is still changing. On the passenger side, High Speed Rail (speeds greater than about 250 km/hr) is receiving increasing attention as a way to shift passengers from air to rail, reducing energy consumption and noise: at the same time, many countries are investing in suburban railways in order to reduce road congestion. On the freight side, railways are no longer seen as a panacea for transportation needs, potentially ubiquitous in location and commodity. Instead, freight railway operators are increasingly focusing on their inherent economic advantage – longer distance transport of high volume flows, both of low value commodities (such as coal, iron ore and agricultural goods) and of containerized commodities that have concentrated flows. Regulation has adapted accordingly.

The current global economic crisis has had a dramatic impact on transport. Transport volumes have fallen, both for passengers and freight. Railways have been significantly affected, both by the slowdown in industrial production and the fall-off in international shipping. To an extent, this traffic will return when the world economy recovers. In the short term, the slowdown will take some of the stress off transport capacity that had become stretched by rapid growth, furnishing a breathing period for transport planners and regulators to assess the impact of emerging techniques such as congestion pricing as well as to develop a better approach for future capacity needs. It is also possible that the "myth of perpetual growth"

1. World Bank (1982)

will have been somewhat devalued and that planners and regulators will view transport capacity, and the regulation of its users, with a fresh eye.

"Regulation" in this paper will mean the analysis and intervention in tariffs, market entry and service provision by an entity separate from a service provider: that is, economic regulation. Regulation of safety practices and health in the workplace is an entirely separate issues that will not be addressed though, of course, it is an essential responsibility of government.

The World's Major Railways

Almost all of the countries of the world have railways – approximately 101 by the World Bank's count. As Figure 1 shows, however, the actual freight traffic flows are highly concentrated. This study will focus on the major railways or railway groupings – China, Russia, India, Brazil, the European Union (E.U.) and North America. Figure 1 shows that these railways carry approximately 89% of the entire world railway freight traffic (measured in ton-km).

Although this study will focus on rail freight, it is significant for the overall railway picture to look briefly at the rail passenger picture as shown in Figure 2. As with freight, passenger traffic is also concentrated, with the major railways in the sample carrying about 76% of the world's passenger traffic (measured in passenger-km). Many of the major freight carriers are also major passenger carriers, but there are some differences. Japan carries a relatively small volume of freight traffic but has huge passenger numbers: Japan is not included in this analysis because of the small role of freight in the national railway. North America and Brazil carry large volumes of freight, but are insignificant in total passenger flows.

The balance between freight and passenger traffic also varies greatly among the major railways as Table 1 shows. The freight/passenger mix can have an impact on the role of the railway and the way it is regulated. Freight dominant railways tend to be organized on the needs of freight shippers, with passenger operators (and passenger service frequency and reliability) taking a secondary role. Passenger dominant railways, by contrast, tend to be operated for the benefit of passenger services, with freight capacity and service quality suffering accordingly. Issues of market power and thus regulatory intervention in tariffs and entry tend to be much more relevant for freight dominant railways than in passenger dominant railways as a result.

Before focusing on the six major systems, it is only fair to acknowledge that some very large railways are being left out. In particular, the railways of Ukraine, Kazakhstan and Belarus carry more freight ton-km than most E.U. railways, as do the railways of Australia and the Republic of South Africa. The six large Japanese passenger railways together carry more passengers than any other railway system, though they are ranked 4th in passenger-km.

A Railway Typology

As suggested above, there are great differences among the world's railway networks and, as a result, there are significant differences in approaches to management and regulation. It will be useful to look at a number of dimensions in which railways differ. Table 2 summarizes these dimensions.

Market Versus Planning

Perhaps the most striking distinction among railways has been the degree to which they operate in a planned economy. Planned economies characteristically produced vast quantities of industrial goods that were best suited for rail transport.[2] This emphasis was compounded by an incomplete understanding of

[2]. See ECMT 2002 for a discussion of the characteristics of planned economy railways.

logistics, as opposed to just transport, costs, which magnified the apparent cost advantage of rail. Finally, the use of railways was easier for planners to control, reinforcing the choice of rail as opposed to truck transport. The result was that, when Former Soviet and Eastern European planning systems collapsed, their railways collapsed along with them. Table 3 compares the freight performance of China, Russia, the former CEE countries, the EU15 (the Western EU countries), and the North American railways in 1980, 1988 (the peak year of the FSU), 1995 (nearly the bottom year for the formerly socialist countries), 2000 and 2007. Clearly railways have a different role in market than in planned economies, and regulation would need adjusting accordingly.

Private versus Public Roles

Railways have varied widely in the relative roles of the public and private sectors, as Table 2 shows. Freight railways in the U.S. have largely been private[3]: that is, they are owned by shareholders and are listed on the major stock exchanges. Canada long had one private railway (Canadian Pacific, or CP) and one public (Canadian National, or CN). In 1996, the Government-owned shares in CN were sold to the public and CN is now wholly private. The typical approach outside of North America has been public ownership, but this began to change in the early 1990s. Since then, most Latin American railways (including Argentina, Brazil and Mexico) have been transferred to private concession management. Some private freight carriers are emerging in the E.U. (faster in the formerly CEE countries than in the West) and the U.K. freight carriers are now wholly private.[4] India and China continue public ownership whereas Russia is permitting private investment in certain areas such as rolling stock. The concept of regulation poses a dilemma when the railway is publically owned and controlled for several reasons: if the railway is controlled by public policy makers, presumably it would not be allowed to exercise any market power it might have. A regulator would face a conflict of interest since the railway budget and the government budget are intertwined.

Passenger versus Freight Orientation

The world's railways vary greatly in the degree to which they are freight carriers as opposed to freight carriers. Table 1 showed the freight traffic shares for a number of railways in three years: 1980, 1988 and 2007. Over 99 percent of the intercity traffic in Canada and the U.S. is freight. By comparison, Russian rail traffic is about 92 percent freight, while China is about 76 percent freight (and falling slowly). Significantly, the former Central and Eastern European countries (EU 10 CEE) that are now members of the E.U. are freight dominant (76 percent) whereas the E.U. 15 countries are passenger dominant (43 percent freight, and falling). India is also passenger dominant (41 percent freight, and falling).

Regulation of passenger services raises distinctly different issues from freight, partly because the markets are entirely different and partly because passenger services are almost uniformly supported from public funds whereas freight services are normally expected to operate without support. In most cases, the agency supplying the support functions as the "regulator" in the sense that the tutelary agency sets tariffs, specifies services and thus costs, and pays the support. By contrast, freight services are allowed some flexibility to respond to market conditions even when, in some cases, that might generate market power.

3. The U.S. railways were briefly nationalized during World War I, and were centrally "coordinated" during World War II. During the reorganization of the Northeastern railway system, six railways, including the Penn Central, were nationalized and the re-privatized.

4. The recent purchase by Deutsche Bahn of the previously private English, Welch and Scottish Railway raises an interesting question. Since DB is wholly Government owned, this can hardly be called privatization: at the same time, since the U.K. Government is not the purchaser, it does not seem to be re-nationalized, either.

Railway Role in the Overall Freight Transport Market

The share that the railway has in the freight market is also an important indicator that is linked to regulation. If the rail share of the freight market as compared with trucking (for example) is small, then the potential ability of the railways to acquire or exercise market power is likely to be small as well. A railway with a large share of the overall freight market is much more likely to possess at least some market power and thus to be a potential candidate for regulation.

By this measurement, the railway freight market shares (share of rail ton-km as a percent of total ton-km share of rail ton-km as a percent of rail ton-km plus trucking ton-km), potential market power varies widely as shown in Table 2. North American railways argue that, even at 44.8 percent of the total freight market and 57 percent of the rail/truck market, they have little actual market power, an argument that would apply even more strongly to Brazil and the EU railways.

Organizational Structure – Ministry, SOE, Corporate

In broad terms, railways are organized as Ministries, State Owned Enterprises (SOEs) and as independent corporations (though some or all of the equity may be owned by the state). There are only two remaining major railways that are still Ministries – China and India (though both countries have smaller railways that are either SOEs or are owned partly or wholly by local governments). The concessioned railways in Latin America and the franchised railways in the UK (and elsewhere in the E.U) are corporations under private management, as are the North American railways. Most of the railways in the E.U. and in Russia are SOEs.

Vertical Versus Horizontal Integration

Traditionally, railways have been vertically integrated: that is, the infrastructure and all operations were owned and controlled by a single entity. Gradually this approach was relaxed, for example by the creation of Amtrak in the U.S., and VIA in Canada. These two entities (State-owned corporations) are managed separately and pay for their access to the right of way of the private freight railways. More complete vertical separations appeared in the E.U., beginning in 1991 with Commission Directive 91/440 that required E.U. railways to prepare separate accounting for infrastructure from operations. The Commission has expanded the concept of vertical separation in the intervening years to the point that all E.U. railways now separate infrastructure from their operators, and offer access to competing operators, including private operators, in the freight market. By comparison, the North American railways, along with those of India and China, remain essentially vertically integrated.

Horizontal separation applies to the separation of various types of operations – freight from passenger, intercity passengers from suburban passengers, High Speed Rail services from conventional services. Creation of Amtrak and VIA immediately separated passenger services from freight in North America, as did the creation of separate passenger and freight concessions in Latin America. Franchising in the U.K., along with sale of the freight operations accomplished the same in the U.K. By comparison, India and China remain horizontally integrated. Few E.U. railways are horizontally separated, though some (Germany) have a holding company for the various operators.

The issues and approaches to regulation are directly affected by vertical and horizontal separation. For example, with vertical separation and open access, there is no clear reason why rail freight should be regulated in any way significantly differently from trucking and water, especially where the rail market share is small. The E.U. approach reflects this. By comparison, in Russia, with the railway (RZD) enjoying over a 59 percent market share for freight (91 percent vis-à-vis highway alone), some degree of tariff regulation is unavoidable.

LOB Models and Commercial Objectives

Horizontal separation implies some degree of actual institutional distance, and has the advantage that revenues and costs inherently reflect the performance of the separated entities. Where that is not desired, it is still possible to achieve some of the virtues of separation through creation of a Lines of Business (LOB) management model. In this approach, an integrated management creates internal profit centers through various types of revenue and cost allocation in order to create the possibility of assigning commercial objectives for more than just the overall conglomerate. While LOB management must rely on cost allocations that are inherently debatable (especially by governments being asked to pay support based on the allocations of common costs), it at least creates the possibility of creating incentives below the top of the organization to increase revenues and minimize costs though service design, pricing and improvements in efficiency.

Private railways are inherently commercial, and profit centers supported in some areas, with cost centers are the only way for management to control the organization. Thus, the North American railways and the Latin American railways (and the U.K. franchises) are managed by LOB. China Railways and Indian Railways have no lines of business. Adoption of LOB management in E.U. railways is mixed. Some railways, such as DB, appear to have several lines of business and reflect them in their public reporting. Other railways are reported to have lines of business but choose not to reveal the results although it is not clear why. Most appear to be continuing to manage their railway without internal profit centers for their operators.

Regulation is obviously dependent on at least having lines of business because, without accurate reporting of revenues by activity, and with costs by activity unclear, there is no basis on which to make regulatory decisions. This will be a particular problem for the E.U. because the Commission has in effect mandated accounting separation of infrastructure and has required that public support be restricted to social services such as suburban transport. This cannot be accomplished without access to appropriate information by each line of business, but such information does not yet exist in the public domain for all E.U. railways.[5]

The Major Railways: Trends and Issues in Development and Regulation

Ministry of Railways of China (MOR) *– the last unreformed socialist railway survives in a dynamic economy.*

The Ministry of Railways of China, sometimes called China Railways, has been the most dynamic freight railway in the world over the past three decades, as Table 3 shows. Starting from a relatively small base in 1950, MOR has become the world's second largest freight railway system (ton-km) and is the world's largest passenger railway system (passenger-km).[6] This reflects the facts that the Chinese economy has made the transition to a "market" economy with less disruption than the Former Soviet Union (FSU) countries and the former socialist CEE countries, and the fact that the Chinese highway system, though growing rapidly, has not yet been fully developed. The extremely rapid growth of the economy has ensured continuing demand for basic commodities, such as coal and steel, which support the railway system. In addition, increasing wealth in China has put extreme pressure on passenger demand that, given China's immense population and lack of highway capacity and shortage of automobile ownership, has meant that rail passenger traffic has also grown quickly.

5. See, for example, Thompson 2007 for a discussion of the issues of LOB structure and information required for regulation of railways with lines of business.

6. China has essentially no commuter and suburban railway traffic. As a result it is not the largest passenger carrier measured by passengers: Japan, the EU15, India and Russia all carry more passengers.

The net result of these trends is that MOR now has far the highest traffic density (passenger-km and ton-km per km of line), as Table 1 shows.[7] This capacity stress is aggravated by the fact that the coexistence of relatively fast passenger trains and slow freight trains further strains reliable operations. So far, MOR has viewed the primary challenge as simply being one of capacity.

The response has been audacious, one of the largest public investment programs in the world, certainly the largest railway investment program. MOR has planned to invest over US$ 200 billion by 2020 to essentially double the length of the system, from about 63 000 km[8] to over 120 000 km; to increase the amount of double-tracked line from about 35 percent to 50 percent; and to increase electric traction from 33 percent to 50 percent. Within these totals, MOR plans to construct or improve about 18 000 km of line to permit operation of passenger trains at 200 km/hr or above, and will construct at least two new lines – Beijing to Shanghai and Beijing to Hong Kong for speeds at or above 350 km/hr. Also notable is the fact that the construction of new passenger lines is intended to get passenger traffic off currently congested freight lines, thus benefiting both services. The program has been approved by the Chinese Government, but no specific funding source has been identified. A mix of railway earnings, public support at the national and regional level, international banks and, possibly, private sources will be required. At the current rate of spending, the US$ 200 billion estimate may actually be too low. If this program is completed, it will put China in the forefront of all areas of rail operations and technology.

The emphasis on investment and technology, badly needed though it is, may obscure the underlying tension between the dynamism of the economy and MOR's lack of policy or structural adaptation. In all the essentials, MOR remains a monolith driven by a production objective with very little adjustment to the demands that rising competition and market needs will generate. It resists change and is, in fact, one of the last of the unreconstructed socialist organizations.

MOR and the Government have from time to time considered corporatization of MOR with the social functions being transferred to other government agencies and the ministerial functions (policy development and planning) remaining in government (perhaps with formation of a Ministry of Transport). Some form of corporatization has been accepted, in principle, by all, but implementation has been delayed. Other possibilities, such as horizontal or vertical separation (or both), and various forms of LOB organization, at least for specific businesses, have also been discussed but without action so far except for the formation of a container handling company, a special cargo company (hazardous cargos) and an express company.

The primary argument against reform has been simple and, so far, compelling: the country is so dependent on MOR that anything that threatens disruption, either in the short run or the long run, is not acceptable. MOR has resisted private investment for much the same reason: with traffic density and rolling stock utilization already at nearly unsustainable levels, the usage restrictions that might pertain to separately owned wagons or locomotives might be unacceptable.

The key regulatory issue for China is directly linked to the lack of reform. So long as the railway remains a complete monolith, with no significant horizontal or vertical separation, with no line of business information to define costs by type of service, and no diversity in ownership of assets, there is no basis for regulation of tariffs or services. Commercial management is difficult or even impossible.

Government does require MOR to publish its tariffs, and government does control the tariffs for various stated reasons (limiting inflation, providing service to remote regions), but the freight tariff structure in particular has relatively little variation by commodity or service. Without accurate cost

7. The use of ton-tm and passenger-km to measure throughput and density is a typical measure, but it probably exaggerates the difference between freight intensive railways and passenger intensive railways. Other measures, such as train-km/km of line shrink the apparent disparity significantly.
8. Though MOR has 63 000 km of line, there are another 9 500 km of joint-venture lines and 4 812 km of locally owned lines.

information, Government has no basis for deciding which tariffs might reflect an abuse of market position. Moreover, MOR has little or no ability to construct its tariffs for maximum efficiency, nor can it respond effectively to competition as it arises.

Russian Railways – *an enormous reform program is underway.*

Prior to the dissolution of the FSU, the Soviet Railway (then called MPS), was the largest (ton-km) and most intensively operated freight railway in the world. At the peak of the Soviet railway activity, which appears to have occurred in 1988, the Soviet Rail system included not only Russia, but also Kazakhstan, Uzbekistan, and Belarus, among others. Closely integrated into this system were also the Baltic railways (Estonia, Latvia and Lithuania). Then, in 1990, the FSU collapsed and each of its constituent countries embarked on a transition to a market economy.

The effect of the transition on the railways was catastrophic, as Figure 3 shows. By 1998, traffic on the Russian part of the former Soviet Railway was only 39% of the level in 1988 (the Baltics and the CEE railways experienced a similar collapse, as will be discussed below). Although the railway slowly began to recover after the financial crisis of 1998, the monolithic organization of the railway gradually fell out of line with the increasingly market-driven Russian economy.

After studies during 1999 to 2002, the railway announced a broad reform program, to take place over a period of years.[9] Though the program is complex, the principles are based on a number of elements, based both on European and North American experience:

- Dividing MPS into two pieces: a railway enterprise, organized as an open joint stock holding company (OAO RZD); and, a policy and oversight function, shared among the Ministry of Transport, the Ministry of Economy and two governmental Federal Agencies: Antimonopoly Agency and Tariff Regulation Service.

- Institutional separation of infrastructure, freight, long haul passenger, suburban passenger and ancillary social and commercial activities (to be divested) initially under the control of the Holding Company OAO RZD.

- Opening infrastructure for access by competitors, but keeping a national freight operator (100% owned by the State) under common ownership with infrastructure, providing a degree of integration that was needed given the intensity and importance of Russian rail freight.

- Institutional separation for certain specialized freight operations (international transit, intermodal and refrigerated operations).

- Encouraging development of new, private operators in competition with the main freight operator.

- Promoting private investment in freight wagons and locomotives, though the infrastructure owner is expected to own most locomotives for the initial period in order to reduce the investment required of new operators.

- Leaving for later decision the possibility for creating a set of competing, vertically integrated freight operators.

9. See Belova 2005, ECMT 2002, ECMT 2004 and Thompson 2007a for detailed discussions of the Russian railway reform process.

- Revising the freight tariff system – a legacy of the planned economy – to begin to reflect the new competitive realities and to foster the initial entry of new operators.

- Working with Governments at the national and local levels to develop explicit PSO contracts for support of the social requirements of intercity and suburban passenger transport.

- Upgrading the accounting information to full IAS compatibility.

Implementation has taken place in three phases:

- A preparatory phase (2001-2002) to identify and construct the basic legal framework for the reforms. This phase has been completed.

- A second phase (2003-2005) to implement the institutional separation and complete the legal setup for reform, including creation of the required open joint stock companies (with access to the capital markets) and spinning off the initial set of ancillary activities. In addition, the expectation was that an initial round of private investment would be triggered in freight wagons and, possibly, in competing freight operators. The arrangements for Government PSO support for socially driven passenger services were to be developed. This phase is mostly complete: private investment in wagon fleets has been significant (now over 30 percent of wagons are separately owned), and competing "operators" have emerged. The Government has acknowledged the need to compensate RZD for social discounts granted to passengers, but the assured mechanism is not yet in place: compensation for other passenger activities, such as suburban services, is not yet instituted.

- A Third Phase (2006-2010) in which the passenger services would be fully separated and supported by PSO arrangements. Significant private investment in the freight wagon and locomotive fleet has been encouraged, as would access to the private capital markets by OAO RZD. Progress in this phase has been significant. OAO RZD has borrowed repeatedly on the international markets, and has a credit rating equal to that of the Government. A new, national passenger company (wholly owned by RZD, but broadly similar to Amtrak and VIA) has been created and is taking over the passenger services. As Figure 2 showed, the Russian passenger services in total are the fifth largest in the world (after China, India, the EU 15 and Japan), and are larger than France and Germany combined. Passenger and freight tariffs have been reformulated and published.

Overall, given the enormous size of the effort and the high stakes for the country of successful reform without significant disruption (because the freight role of RZD is by a significant margin the highest of any of the major railways), the reform program has made considerable progress.

The overarching regulatory issue is the future role of **intra**-modal competition in the Russian rail freight transport sector. Given the extremely high share of surface traffic carried by RZD, it is clear that two possible choices are available to constrain market power – either foster more competition or institute effective regulation of tariffs and competitive behavior.

The avenues to more intra-modal competition are to increase competition on the existing tracks (the European Model), or to create competing, integrated rail freight companies (the North American Model). Although the creation of competing, integrated rail freight companies was explicitly considered in the initial planning and remains under discussion in the Transport and Anti-Monopoly agencies, it has so far not been accepted because of opposition from RZD.

The option of competition on the same tracks has taken an approach unique to Russia, at least so far. In Russian practice, a distinction has been made between "Operators" and "Carriers." An operator is a

company that owns wagons and possibly locomotives and that organizes freight with shippers (sometimes the shipper owns the operator) and then contracts with a carrier to move the traffic on RZD's tracks. By contrast, a carrier would be a company that owns rolling stock, hires crews, pays a fee to RZD for track access, and accepts liability responsibility for the cargo. Thus far, though there are a number of operators and private owners of rolling stock, there is only one carrier, the RZD freight company. Moreover, RZD has argued that, in order to prevent "cherry-picking," all carriers should have the same nationwide, common carrier obligation that RZD has. Thus, the competitive option that was created in principle by the infrastructure separation has not been fully realized in practice.

It is not clear how effective competition among operators will be in improving the efficiency and lowering the tariffs charged by Russian operators and the RZD carrier. Given the degree of potential market power that exists, the regulator is unlikely to be able to depend on competitive forces alone.

National freight (and passenger) tariff schedules have been formulated and published. Although the new tariff schedules are more complex and flexible than before, they are still limited to three to five commodity groups, do not permit contract tariffs, and are based mostly on weight and distance. They are not solidly based on accurate cost information (that did not exist before IAS accounting in any case), so there is still only limited confidence that any given tariff is actually generating revenue in excess of the relevant costs, and there is concern that some of the traffic in the lowest category of the schedule (approximately 58 percent of ton-km and 27 percent of revenues) is not compensatory. This may be particularly true of long distance (over 3 000 km) movement of cargo from the Far East of Russia that is moving at low rates in order to ensure national economic integration.

The regulatory challenge in Russia is thus a difficult balancing act. Although the railway system still holds significant market power, competition is growing and railways will need tariff and service flexibility if they are to respond. This argues in favor of ever-increasing complexity in the tariff schedule and for ability to sign contract tariffs. However, the lack of accurate costing information may make it difficult to formulate tariffs that are accurately based on costs, which means that both the regulator and railways will risk establishing tariffs that are too low to generate any surplus or so high as to harm the railway's competitive position.

Russian regulation is complicated by the fact that the carriers and operators must pay an access fee to the infrastructure provider. As discussed in a number of analyses of the access charges, Russian access charges appear to have been formulated by subtracting equipment ownership and certain operating costs from total costs rather than (as in the EU) building the infrastructure charges based on infrastructure costs alone.[10] As a result, Russian infrastructure access charges account for a higher proportion of the operator/carrier costs than is the case elsewhere. The regulator thus has a double problem – regulating tariffs charged by operators and carriers, and regulating access charges, which are also commodity-based (again, almost unique to Russia).

***Indian Railways (IR)** – an approach still rooted in the past.*

The Indian Railways of today is a direct descendant of the railway system created during the British colonial era. It is, along with MOR, one of the few remaining monolithic railways though, unlike MOR, it does have a limited number of vertically separated carriers such as the Indian Railways Container Corporation (which has private investors along with Indian Railways ownership). IR, again similar to MOR, has benefited strongly from the growth in the national economy and has been, as Table 3 shows, one of the fastest growing rail freight and rail passenger carriers over the last three decades. In sheer production terms, IR does as good a job of carrying massive amounts of traffic, with limited resources and using outdated assets and under adverse weather conditions, as could be asked. IR has long been the

10. See, *e.g.,* ECMT 2004

backbone of the Indian freight transport sector, and India without IR's long haul and suburban train services would be unimaginable.

At the same time, at least until the last few years, essentially all of the disadvantages of a monolithic, production oriented organization were exhibited by IR. It has been slow to evolve, outdated in its technology, inefficient in its use of labor, unduly subject to political interference, generally unimaginative in its freight business and only marginally profitable despite its strong market position. In fact, a decade ago there were fears that it had fallen into a downward financial spiral from which it would be difficult to emerge without major intervention and assistance.

Aside from a traditionally insular management culture, the primary source of IR's weak financial performance has been the interaction between politically imposed, very low passenger tariffs and the resulting high share of passenger traffic in the total mix. The extent of the problem can be seen in Figure 4, which compares Indian Railways with a number of other railways in the ratio of the average freight tariff (freight revenue/ton-km) to the average passenger fare (passenger revenue/passenger-km) in relation to the percent of the railway's total traffic that is freight traffic (ton-km as percent of ton-km plus passenger-km). The dilemma is that, because IR charges extremely low passenger fares, it has a high share of passenger traffic. In order to break even in total, it thus has to charge relatively high freight tariffs (the adverse leverage) because an average passenger-km costs more to produce than an average freight ton-km. This distortion is confirmed in Figure 5 which shows that Indian Railways has, in Purchasing Power Parity (PPP) terms, the lowest passenger fares and accordingly the highest freight tariffs of the major railways shown. In addition, though Table 1 showed that IR has only the third highest traffic density of the major railways, less than half that of China, the IR traffic is dominated by passenger services, which, combined with relatively outdated signaling technology and outmoded rolling stock, has meant that traffic congestion on IR is as bad as in Russia or China.

Probably the low point of IR's recent development was marked by the report of an expert Commission, under the leadership of Rakesh Mohan completed in 2001.[11] The report concluded that IR faced a looming financial crisis based on low-quality and over-priced freight services, a large backlog of investment, and a lack of market incentives. The report found that IR lacked customer focus because of its monolithic structure, had no clear purpose; that is, it was a government agency without commercial objectives, had an outdated business structure and lacked autonomy from political interference. In broad terms, the report recommended separating railway from government through creation of a railway corporation and a Ministry of Transport, adoption of a LOB organization for the railway, spin-off of non-core activities, rebalancing of the passenger tariffs, incorporating private finance where possible (wagon ownership, for example) and recasting of the IR accounts (virtually unchanged for many years) into a modern format compatible with IAS or the Indian equivalent of GAAP. The report also recommended changes in the management culture, especially in tenure and skills development. IR management opposed the report and essentially ignored its results.

Then, in May of 2004, IR experienced what has been termed by some as a "miracle." A new Minister, Lalu Prasad (popularly called Lalu), was appointed. Unlike prior Ministers, Lalu took a direct role in railway affairs, and decided to fix a number of the obvious operational, productivity and cost-related issues facing the railway. The basic concept was to find a series of "quick fixes" that would have an immediate impact on financial performance without challenging the more important political constraints the railway faced.

The quick fixes were not revolutionary, and were well within standard railway practice elsewhere. They included increasing axle load and wagon loading to ensure that each freight train carried its

11. Due to opposition from IR management, this report, often called the "Rakesh Mohan Report" was never officially issued, but copies were widely circulated. Tellingly, much of the IR opposition was related to the recommendations for change in the bureaucracy and in methods of pay and promotion by seniority, not to the more substantive aspects of the reforms.

maximum load;[12] rationalizing IR's freight tariffs to respond to increasing truck competition; increased hours of freight operation to increase productivity of line and wagons; reducing freight bottlenecks; and, increasing the capacity of passenger trains.[13]

The results were dramatic and immediate. Between 2001 and 2007, IR's net earnings after dividend to Government increased by a factor of 14 and its operating ratio (the ratio of operating costs to revenues) fell from nearly 100 percent to 78 percent (the same as the average for the U.S. Class I railroad system in 2007). The short term financial emergency was over.

IR has also proposed to attack its capacity problems in the so-called "Golden Quadrilateral" (the connecting links among Mumbai, New Delhi, Kolkata and Chennai) by building a fully separated, freight-only line that would not be hindered by large numbers of passenger trains. IR has estimated that the quadrilateral generates about 55 percent of the freight carried by the railway. The full scope of the project is not yet clear, and no time frame has been committed. Connecting only the four corners would involve around 5 000 km of new line. The estimates of the cost have averaged roughly US$ 4 million/km, which would yield a total project cost of around US$ 20 billion.

The key current regulatory issues for rail freight in India are strongly linked to the gap between the Mohan Report's analysis and recommendations and what the turnaround program did NOT do. Although the turnaround did address a number of cost and productivity issues, it did not deal with structural issues such as creating a wholly-owned railway corporation, or options for horizontal (or vertical) separation, or LOB management. As a result, there is no permanent institutional basis to sustain the turnaround and there are a number of threats, such as decisions by the national pay commission, which could erase much of the financial gains. Much of the turnaround depended on Lalu's role, and a political replacement could easily overturn his achievement.

In fact, there is currently no regulation of freight or passenger tariffs or services in India. The Railway Board can change tariffs or services within its discretion, but always subject to political oversight. More important, freight tariffs must always be formulated against the requirement to provide cross support for significant losses in the passenger sector of the railway. In addition, the railway has only recently adopted modern accounting standards, and currently does not generate cost information specific to lines of business.

With this in mind, it is hard to see how freight tariffs could be rationally regulated. Current freight rates are clearly higher than they need be, so market power is being exercised by definition. This cannot be corrected until Government provides direct support to those passenger services that are performing a social service; but, internal accounts do not support segregation of costs in a way that would permit the public support to be accurately measured.

Railways in the E.U. *– the challenge of forming an integrated economic space.*

Twenty five countries in the E.U. have railways (Cyprus and Malta do not). This is an enormously diversified group, from large to small, from low density to high density, and from passenger-dominant to freight-dominant. Organizational structure varies from horizontally integrated to institutional separation of various businesses, and ownership varies from wholly public to a significant degree of private participation.

As of the early 1990s, the unifying railway themes were the poor performance of freight railway service in competition with trucks and waterways and the Commission's conviction that the railways were

12. This also included accurate weighing of the wagons to ensure that the railway got paid for the full amount moved. There was suspicion that shippers were underreporting shipment weight and that local railway agents were aware of this.

13. See Ditmeyer 2007 and Blanc 2007 for a detailed discussion of the measures taken and an analysis of the results.

still functioning primarily as a disparate collection of national railways and not as a Union-wide **system**. Fragmented railway organization was thus directly in conflict with the objective to create an integrated economic space.

After years of increasing concern over the performance of the Union's railways, the Commission issued Directive 91/440 in 1991. This Directive has been followed by a series of railway Packages, all with the same broad objective of system standardization and compatibility ("interoperability") in order to foster system-wide, seamless movement and to develop more intra-modal rail freight and passenger competition. Implementation of the Commission's program has taken time, partly because of resistance from national railways and their governments and partly because the Commission's understanding of the problem of integration has improved and deepened over the intervening time. In very summary terms, the E.U. railways must:[14]

- Separate the accounts for infrastructure from those of the operating agency. Full institutional separation is not required, but many members have opted to do so.

- Develop and publish access charges for the railway infrastructure and permit access to the infrastructure without discrimination on national grounds. Currently freight operators are in principle permitted to provide competing services through the E.U. system. Open access should also apply to intercity passenger operators, but not to local and suburban services directly subsidized by governments. In cases where the infrastructure manager is not institutionally separated, then access charges must be determined by a separate agency, and access to the infrastructure must be managed independently and in a non-discriminatory manner.

- Base infrastructure access charges on marginal costs. Infrastructure agencies may mark up their access charges above marginal costs, but should do so in a way that least distorts the use of the infrastructure and that does not create discrimination in access to the infrastructure.

- Limit public support to social services and not subsidize services that should be commercially self-supporting. In general, this means that rail freight and intercity passenger services may not be subsidized. Governments may support social services, but this should be done through an explicit contract and not through general budget support. In order to meet this requirement, national railways should separate their accounts horizontally (LOB) as well as vertically (infrastructure versus operations).

- Meet a wide range of auxiliary requirements that ensure that technical standards are harmonized, operating and driving licenses issued in one country are valid in all countries, safety regulations and uniform and enforced uniformly, among others, all of which have the objective of reducing the "border effect" of having individual national railways.

The Commission has made slow but steady progress in implementing this program. Almost all networks now publish a Network Statement in a common format that establishes access charges for the network. Access by potentially competing freight operators has gradually been established and many countries have more than one freight operator (a process that has actually moved more rapidly in the newer members than in original members). One operator, Railion (a part of the DB holding company) now operates freight trains under one corporate banner throughout most of Germany, The Netherlands, The U.K., Denmark, Sweden, Poland and Switzerland. It would be possible to argue that seamless freight railways are emerging in the E.U.

14. See Nash (2005) and Thompson (2008) for a detailed discussion of these requirements and the way they have been employed in setting E.U. railway infrastructure access charges.

Unfortunately, this may be an overly optimistic view, for a number of reasons. First, as Figure 3 and Table 3 show, rail freight ton-km in the EU15 countries has actually **fallen** by over 10 percent between 1980 and 2007[15], and has fallen by over half in the CEE members of the E.U. The rail freight share of the transport market in the EU15 has fallen from about 20 percent in 1990, just before Directive 91/440, to slightly under 15 percent in 2007. Moreover, there are indications that **international** rail traffic among the EU members is not increasing and may actually have fallen since 1998.[16] While it would be possible to argue that the trends would be even less positive in the absence of the Commission's Directives, it seems equally difficult to argue that the Commission's objective of increasing rail's share in the freight market is being met. This shortfall may even gain importance in the light of more recent emphasis on meeting greenhouse gas reduction targets that will add value to the lower energy consumption of rail as opposed to trucks.

The specifically regulatory issues the Commission faces are not ones of tariffs and service. For the most part, rail freight (and all freight transport) tariffs are unregulated because competitive market forces make traditional regulation unnecessary. Instead, rail freight regulation issues appear to be related to issues of priority of access, access charges and industry structure.

Most of the E.U. networks are passenger dominant, and network managers feel more pressure to ensure access for passenger trains. Freight trains often are not given access during peak hours of the day. Unfortunately, trucking competitors are not similarly limited (though peak hour congestion on highways may limit their service as well), and freight rail service can suffer accordingly. In addition, operators must request times of access (often called "slots" in network terminology), well in advance of their expected use. This is compounded when an international rail freight operator has to submit slot requests to a series of network operators, any one of which can delay a response, thus limiting the response for all. Trucks face no similar restriction.

Infrastructure access charges pose another potential problem. The access charge levels and structures of the E.U. network operators are not uniform: in fact, no two members have the same levels and structure. A potential freight operator thus has to thread its way through disparate systems, some of which could affect the optimum train makeup and the most efficient scheduling. In addition, network managers with access charges that are weighted so as to collect relatively more from freight than passenger services (in order to minimize apparent public support) inherently shift freight traffic from rail to highway (or water).

Finally there is an oversight issue of rail freight sector structure. The Commission's concern in formulating Directive 91/440 and later packages appears to have been focused on disconnecting the linkage between operators and infrastructure with the expectation that freight operators would eventually be organized in accord with market demands (origin to destination traffic flows) rather than national boundaries.

In practice, a few privately owned international operators are emerging, such as Rail4Chem, and these operators are gaining traffic. At the same time, emergence of large and international state-owned operators such as Railion (owned by DB) could raise issues of competitive structure if Railion's size and its connection with the infrastructure owner in the E.U.'s central market for rail freight (Germany), and its access to the finances of a state-owned giant, permits it a significant competitive advantage. In addition, by controlling access to major ports in several countries, Railion could hypothetically affect the flow of rail freight traffic throughout Europe. Many economists feel that the existence of private competitors will constrain Railion's ability to exercise market power: other industry observers are less comfortable.[17] In

15. This decline is exaggerated by the fact that the cargo of the former Deutsche Reichsbahn is included in the 1980 total. Many of the other EU 15 members experienced freight traffic growth.
16. Thompson (2008), pg 18.
17. See, *e.g.,* ITF 2009 for a discussion of the competitive issues in transport organization, including a discussion of the issues posed by the expansion of Railion.

any event, there appears to be no regulator in the E.U. that has the remit to consider this type of market structure issue.

Brazil – *moving railways from public to private sector.*

Brazil furnishes a good example of the Latin American model of rail freight concessioning. The reason for the concessioning model was that poor public management (especially imposed surplus labor) had combined with emerging trucking competition to drive all of the Latin American railways into effective bankruptcy. Between 1992 and 1998, starting with Argentina, then Chile, Brazil, Bolivia, Mexico, Peru and Guatemala, all of the freight railways (and some of the passenger services) were competitively concessioned to private operators for periods ranging from 30 to 50 years.

Brazil began the 1990s with a Federal railway (RFFSA), a State railway of Sao Paulo (FEPASA) and two private railways owned by the iron ore mining company CVRD (Vitoria Minas and Carajas). Unfortunately, as is the case in many Latin American countries, both RFFSA and FEPASA were collections of earlier railway systems, some of which were meter gauge and some of which were broad gauge, making management of them as a system difficult. Instead, they were managed in regional groups, retaining the gauge distinction.

Beginning in 1995, Brazil initiated the process of concessioning, beginning with the RFFSA constituents and ending with FEPASA. In all cases, the approach was to use a public auction with a stated minimum price for the concession. This was preceded by a program of labor reduction based on public compensation for those who lost their jobs. Concessionaires were required to accept the labor force remaining after the public reduction program, but were allowed to reduce the labor force further if they paid the publicly established labor protection package.

The overall result has been positive, as Table 4 shows. For most concessions, traffic has grown steadily, with a total 114 percent increase between 1995 and 2008. The effect of the labor program is also significant. Immediately prior to the Government's reduction program, the entire system had 65 000 employees. By the time concessionaires began taking over, this had fallen to 26 000, and it fell further to a low of 18 000 before growing again as traffic grew. Over this period, output per worker (ton-km/employee) has slightly more than quadrupled!

A number of potential regulatory issues have emerged as the concessioning program has evolved. Prior to concessioning, with RFFSA and FEPASA in public hands, regulation, *per se*, was not a significant concern. For the two CVRD railways, since they were carrying their own products, regulation was not needed. During the process of concessioning, Government policy was to push forward without a regulatory program and to see what regulation was needed after the concessions were in place.

For most of the current rail traffic, there is effective trucking competition and regulation is limited. Some concessions, ALL and FCA, for example, pose few issues of market power. In other cases, though, such as MRS, EFVM and EFC, concessions are owned or controlled by their principal shipper: other shippers wishing to use the concession are not confident of receiving non-discriminatory tariffs or equal service quality to that of the owner. In other cases, MRS for example, an argument has been made that the focus of the railway is on hauling the owners' products, and there is little interest in developing traffic in other commodities or from other connections.

The Brazilian regulator, ANTT, has been active in gathering and publishing data about the concessions and there is some basis available for measuring traffic, tariffs and productivity so the overall question of abuse of market power can be assessed. The regulatory issues related to allowing a major shipper to own or control the concession are not a surprise because the likelihood that the MRS concession would be purchased by its major user was well known in advance of the concessioning auction (the winning bid, with no competing bids, was about one US$ above the minimum price). A common regulator's dilemma is that it is easier to force a railway to cease a negative behavior (overpricing) than it

is to require the railway to offer a new service or a new connection when it does not wish to do so. This has been a common challenge in a number of the Latin American concessions, notably in Mexico where the major concessionaires have refused to allow other concessionaires to operate over their tracks in return for a trackage fee (they prefer to interchange the traffic and divide the tariffs instead).

The railways of North America *– regulation and the private sector*.

The railways of North America present an example of fully competitive, privately owned, integrated freight railways that have been regulated for many years. The three countries in North America have somewhat different railway structures and regulatory approaches.

The rail network of the U.S. consists of 7 Class I railroads (annual revenues > US$ 360 million), 33 Regional railways (annual revenues between US$29 million and US$ 360 million) and 523 Local railroads. All of the Class Is and Regional railroads, and essentially all of the Local railroads[18] are privately owned and have the freight operator integrated with the infrastructure. Canada has two Class I railroads, Canadian Pacific (CP) and Canadian National (CN), one regional-sized railway (BC Rail) and at least 50 smaller railroads. Two of the U.S.Class I railroads – Grand Trunk (CN) and the Soo Line (CP) are owned and controlled by Canadian carriers. All of these railroads are privately[19] (or non-Federally) owned, and all are integrated carriers. In both countries, there is a national passenger carrier (Amtrak in the U.S., VIA in Canada) that is publicly owned and supported by the national government. Amtrak also receives some contracted support from State governments.

The freight railways of Mexico are concessioned. Two of the concessions, KCS de México and Ferromex, would qualify as Class I railroads, and both have significant connections to, and investments from, U.S. carriers. Mexico has essentially no intercity rail passenger service. Similar to the experience in Brazil, traffic on the two largest Mexican concessions has slightly more than doubled since the last year before concessioning, and the labor force has fallen by about half, thus quadrupling labor productivity.

Railway regulation began in the U.S. in 1870, partly as a reaction to actual market power of rail transport before the rise of alternative modes, and partly as a result of a political belief that the railway market power could be tapped to support a social demand for rail passenger service. As often happens, economic reality diverged from politics, in the U.S. case beginning after World War I with the advent of the highway system and accelerating after World War II when the Federal Government vigorously support the construction of highways and waterways without requiring the users to pay adequate user charges. Regulatory policy continued to be based on intrusive involvement in tariff controls as well as enforced cross support to passenger services with the result that, by about 1970, the entire rail system was threatened with bankruptcy.

The first reaction was institutional. The national passenger carrier, Amtrak, was created and publicly supported in order to take the burden of passenger losses off the backs of the private freight carriers. Although removing the passenger losses was a helpful and essential first step (about 25 percent of the net income before taxes of the freight carriers was being absorbed by passenger losses), a string of bankruptcies in the Northeast of the country made it clear that more change – specifically a change in regulation – was going to be required.

By the end of the 1970s, "deregulation" had become an accepted remedy in a number of industries. Airline deregulation was first, and then the Congress decided to deregulate the rail and trucking industries, essentially simultaneously.

18. A few of the local railroads are owned by local governments or public authorities.
19. For most of its history, the Canadian National was a Crown Corporation (publicly owned) and was used partly as a method for social development, and partly as a competitive yardstick for comparison with Canadian Pacific. In 1996, Canadian National was privatized and has subsequently become the most successful and efficient of all North American railroads.

Rail deregulation (called the "Staggers Act" after the name of the Congressman who initially sponsored it) fundamentally changed the relationship between regulator and regulated. After deregulation, railroads were free to set tariffs within a very wide range of flexibility. So long as the railways were not earning monopoly returns in total, and so long as they could not be shown to be abusing market power over a particular shipper[20], rail tariffs were freed of regulation. Railroads were freed to sign contract tariffs in which the shipper makes volume guarantees and the railway makes specialized investments and offers discounted tariffs. Railways were free to abandon unprofitable track and services.

The result has been a demonstrably successful legislative initiative. As Figure 6 shows, since the Staggers Act railroad tariffs have fallen by over 50 percent in real terms. Although, as always, some commodities have benefited more than others, every major category has far lower tariffs and far better service than ever before. In real terms, the average rail tariff is less than half its level in 1981. Individual commodities range from 39 percent (coal) to 70 percent (pulp and paper) of their 1981 levels in real terms. As Figure 5 showed, U.S. and Canadian rail freight tariffs are the lowest in the world in PPP terms. Over the same time, return on equity rose from an inadequate range of 1-6 percent to a still inadequate, but much healthier range of 8-12 percent. It should be added that the trucking deregulation initiated at the same time as rail deregulation, has had a similarly powerful effect on trucking costs and competitiveness.

Despite the achievements of deregulation, there is significant pressure to re-regulate at least certain aspects of the current system. This has a number of causes. First, there are no recorded cases of shippers arguing that their tariffs are too low, nor do many avow that their service is too good. This has combined with a continuing strain of populism that has little sympathy for the railroads to produce a presumption in favor of doing something to answer persistent complaints.

At least some complaints may be valid. In 1982, there were 33 Class I railroads: today there are only 7. The mergers this change reflects have meant that at least some shippers that formerly enjoyed competition among railways now must deal with a single carrier, which creates the perception, if not always the reality, of abuse of market power. In addition, the system suffers from success in that economic growth and lower tariffs have caused traffic growth that has begun to strain the capacity of the system. Since passage of the Staggers Act, traffic density (ton-km/km) has more than tripled, leading to a situation in which prices had to go up in order to finance added capacity, a case which shippers will accept in total, but would prefer that it not apply to them individually.

In response to Congressional concern, there have been two recent, detailed studies of competition in the U.S. rail industry, one by the U.S. Government Accountability Office (GAO),[21] and one sponsored by the Surface Transportation Board (STB) at the recommendation of the GAO.[22] The GAO study analyzed the issues and expressed a number of possible concerns, but reached no conclusions. The Christensen study attempted to answer the GAO's concerns, and reached the following conclusions.[23]

- "Class I railroads' rates (real revenue per ton-mile) rose substantially above short-run marginal cost in 2006.

- Economies of density and fixed costs require railroad pricing above short-run marginal cost to achieve revenue sufficiency.

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20. The test is that if a proposed tariff does not exceed 180% of its variable cost (determined under a defined accounting system) then the tariffs can not be found too high. If the proposed tariff does exceed 180 percent of its variable cost, it may still be acceptable if it does not pose an unacceptable burden on the traffic in question and if it does not exceed the "stand alone" cost of serving the traffic. Thus do lawyers and economists guarantee themselves an ample annual income.
21. See GAO (2007)
22. See Laurits R. Christensen (2008).
23. Christensen (2008), ES-5 and ES-6.

- For most years in the 1987 to 2006 period …, the Class I railroad industry does not appear to be earning above normal profit.

- The increase in railroad rates experienced in recent years is the result of declining productivity growth and increased costs rather than the increased exercise of market power.

- Railroads use differential pricing to recover their total costs.

- Different commodity groups face different markups of railroad rates over marginal costs.

- Within commodity groups, shippers with no or very limited transportation options tend to pay higher rates than shippers with the same shipment characteristics who enjoy more or better transportation alternatives.

- The ratio of revenue to … variable cost (R/VC) is weakly correlated with market structure factors that affect shipper "captivity," and is not a reliable indicator of market dominance.

- Capacity "tightness" is primarily due to congestion at terminals or other specific network locations…

- Current market circumstances imply that providing significant rate relief to certain groups of shippers will likely result in rate increases for other shippers or threaten railroad financial viability. [emphasis added]

- Incremental policies such as reciprocal switching and terminal agreements have a greater likelihood of resolving shipper concerns via competitive response, and have a lower risk of leading to adverse changes in industry structure, costs, and operations.

- Some shippers will not benefit from efforts to enhance railroad competition, implying the necessity of continued regulatory oversight."

A fair summary of the Christensen study is that U.S. rail regulation appears to be working reasonably well and that incremental adjustments intended to enhance competition in specific situations appear to be all that is needed. More specifically, the conclusion (bolded above) that political interventions to help specific shippers will only shift the rate burden to other shippers or weaken railroad viability is a clear warning that such intervention would be unwise. "If it ain't broke, don't fix it."

Recapitulation and Summary of Key Regulatory Issues

At first glance, the major countries studied in this report appear to be so disparate as to yield few general conclusions; and yet, a number of common themes emerge.

The primary issue is the interactions among structure, competition objectives (inter-modal and intra-modal) and regulation. In the Soviet regimes, with a publicly owned monolith and without any objective for competition, regulation (in the sense of controlling tariffs, entry or services) was simply replaced by the fiat of the railway and planning ministry. Railways ran trains, carried cargo, charged what they were told to charge, and looked for government to make up the difference between revenues and costs. In the beginning of the Communist regime in China, for example, the railway revenues went directly to government and the railway looked to government for a budget to cover operating costs as well as any losses and capital.

When countries adopt market economies, and when railways begin to face inter-modal competition, though, railway structure needs to change. As trucking (and sometimes water) competition stiffens, especially when truckers and barge companies are privately owned, the issue of abuse of market power in railway tariffs arises. One potential response is to try to regulate the monolith, while another response is to ensure enough competition that tariff regulation is less necessary. A mixture of both responses is also possible.

When the market is fully developed, and especially when competition is strong, the need for regulation should change from an intrusive approach to one of mostly observation. Measures such as line of business organization can unbundle finances to ensure that the freight operation is not being supported by government and thus has an unfair competitive position vis-à-vis private operators. Government can create intra-modal competition for rail by separating infrastructure from operations in a way that permits competition on the same tracks. In a few countries (U.S., Canada and potentially Russia), the network is large enough to permit competition among integrated freight companies. When structure is appropriate and competition strengthens, regulation can be reduced to a focus on limited situations where whatever market power that remains is demonstrably abused.

From this perspective:

- China and India have hardly begun to move forward. Though competition is rising as the road system is developed, railway and government are still so intertwined and so far from commercial orientation that it is hard to see what could be regulated and how it would be done.

- Russia offers the rare case where trucking competition is still limited in much of the country (and will necessarily remain so for a long time), so the railway clearly has market power. Unfortunately, the regulator neither has the information nor the tools to analyze or change tariffs and services, nor is it clear that "operator" as opposed to "carrier" competition will suffice to discipline behavior.

- The E.U. is fortunate to have so much trucking and barge competition, and railways have such a limited market share, that regulation of rail tariffs is not needed. This said, though, the Commission's objective of competition in the rail freight market, and of creating a set of seamless rail freight operators throughout the E.U. has not yet been accomplished. Meeting these objectives will require continuing oversight of access charges and possibly of rail freight industry structure.

- Brazil probably does not need significant tariff regulation due to competition, but may need oversight of anticompetitive behavior by some of the operators. Whether this is a classical regulatory issue, or primarily one of enforcement of the concession agreement is less clear. In addition, ownership of rail companies by their major shippers may pose continuing issues of distorted incentives when serving commodities other than the owners'.

- In North America, rail freight regulation works well in general, and the overall challenge is to avoid doing more economic harm than good if any politically inspired changes in regulation are introduced. Railways in Canada and Mexico also fact stiff competition, both within their domestic transport markets and, to a significant degree, from U.S. railroads.

In looking at the regulatory issues that this collection of countries raises, it is important to restate the fact that transport **regulation** (like transport) is (or should be) a derived demand and not an end in itself. That is, when an industry benefits so strongly from economies of scale that competition is not feasible, then the industry needs regulation in order to prevent inefficient behavior such as monopoly pricing or discrimination. The presumption has long been that railway infrastructure is an example of such great

economies of scale that competition between parallel railway lines would be inefficient and that railways must therefore be regulated.

Experience worldwide is showing that this presumption no longer holds, certainly not to the degree that it might have been valid in the 19th century. First, the North American (and possibly Russian) cases show that competition on parallel lines is an efficient approach when the country is large enough and the market deep enough, though intermodal competition is always a useful complement. Second, the E.U. and Brazil cases show that intermodal competition from trucking and waterways can sufficiently limit any rail freight market power as to obviate the need for external regulation. Moreover, the E.U. case shows that competition among rail freight operators on the same line can eliminate market power, assuming that the terms of access permit efficient operation.

It is clear, then, that regulation should **follow** decisions about appropriate industry structure and levels and types of actual and desired competition.

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FIGURES

Figure 1.

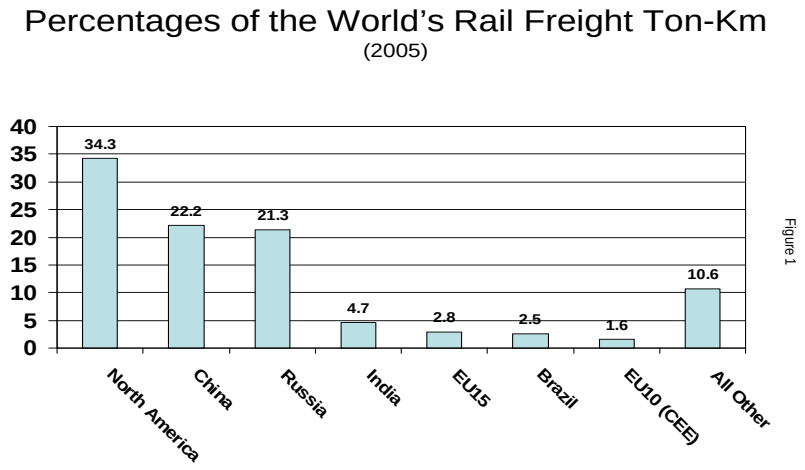


Figure 2.

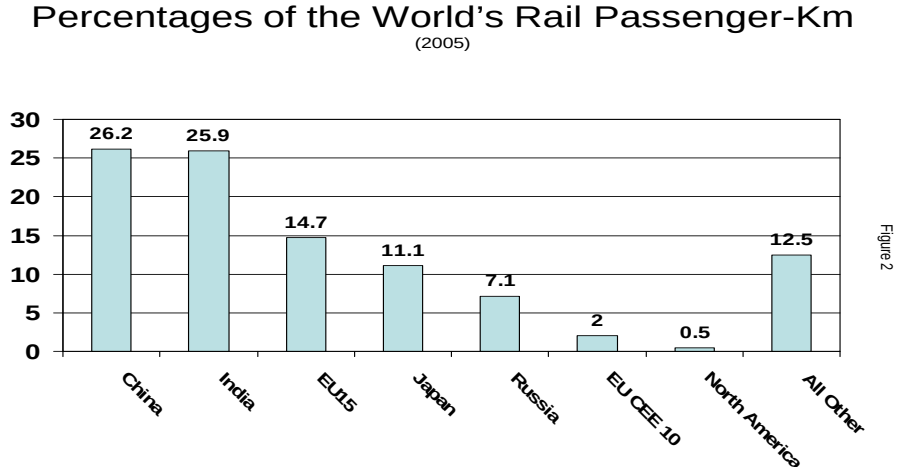


Figure 3.

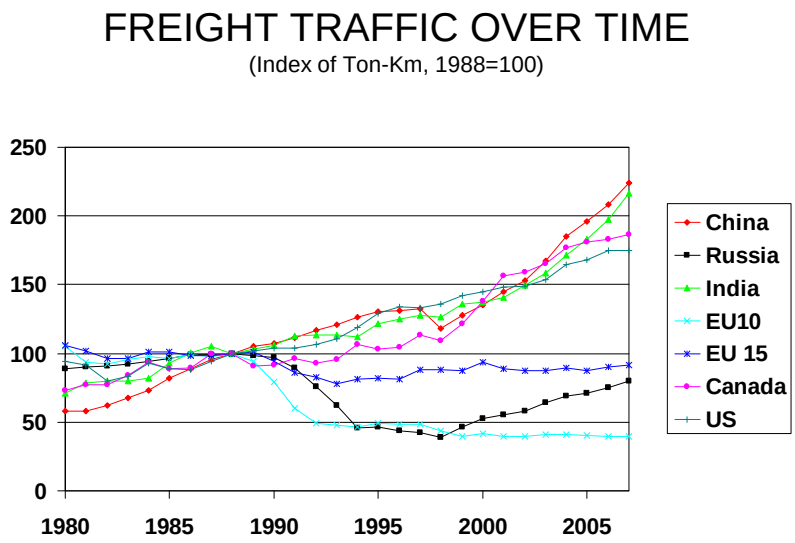


Figure 4.

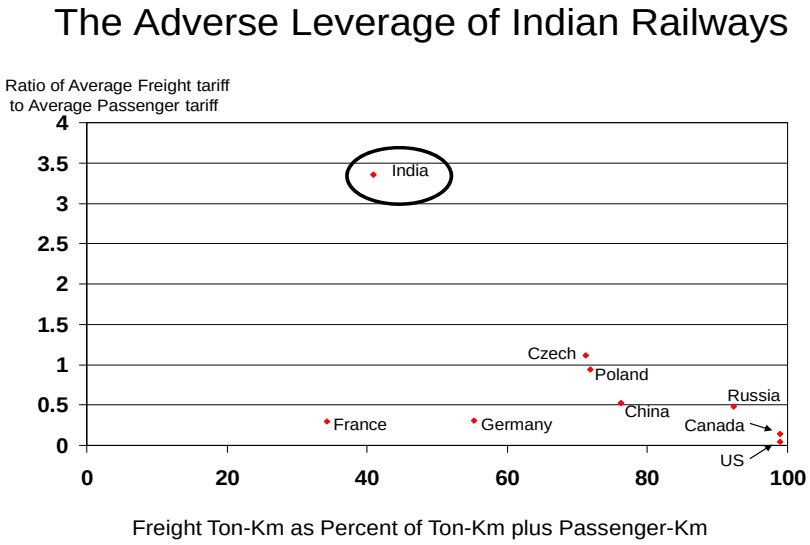
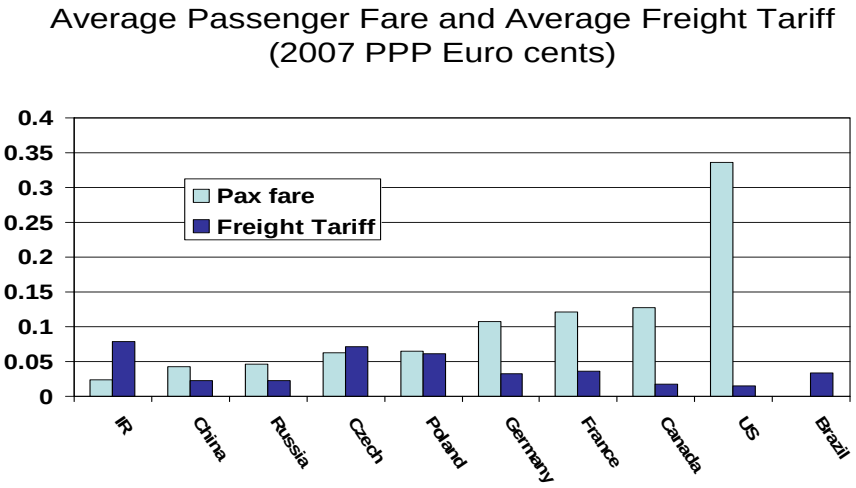


Figure 5.



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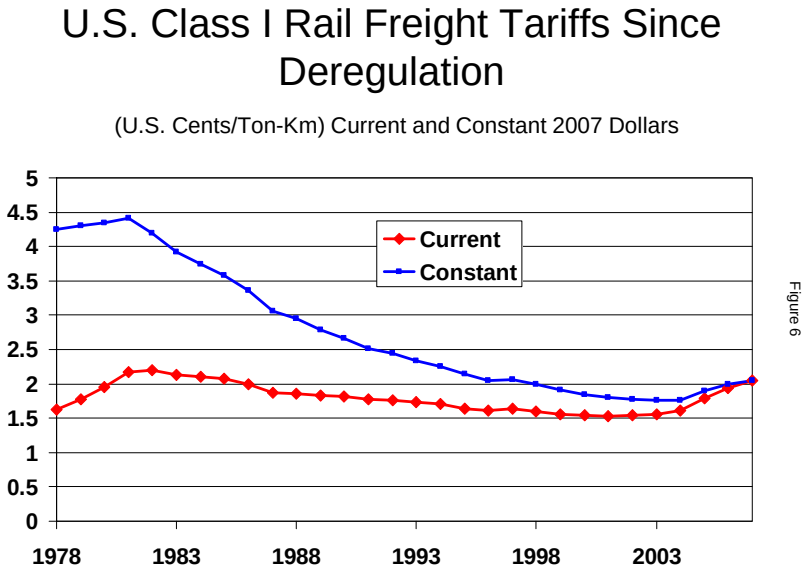
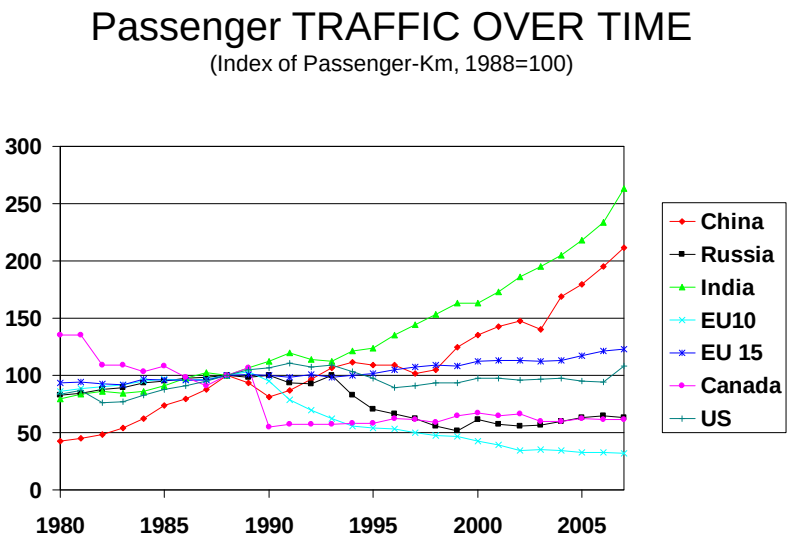


Figure 7.



TABLES

Table 1. **Freight Share of Total Railway Traffic**

Freight Share of Total Railway Traffic				**Total Traffic Density**
(Rail ton-km as % of Rail ton-km plus Rail passenger-km)				(ton-km+ pass-km per km of line
	1980	**1988**	**2007**	**2007**
China	80.5	75.2	76.2	40.5
Russia	91.1	90.5	92.3	23.9
India	43.2	45.7	40.9	15.5
Total EU CEE 10	**75.7**	**71.9**	**75.9**	**3.0**
Total EU15	**53.4**	**50.1**	**42.7**	3.8
North America Total	**99.0**	**99.2**	**99.6**	**13.4**
Brazil	na	na	100.0	8

Source: UIC, International Railway Statistics, various years,
STB Statistics of Class I Railroads, World Bank

Table 2. **Railway Typology: Dimensions of Variation of Railways**

	Market vs Planning	**Private versus Public**	**Passenger versus Freight**	**Rail Role in Transport Market (rail as % of total ton-km/rail +truck only)**	**Organizational Structure**	**Vertical versus Horizontal**	**LOB models and Commercial Orientation**
China	Planned but slowly changing	Wholly public	Freight oriented, but passenger role growing	24.3%/65.9%	Ministry	Horizontally and Vertically Integrated	None
Russia	Shifting to market	Private wagons and operators	Freight oriented, but major passenger traffic	59.3%/91.0%	SOE	Holding company	Freight is partly commercial, passenger will be separated
India	Slow recognition of market	Wholly public	Passenger dominant	49.9%/49.9% (est)	Ministry	Horizontally and Vertically Integrated	None
E.U.							
EU15	Market-driven (and losing share)	Mostly public, but private carriers emerging	Mostly passenger dominated	14.8%/16.8%	SOE	Infrastructure separated, many operators separated	Wide divergence
EU10	Market-	Some private	Freight	29.3%/32.4%	SOE	Infrastructure	Wide

CEE	driven (and losing share)	freight carriers -- more than in EU15	dominant, especially Baltics			separated, many operators separated	divergence
Brazil	Wholly market	All freight railways are concessioned	Wholly freight dominant	?/20%	Concession	Vertically integrated	Fully commercial
U.S.	Wholly market for freight	Freight wholly private	Freight dominant	44.8%/57.4%	Corporations	Freight vertically integrated, passenger separated	Fully commercial, passenger separated

Source: Author

Table 3. **Traffic Levels Over Time for the Major Railway Systems**

Freight Ton-km (000 000)

	1980	1988	1995	2000	2007	% growth, 1980 to 2007	% growth, 1998 to 2007
China	570 732	986 020	1 287,420	1 333 606	2 211 246	287.4	124.3
Russia	2 316 000	2 606 000	1 214,000	1 373 200	2 090 337	-9.7	-19.8
India	158 474	222 374	270 489	305 201	480 993	203.5	116.3
Total of EU CEE 10	371 321	353 885	173 066	147 649	140 758	-62.1	-60.2
Total of EU 15*	285 681	269 036	219 743	251 762	245 255	-14.2	-8.8
Total Canada	180 219	246 043	254 149	(est) 340 000	458 023	154.1	86.2
Total U.S. Class	1 393 235	1 477 488	1 911 023	2 142 145	2 587 222	85.7	75.1

Passenger-Kilometers (000 000)

	1980	1988	1995	2000	2007	% growth, 1980 to 2007	% growth, 1998 to 2007
China	138 037	325 731	354 261	441 468	689 618	399.6	111.7
Russia	227 300	273 615	192 117	167 100	173 411	-23.7	-36.6
India	208 558	263 731	326 197	430 666	694 764	233.1	163.4
Total of EU CEE 10	119 189	138 423	75 437	58 810	44 630	-62.6	-67.8
Total of EU 15	248 993	267 441	272 683	299 642	329 419	32.3	23.2
Canada: Via Rail	3 110	2 304	1 341	1 544	1 409	-54.7	-38.8
USA:Amtrak	7 637	9 158	8 924	8 970	9 923	29.9	8.4

* Includes the former East German railway (DR) for years before 1994.

Source: UIC, International Railway Statistics, various years, STB Statistics of Class I Railroads, World Bank

Table 4. **Brazilian Freight Concessions**

	1991	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	% growth, 1995 - 2008
Concession	**Freight Ton-Km (000 000)**																
Centro Atlantico (FCA)	6 808	6 867	6 323	*5 915*	5 276	7 019	7 417	7 628	8 140	8 600	7 500	8 700	10 700	9 200	14 400	15 100	138.8
Novoeste	1 709	1 916	1 608	*1 434*	1 486	1 578	1 625	1 588	1 462	1 700	1 200	1 200	1 300	1 700	1 200	1 100	-31.6
CFN (Nordeste)	846	926	763	651	516	640	905	709	701	800	800	800	800	700	1 000	900	18.0
ALL (old FSA)	7 816	9 020	7 489	6 940	*6 849*	8 347	9 354	10 285	11 998	12 800	13 900	14 200	15 400	17 500	17 500	16 400	119.0
MRS	19 089	20 370	20 163	18 467	20 550	21 204	21 823	26 837	27 369	29 400	34 500	35 700	44 400	47 500	52 600	55 600	175.8
Tereza Christina	129	96	102	93	*149*	166	167	259	214	200	200	200	200	200	200	200	96.1
Bandeirantes (old FEPASA)	6 346	6 473	5 992	5 213	4 987	4 995	5 014	5 984	8 278	8 300	9 200	9 500	2 300	1 200	1 900	4 300	-28.2
EFVM (Vitoria Minas CVRD)	41 500	47 000	48 500	50 000	56 600	52 000	55 000	58 000	54 400	57 000	60 500	64 800	68 700	73 400	75 500	72 800	50.1
EFC (Carajas -- CVRD)	29 308	31 500	34 500	37 500	41 800	40 400	42 000	45 000	48 000	49 000	52 400	63 600	69 500	76 700	83 300	87 500	153.6
Ferronorte	-	-	-	-	-	-	-	-	1 300	1 900	2 100	2 300	8 000	7 900	9 400	11 300	na
Total	113 551	124 68	125 440	126 213	138 213	136 349	143 305	156 290	161 862	169 700	182 300	201 000	221 300	236 000	257 000	265 200	111.4
Concession	**Employees**																
Centro Atlantico (FCA)	14 564	13 092	10 988	*5 181*	3 251	2 416	2 314	2 596	2 821	2 582	3 599	3 991	4 799	5 679	-		

Novoeste	3 267	2 923	2 424	*884*	774	623	645	639	596	618	612	761	1 199	391			
Nordeste	5 416	4 870	3 707	2 403	1 477	622	639	694	939	946	1 150	1 984	1 989	1 836			
ALL (old SA)	12 205	11 140	9 604	6 695	*3 110*	2 379	2 108	2 018	2 055	2 122	2 132	2 342	2 371	2 475			
MRS	11 990	10,937	9 398	5 775	3 934	3 299	3 058	2 988	2 686	2 709	3 039	3 400	3 624	3 847			
Tereza Christina	488	362	343	236	*238*	210	144	142	141	229	219	211	236	237			
Bandeirantes (old FEPASA)	17 658	16 999	13 432	11 013	8 391	8 340	3 050	3 174	3 844	2 325	2 327	2 125	2 584	385			
EFVM Vitoria Minas (CVRD)	3 600	3 700	3 700	3 700	3 806	4 000	4 200	4 500	4 726	4 378	4 778	5 268	6 015	7 128			
EFC Carajas -- (CVRD)	1 500	1 500	1 500	1 500	1 241	1 800	2 000	2 400	2 867	2 671	2 245	2 585	3 483	3 724			
Ferronorte	-	-	-	-	-	-	-	-	408	624	1 014	1 000	1 702	375			
Total	70 688	65 523	55 096	37 387	26 222	23 689	18 158	19 151	21 083	19 204	21 115	23 667	28 002	26 077			