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# Lessons from railway reforms in Brazil and Mexico<sup>☆</sup>

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## Abstract

This paper describes the rail restructuring processes in Brazil and Mexico during the 1990s. It first reviews the way in which the transfer of public railroads to private concessionaires was accomplished in these countries, and then focus on the major challenges faced by them just after the privatization. From this analysis, at least three core lessons are drawn: concessioning can be a viable mechanism for rail privatization in some developing countries; regulatory problems inevitably emerge during and after the concessioning process; and, therefore, to minimize them, contract design should be carefully addressed in previous stages of the process. © 2001 Elsevier Science Ltd. All rights reserved.

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## 1. Introduction

During the last decade, there has been a dramatic increase in the liberalization of transport policies and a strengthening of the role of private operators and investors in transport infrastructure and services in Latin America. This increased private sector participation has often reflected changing ideologies about the role of the state and dissatisfaction with publicly provided services. However, the main driving force behind it has generally been the pressure to look for private financing imposed on governments by lasting fiscal crises. This change in the financing of the sector is also providing an opportunity to restructure the transport industry in an attempt to improve its efficiency and sustain these improvements.

The purpose of this paper is to draw core lessons from the experiences of two Latin American countries—Brazil and Mexico—in order to provide governments in the region and elsewhere with better information related to how they could structure a reform package in transport to make the best of the growth opportunities within their countries. Latin America is a good example to base this paper on because most countries in the region display many of the social and economic problems experienced throughout the developing world, such as significant migration from rural to urban areas and the consequent need for rapid expansion of service delivery combined with

low levels of per capita income. In addition, there are countries in the region that have been at the forefront of transport reform. Chile was among the first in the world to undertake significant reform of the railroad industry and create some innovative methods for road concessioning; Argentina's overall transport sector reform is viewed as an example in several other places, and Bolivia's capitalization program is a model of whole-scale reform of infrastructures.

This paper specifically focuses on the rail sector, where some changes have been more radical than others, and where there has been a generalized element of experimentation in the region which has created different approaches. Yet the common spirit of all of them includes an increased level of private sector participation that tries to retain a relevant regulatory role for the government. We will describe these reforms and their consequences, outlining the context where they took place. Our lessons, therefore, may not apply to other contexts, but could possibly help to identify a common set of problems to deal with in any rail privatization experience in developing countries.

To address these issues in order, after a brief introduction on the Latin America transport restructuring process (Section 2), we will use the examples provided by the cases of Brazil (Section 3) and Mexico (Section 4) to illustrate the main characteristics of the reforms. We finally conclude in Section 5 with a general discussion of the lessons learned from these changes.

## 2. Transport reform in Latin America

From a historical perspective, the Latin American

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Table 1  
Roads and railways in Latin America (selected countries) (source: The World Bank, 1995)

	Paved roads (km)				Railtrack (km)			
	1960	1970	1980	1990	1960	1970	1980	1990
Argentina	22,712	33,375	52,194	57,280	43,905	39,905	34,077	35,754
Brazil	12,703	50,568	87,045	161,503	38,287	31,847	28,671	22,123
Chile	2604	7411	9823	10,983	8415	8281	6302	7998
Colombia	2998	5980	11,980	10,329	3161	3436	3403	3239
Mexico	25,667	42,674	66,920	82,022	23,369	24,468	20,058	26,334
Total region <sup>a</sup>	85,514	182,088	267,962	370,059	132,470	120,045	105,691	110,301

<sup>a</sup> Also includes Bolivia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Peru, Nicaragua, Panama, Paraguay, Venezuela and Uruguay.

transport system can be viewed as a network of traffic corridors where—with the exception of the landlocked countries, Bolivia and Paraguay—the movement of freight and people always started and ended at the main ports in the Atlantic and the Pacific, and was only gradually penetrating the richer areas in the interior. The centralized economy and society that the Spanish and Portuguese colonial authorities promoted during the centuries that followed the first European settlements favored the development of single corridors from production sites to export ports and paved the way the railroads would use in the 19th century. It was only after the World War II when roads became the dominant transport mode, by connecting growing urban industrial sites with the coast and the interior.

As illustrated by Table 1, during the last 40 years, the kilometers of roads have been growing at a faster pace than railtrack has been declining. In 1960, the ratio of kms of paved road per km of rail line was 0.64, whereas in 1990 the same figure had risen to 3.35. In some countries, such as Brazil or Argentina, the reduction of the railtrack was above 20%. Simultaneously to this physical decay there was a substantial fall of the market share in both freight and passenger markets during the 1970s and 1980s, which apparently stabilized during the 1990s in the freight market. This decline was particularly relevant because it took place in a period when the total volume carried in both markets experienced a growth of about 50% in the region. Thus, the rail industry appears not to have been able to take advantage of the growing demand for transport in the last four decades.

This substantial reduction in market share, which is not only particular to Latin America countries but also a common trend around the world, can be attributed to both exogenous and endogenous causes. The first category includes the rapid development of alternative modes of transport, especially by road. In freight transport, an expanding and competitive trucking sector gained a growing percentage of road transport in many countries. The endogenous causes of the decline could be summarized in the inability of the sector to adapt itself to the changing conditions of its economic environment. Regulation became and remained obsolete and the rail industry was slow to react. The policies adopted during the 1970s and 1980s

did not halt the steady loss of market share, the growing financial deficits, and in some countries, the impossibility of raising the low productivity indices of the industry. Thus, more radical restructuring processes and overall reforms were put into practice (Campos and Cantos, 2000).

From the Great Depression onwards, many Latin American countries had adopted state-led development models. Governments not only regulated most socio-economic activities, but also became the largest producer, employer and consumer in many of these countries through the establishment of special agencies and state-owned corporations. Rail transport was not an exception and, at the beginning of the 1980s, most services and infrastructures were still controlled by the state, either at the regional or the central level. This situation was a direct result of the development models of the 1950s and 1960s, and was partly based on the narrowness of the private sector initiative. In countries like Venezuela, Brazil or Mexico, public sector expansion programs were directly responsible for the high rates of growth of these decades.

Infrastructure privatization—in general, but also in the case of the rail industry—was not likely to take root, succeed and achieve its public policy objectives under these circumstances unless private investors could be assured that their investments would generate an adequate economic return. In the rail industry, where deterioration under public hands was evident, urgent reforms were needed in order to encourage and sustain efficient private sector participation.

This change in the countries' economic framework was not easy and had to include several key aspects at least. The first one was to clearly define the scope and nature of private property rights in the provision of public services. Second, this framework should also encourage the efficient flow of private resources to infrastructure by removing obstacles to private provision of services. The provision of public sector services that were not privatized outright also required a clear environment for efficient contracting between the government and the private sector. Finally, the legal and regulatory framework associated to these changes should also provide an efficient mechanism for resolving disputes between the parties and assure the private parties' recourse to fair and speedy dispute resolution mechanisms.

The rail industry in countries such as Chile, Argentina, Bolivia, Peru, Mexico or Brazil embraced these reforms with more or less forced enthusiasm. In most cases, however, even the constitutions or the sectoral laws limited the participation of private sector, not only in the ownership but also in the operation of services, which were attributed to the exclusive responsibility of the existing public corporations. Private participation was often subject to the will of the government authorities. This restriction stemmed from the fact that some countries considered ‘public services’ to be the exclusive domain of the state. Under these circumstances, the alternative of outright privatization of services and infrastructures was always a difficult one. Important legal amendments and constitutional changes were needed to sell state-owned enterprises. Argentina and Chile had to change their entire legal systems, Brazil passed a new constitution in 1988; Mexicans had to reform theirs in 1995. Therefore, alternatives without full privatization—particularly those involving concession of rail services—were preferred. Chile and Argentina started this movement in the mid-1980s, but the processes where the reform was taken more extensively are the experiences of Brazil and Mexico, the two largest economies in the region.

### 3. The reform of the Brazilian railroads

The first rail line in Brazil was completed in 1854 by private foreign capital. During most of the following 100 years, private operators dominated the industry, but with an increasing participation of the public sector. In 1957, culminating nationalization policies of previous years, Federal Law 3115/1957 was enacted, incorporating under the jurisdiction of the Ministry of Transport the government-owned Federal Rail Network Corporation (RFFSA or Rede Ferroviária Federal, Sociedade Anônima). Twenty years later, a second operator in the form of a state-owned corporation, Ferrovias Paulistas, Sociedade Anônima (FEPASA), was created by State Law 10410/1974, which also established rules for the state of Sao Paulo for the financing of uneconomic rail services, absorbing the contributions to the workers pension fund, and other liabilities of the existing operators within that State.

These two operators provided rail transport services to about 95% of the country’s freight shippers, whereas the third important operator (and the largest in terms of output at the beginning of the 1990s) was the Companhia Vale de Rio Doce (CVRD), a huge government-owned industrial holding that exploited two specialized rail lines, Estrada de Ferro Vitória a Minas (EFVM) and Estrada de Ferro Carajás (EFC), from their mining sites to the ports in the north and center of the country. This company only served its own traffic, which mostly consisted of large volumes of iron ore for export.

By 1996, several restructuring procedures had been attempted to tackle the most urgent needs of the industry

while maintaining it within the public sector. These policies, however, were not enough and the government started to look at the successful experiences of Argentina and Chile. Encouraged by these examples, Decree 473/1992 included RFFSA in the Brazilian National Privatization Program in a political movement that represented the first major privatization of public infrastructure services in Brazil. At this moment, in view of the geographic characteristics of the country, the size and state of conservation of the railway network, as well as the significant cross-regional differences in traffic, it was decided that the restructuring process could be more easily implemented using RFFSA’s existing regional structure.

RFFSA’s network was separated into six vertically integrated monopolies (called *malhas*) whose rail services would be concessioned out by the Ministry of Transport, and whose rolling stocks and existing infrastructures would be simultaneously leased by RFFSA to the private operator. The reason for this double concession-leasing method was that, according to the 1988 Constitution, the federal government had to remain the titular to the right of providing rail transport services in the country and, in addition, retain under its ownership the assets involved in those services.

As shown by Table 2, six concessions—Nordeste, Centro-Leste, Sudeste, Sul, Teresa Cristina and Oeste—were awarded between 1996 and 1997. Four of these railroads connected ports along the coast with their respective hinterlands, approximately 400 km inland. On 23 December 1997, FEPASA was transferred to the federal government and in May 1998 the Malha Paulista, as it was also known, was immediately included in the privatization program. Its sale took place in November 1998 and concluded the privatization process of former government-owned rail operators.

Finally, when CVRD was privatized in June 1997, its two railroads (EFVM and EFC) were sold with it as part of the industrial holding; they were not concessioned in the same way as the RFFSA network. Since they had been originally designed to connect the company’s mines and mills with one another and with the exporting ports of Vitória, Tubarao and Sao Luis, the railroads were kept with the company under control of the new owners. The two railroads essentially now operate as internal departments of CVRD, specialized in iron ore traffics, although they are obligated to carry traffic for other shippers as well.

#### 3.1. The concessioning process

Except in the case of CVRD, the concessioning was implemented through public competitive bidding for the operation and maintenance of each of the *malhas* for a period of 30 years (renewable for another 30 years) with the simultaneous leasing of operational assets by RFFSA and the sale of some small non-operational assets. There were no prequalification requirements for candidates and the only limit established to avoid excessive concentration

Table 2  
Economic characteristics of Brazilian concessions (Source: Campos and Alexander, 1999) (figures for track and rolling stock and employees correspond to 1998 actual values. Figures for output (in TKU billion), operating revenues (in US\$ million) correspond to 1995 (before the concession) and to the targets set for 2002, the 6th concession year)

	Oeste	Centro-Leste	Sudeste	Tereza Cristina	Sul	Nordeste	Paulista
Concessionaire	FNV	FCA	MRS	FTC	FSA	CFN	FEPASA
Track length (km)	1621	7080	1674	164	6586	4534	4236
Track gauge (m)	1	1	1.6	1	1	1	1.6 & 1
Locomotives	88	397	406	10	395	112	408
Wagons	2777	9233	11,406	563	10,626	1919	11,855
Output							
in 1995 (actual)	1.6	6.26	20	0.10	7.5	0.7	6
in 2002 (target)	5	26	37	0.16	24	4.4	17.2
Operating revenues							
in 1995 (actual)	37	175	321	8	187	26	187
in 2002 (estimate)	86.0	350.0	490.0	9.7	327.0	70.3	243.1
Employees (1990)	2423	10,982	9397	343	9604	3707	13,432
(Transferred)	(1800)	(7900)	(6600)	(250)	(6900)	(1600)	(6380)
Main cargoes	Petroleum, soybeans, steel, minerals	Petroleum, cement, steel, soybeans, grains	Iron ore, cement, steel, limestone	Coal and by-products	Soybeans, petroleum, rice, alcohol	Iron ore, petroleum, oil, cement	Petroleum, oil, minerals, grains, pellets

of ownership in each concessionaire was that the share of each economic group participating into a concession should be limited to a maximum of 20% of the consortium's total stock. However, no restrictions were imposed for cross-participation in different concessions or about the participation of major rail users, clients or suppliers as shareholders in privately operated concessions, which eventually happened, as shown by Table 3.

Each auction was won by the highest bidding consortium, whose bid had to be above a minimum stipulated by the government. The amounts paid by each winning consortium—a down payment of between 10–30% of the minimum price and quarterly installments for the rest—were shared by the Federal Treasury (5%, corresponding to the concession of rail services) and RFFSA (95%, corresponding to the lease of assets). Five of the seven RFFSA concessions sold for more than the minimum bids. This success was due in part to the fact that the government reduced the workforce by approximately half in advance of the concessioning (Table 2), and also in part due to the relatively stable macroeconomic environment during these years. In addition, it was because the consortia were often formed by the railways' main customers, with direct interest in the success of the services, although they also included (mostly Brazilian) investment funds. The government received a total of about R\$1700 million (US\$950 million) for the seven concessions, although only about R\$400 million as a down payment.

There were no specific investment obligations set in the contracts. They only spelt out specific targets on output and safety, in terms of minimum net ton-kilometers carried each year and maximum number of accidents per train-kilometer during the first 5 years. These targets—which were different for each concessionaire according to the situation of its network—would be reviewed during the third concession year, establishing the new goals for the next 5-year period. The implicit idea behind these targets was that, in order to meet them, the concessionaires would have to carry out investments and therefore they all were obliged to submit in advance a triennial investment plan to obtain clearance.

With regard to the relationship between the concessionaires with the final users, the maximum prices to be charged for transport services were also set in the contracts. Ceilings varied according to the length of the haul, type of product and the geographic region served. These prices were to be periodically revised to correct them according to inflation. There also existed a vague notion regarding the concessionaire's obligation to maintain its financial and economic equilibrium: the concession contract determined that the tariffs should always be above the railroad long-run variable costs, although no methodology was provided for the calculation of these costs.

### 3.2. Main issues after the concessioning

Since the payments to RFFSA for the leased assets

Table 3  
The Brazilian rail concessioning process (source: Campos and Alexander, 1999)

	Oeste	Centro-Leste	Sudeste	Tereza Cristina	Sul	Nordeste	Paulista
Auction date	05/03/96	14/06/96	20/09/96	22/11/96	13/12/96	18/07/97	10/11/98
Transfer date	01/07/96	01/09/96	01/12/96	01/02/97	01/03/97	01/01/98	01/01/99
Number of bidders	n.a.	2	3	1	4	4	2
Shareholders (in italics, main ones)	Noel Group, Brazil Rail Partners, Western Rail Invest., Bankamerica, DK Partners, Chem. Latin America Equities	Min. Tacumã, Interfêrea, CSN, Tupinam., Railtex, Varbra, Ralph Partners, Judori, CVRD	CSN, MBR, Ferteco, Usiminas, Celato Caemi, Cosigua.	Banco Interfinance, Gemon G Eng Mont, Sta. Lúcia, others	Ralph Partners, Varbra, Judori Empr. Part, Railtex, Judori, Interfêrea Brazil.	CSN, ABS, Taquari, CVRD, others	Prevision Funcef., U. de Comercio, Chase Latin, CVRD
Bid (R\$ mill.)							
Minimum bid	60.2	316.9	888.9	16.6	158.0	11.5	233.4
Actual bid	62.4	316.9	888.9	18.5	216.6	15.7	245.0
Premium (%)	3.5	0	0	11.3	37.1	37.9	4.9

(including tracks) and many other details were clearly specified in the contracts, one of the most important issues that faced the Brazilian rail industry at the moment of the privatization was the management of cross-concession traffic. Traditional cargoes, such as ores, iron and steel, needed to travel from inland to the main cities and seaports, i.e. east to west. New products, final goods and half-elaborated commodities, however, were creating an increasing need for north–south traffic, particularly to gain access to the cities of Sao Paulo and Rio, and their respective ports. Since the concessions were let on the basis of the old approach, north–south traffic needed to cross several concession areas.

Establishing a process to manage this cross-concession traffic was identified by all the players within the industry as a key issue to address, so that the growth potential of these new markets could be easily unleashed. But it was difficult to achieve an early compromise and, thus, the Brazilian concession contracts included not very detailed provisions on access rules to other networks. In general, it was expected that the interested parties would reach an agreement on these issues. If not, the government, through the Ministry of Transport, had the power to review the problem and enforce compulsory rates. Railroads were also obligated to carry joint traffic or, if they could not, to allow the connecting railroad access to its tracks so that it could complete the movement. The two railroads were to negotiate the tariffs for joint traffic, but again the government could step in to set the rates if the negotiations failed.

Although the restructuring model chosen for Brazilian railroads intended to minimize access issues by reorganizing the industry into separate and relatively disconnected networks, the horizontal separation model made it clear that in most cases a concessionaire would have to use its neighbors' tracks when carrying long-distance traffic. The government did not worry excessively about this issue during the privatization of RFFSA because the six RFFSA companies that were formed interchanged little traffic with one another. But they interchanged with the CVRD railroads and with FEPASA, and the privatization of FEPASA in 1998 (and particularly the access to the port of Santos, which included an internal rail network of about 200 km) brought the issue of joint traffic to the forefront again.

In fact, despite the historical lack of connection among several lines due to distance or different gauges, the interconnectivity issues were very important in 1995, particularly in central and southern Brazil. However, some railroads were much more dependent on joint traffic than others. For example, of the 17 million tons originating on FEPASA in 1995, almost 2.5 million tons was transferred to MRS, mostly to be shipped out of the port of Santos. From MRS' perspective, however, this cargo accounted for less than 10% of MRS' total tonnage, and even less of its ton-kilometers because they traveled only the last 22 km or so of their journey on the MRS system.

In 1999, complaints about access tariffs were common

among the carriers. FEPASA and FSA were in a tough dispute over through rates, for example, and FEPASA regarded the rates that MRS charged for access to Santos as excessive. However, no complaints had been brought to the regulatory agencies so far, which suggests that the railroads were still hopeful of negotiating reasonable solutions without appealing to external control mechanism.

As mentioned above, the general policy set in the contracts on access rights, joint traffic, multimodality, etc. favored bilateral, market-based solutions, giving again only the power of arbitrage to the Ministry of Transport. This implicitly reflected the idea that if regulatory authorities prevented the abuse on shippers then there was no need for them to also regulate the division of tariffs for joint traffic or to order one carrier to allow another access to its tracks. In theory, such matters could be handled by negotiations among the carriers, much as they would be in a normal competitive market. However, in the case of Brazil, this approach required two prequalification criteria hardly met: that the regulators were able to regulate tariffs for captive shippers and that the railroad management was experienced and sensible about negotiating joint tariffs. This final point required the management of the concessions to have a single objective, that of profits, which was not necessarily the case of Brazil, since the ownership was shared among shippers and investment funds, as shown by Table 3.

#### 4. The reform of the Mexican railroads

Railroads began operations in Mexico in the late 19th century, when several US companies used imported materials to build lines along the country's Pacific coast. The largest company, Ferrocarriles de México (FdM), became Mexican-owned in 1908 and was later nationalized in 1937. In the 1980s FdM and the remaining rail lines were incorporated into Ferrocarriles Nacionales de México (FNM), controlled by the Transport Ministry (Secretaría de Comunicaciones y Transportes, SCT), and in 1983 the Constitution was amended to formally require that the federal government owned and operated all main railway services in the country.

FNM was an integrated monopolistic railroad that provided freight services in both the national and international markets. It also provided some inter-city passenger services, but did not supply any commuter passenger services to Mexico City or any other major city. In 1996, the overall system was composed of 26,623 km of track, of which 77% were primary lines divided into three main geographical divisions, Pacific-North, Northeast and Southeast. The rest of the system formed the short lines, the network that served the metropolitan area of Mexico City and some small private lines. Like many other state-owned rail companies, FNM had developed a production-oriented, rather than a commercial-oriented culture. Although some of its operating performance indicators were comparable to

those of similar countries in the region (for example, average hauls of 2830 tons, train-lengths of 41 cars, etc.), others clearly reflected several sources of inefficiency (for example, average train-speed was only 25 km/h and average daily distance traveled by locomotives was below 250 km) related to the age and state of maintenance of track and rolling stock. Safety concerns related to the number of accidents, spoiled cargo and theft were also high.

##### 4.1. *The concessioning process*

As early as 1980, the Mexican government was aware of the deteriorating evolution of its rail sector and reckoned that its poor performance hindered the development of the country. In the period from 1982 to 1989, several institutional reforms within the existing system were attempted but they failed. President Salinas' administration (1989–1994) was marked by more significant improvements in performance, but also by a calculated ambiguity about whether the railroad might eventually be privatized. In 1992, a new Director General for FNM was appointed and he announced a Program for Structural Change (Programa de Cambio Estructural, PCE) whose main goal was to establish a more commercially oriented railroad.

The plan was designed to enhance the company's efficiency and productivity by focusing on freight transportation as the core business and eliminating some unprofitable services. Arguably, the most important PCE reform involved labor: the workforce was reduced from approximately 80,000 to 50,000 employees, largely through a program of voluntary retirements. With the unions' cooperation, moreover, the book of work rules, which had been unchanged for many years, was simplified and modified to increase labor and locomotive productivity. Under the PCE the financial performance of the railroad also improved, but not enough to reverse the trend of previous years.

When President Zedillo took office in December 1994, the Finance Ministry was reportedly disappointed with the rate of improvement under the PCE. The pace of the restructuring process was accelerated and, in February 1995, the Mexican Congress approved a new amendment to article 28 of the Constitution, which reclassified railroads as a priority activity, thus opening opportunities for private sector investment within the railway system. In May 1995, the Ley Reglamentaria de Servicios Ferroviarios (LRSF), a new sectoral law regulating railway services, outlined the general procedures for these investments and defined the conditions under which private participation in railways was going to be allowed for the first time in 40 years.

After discarding some alternative proposals, the scheme chosen for privatization involved the geographical separation of FNM's assets and operations to setup a number of route-based companies according to the pre-existing regional divisions. Each of these companies was awarded a 50-year concession title describing service conditions and overall relationship with the federal government and other

Table 4  
Some economic characteristics of Mexican concessions (source: SCT, 1996) (P, Pacific; G, Gulf)

	Pacific-North	North-East	South-East	Short-lines
Track (as a percentage of total)	30.3	19.3	10.7	38.7
Freight traffic (as a percentage of total)	46.2	37.6	8.6	7.8
Revenues (as a percentage of total)	44.7	37.1	9.8	8.4
Main cargoes	Iron, coal, oil	Corn, wheat, iron	Corn, wheat, oil	Different across regions
Major industrial cities	Mexico City, Monterrey, Guadalajara	Mexico City, Monterrey, Guadalajara	Mexico City	Several cities
Major ports	Tampico (G), Manzanillo (P)	Tampico (G), Veracruz (G), Laz. Cardenas (P)	Veracruz, Coatzacoalcos, Salina Cruz	None

private operators. The concessions could be extended for up to an additional 50-year term and, in general, they allowed to operate, exploit and, if required, build new lines with the goal of providing public railway transportation and ancillary services specified in their respective titles. Under this format, vertical integration of the different functions or services in FNM was preserved, although functions could be unbundled whenever it was deemed necessary.

After the horizontal breakup, the final stage of the privatization process was the sale of the shares owned by the government in the concessionaire companies through a bidding process open to private investors. The government decided to sell first 80% of the shares of the capital stock of each of the companies through a sealed bid auction to be won by the highest bidding consortium. The government also obliged itself to sell its remaining 20% stake in each company within 5 years of the initial transfer (Table 4).

The overall privatization scheme recognized that the main demand for rail services in Mexico came from freight carriers. With respect to passenger transport, apart from those lines already included in the concessions, several services would be privatized by assigning the concessions to companies bidding for the lowest subsidy. This process would only be applied to routes that lacked an alternative transportation mode. In other cases, passenger services would simply disappear since road transport was perceived as a generally adequate transport means for the country.

The 1995 railroad law (LRSF) kept the regulation of the privatized Mexican rail industry after the auctions within the SCT, particularly under the control of the Dirección General de Tarifas (DGT), a 250-staff regulatory body who was also in charge of tariffs (other than in railroads) and multimodal issues. However, as compared to the period when it also ruled over FNM, the regulatory functions of this body were now limited to supervise the activities of the concessions, devise the general policy for the industry and act as an arbiter in case of conflict among concessionaires.

According to the concession titles, the concessionaires were free to set their own tariffs in recognition of the extensive competition from trucks and the potential for competi-

tion among the concessions. Maximum prices were registered within the DGT, which might intervene if no effective competition existed (in this case, it also required the favorable opinion of the competition agency) or if users complained of being abused. No subsidies (except for small public service obligations) or other guarantees were granted to overcome potential losses.

Concessionaires also retained an exclusivity right to operate services and infrastructures for 30 years on their lines (18, in short lines), including the right to build new ones within their right of way. However, to counteract this monopoly power and in order to promote effective competition among operators, concessions were designed to share several common tracks around major urban and industrial areas (particularly, Monterrey and Mexico City) and several ports (Tampico and Veracruz). For these cases, concession titles included detailed mandatory access and connecting rights between concessionaires. The prices of these rights were to be bilaterally negotiated between private operators, once they started operations, although the SCT should intervene if no agreement was reached before a year or when any of the concessionaires requested it.

As shown by Table 5, the first concession offered for sale, in June 1996, was the longest of the short lines, Ferrocarril Chihuahua al Pacífico, which the government thought could constitute a low risk test of its overall bidding system. Unfortunately, the railroad was in extremely poor conditions and only one bid for US\$28 million was offered. Since this was below the government's reservation price of US\$50 million, the sale was canceled in October 1996 and it was decided that the package should be restructured to attract more potential investors.

In December 1996, the Northeast Railroad was acquired by Transportación Ferroviaria Mexicana (TFM), a consortium formed by a Mexican transportation company (Transportación Marítima Mexicana) and the US railroad Kansas City Southern Industries. With a bid of P\$11 billion (US\$1.4 billion)—almost three times the size of the runner-up's—TFM acquired 80% of the shares of the company: the first 32% had to be paid for soon after the auction, the next 48%

Table 5

The Mexican rail concessioning process (source: SCT, 1996; Diario de la República Mexicana (Official Gazette)) (SL, short line)

	Number of bidders (bid, in P\$ billion)	Winning consortium	Transfer
Ferrocarril Chihuahua-Pacífico (SL)	One bidder (0.02)	No bid above minimum	–
Ferrocarril del Noreste	ICA/Union Pacific/SBC (4.1) <i>Grupo Ferrovionario Mexicano</i> (GFM) (4.2) TMM / KCSI (11.0)	<i>TFM</i> (= TMM + KCSI)	June 1997
Ferrocarril Pacifico-Norte	<i>Grupo Ferrovionario Mexicano</i> (GFM) (4.1)	<i>FerroMex</i> (= GFM)	February 1998
U.F. Coahuila-Durango (SL)	<i>Grupo Acerero Norte</i> (GAN)/Peñoles (0.2)	GAN/Peñoles	March 1998
U.F. Nacozari (SL)	<i>Grupo Ferrovionario Mexicano</i> (GFM)	No bid above minimum	–
Vía Corta Tijuana-Tecate (SL)	<i>Medios de Comunicación y Transporte</i> (0.07)	Revoked due to no payment	–
Ferrocarril del Sureste	GAN/Peñoles/Illinois (1.3) TRIBASA (2.8)	<i>FerroSur</i> (= TRIBASA)	January 1999

within 180 days of the first payment, and the final 20% was planned to be acquired in 1999.

The second sale, announced in March 1997 was for Ferrocarril Pacífico-Norte, the most sought after of the three main lines. The concession documents allowed competitors to bid for the original Pacific-North concession alone or for a concession that also included the main connecting segment of the failed Chihuahua al Pacífico railroad (Ojinaga–Topolobamba). Although initially three consortia were interested, only one bid was finally submitted including the Ojinaga–Topolobamba line. The North-Pacific railroad was acquired by FerroMex in June 1997 for P\$3.1 billion (US\$524 million) for the 80% of capital and, as TFM had previously done, a 25% stake in Mexico City's terminal company. This consortium was formed with the former losers Grupo Ferrovionario Mexicano (74%), ICA (13%) and the US railroad, Union Pacific (13%), although ICA reached an agreement in December 1998 to sell its shares to Union Pacific. After private operations started in February 1998, FerroMex also acquired the 20% of shares remaining in government hands.

In October 1997, the short line Coahuila-Durango was concessioned for 30 years to a consortium formed by Mexican firms Grupo Acerero del Norte (GAN) and Industrias Peñoles, two of the most important shippers, whose bid of P\$180 billion was over the reservation price. The auction also included several other purchases and leases of rolling stock for about P\$20 million.

The Southeast railroad, now FerroSur, was acquired in mid-December 1998 for US\$322 million by the Mexican holding Grupo Tribasa, which also maintained interests in toll roads and airports. The winning bid for the 100% of the company was twice its only rival's, a consortium of GAN, Industrias Peñoles and Illinois Central. The main attraction of the Southeast railroad was the line connecting the port of Veracruz to Mexico City. Grupo Tribasa announced that it would not exercise the right to acquire the short line Chia-

pas–Mayab (comprising the railroads in the Yucatan peninsula), so this line was left to be privatized independently, along with the remaining short lines. The private operator took over operations in January 1999 and this transfer closed the sale of the three large companies into which the national network of railroads had been divided.

Finally, Mexico City's Terminal, Terminal Ferroviaria Valle de México, is privately managed since April 1998. As scheduled, each one of the main rail operators owns 25% of the shares (included in their auction packages), whereas the government retains the remaining 25%. At the end of 1999, a wide majority of private investors and government officials agreed that, particularly when compared to what had happened in the toll roads process, which suffered from a severe backlash (Gomez-Ibañez and Meyer, 1993; Gomez-Ibañez, 1997), railroad restructuring in Mexico constituted a fine example of transition from a model of public sector dominance to a system of private operation of an existing transport infrastructure.

#### 4.2. Main economic issues after the restructuring of Mexican railroads

The restructuring process completely changed the dominant role played by FNM in the national railroad system since the 1940s. At the end of 1999 it only operated a few short lines in the South (Vía Corta del Sur) and remained as the nominal owner of several short lines that had not been sold. Waiting for its liquidation, the company had leased most of these lines to the concessionaires of the main rail services, which received adequate compensation for public service obligations. With respect to passenger services, it was estimated that only 10 trains on FNM's lines would be operating by December 1999 (down from 61 in 1996), requiring a public subsidy of P\$164 million (US\$17 million).

On the side of the private concessionaires, it is still too early to carry out a detailed assessment of their impact on the sector's overall performance. However, the initial figures provided by the SCT seem to be positive. For example, it has been recorded that the new operators have already invested more than P\$3 billion during 1997–1998 and it is estimated that another P\$3.3 billion will be spent during 1999. According to the proposed business plan in their technical bids, the present value of investments during the first 5 years of private activity will be about P\$9.0 billion.

Several factors related to competition and access among private railroads can be identified in the Mexican railroad privatization model. The potential for this intramodal rivalry, which was one of the goals of the reform, is large but it could still be affected, positively and negatively, by three factors embedded in the system.

#### 4.2.1. *Intramodal competition favored by structural design*

When the packages of major rail lines to be concessioned and the short-lines related to them were designed, it was considered that, where possible, no concessionaire should have exclusive access to major cities (Mexico City, Monterrey and Guadalajara), industrial areas (center-north of the country) or ports (Tampico and Veracruz) (Table 4). This restriction required the mandatory imposition of trackage and haulage rights in the key routes, in order to grant a railway concessionaire access to other railways' licensed tracks, upon payment of a fixed fee. It also implied the limitation of exclusivity rights in the concession titles by not hindering other companies from operating the same routes, whenever they were willing to invest in parallel tracks.

This design was particularly difficult in the case of the North-Pacific (FerroMex) and Northeast (TFM) networks, since the Southeast was connected to them only through Mexico City. These two railroads compete with each other in the Queretaro–Mexico City line, and in the access to Tampico, Aguascalientes and Monterrey. In the border crossings of Nuevo Laredo and Matamoros, TFM faced no competition, and neither did FerroMex over the crossings in Mexicali, Nogales, Ciudad Juarez and Piedras Negras. Both TFM and FerroSur had access to the largest port in the country, Veracruz, and all three concessionaires jointly operate Mexico City's terminal.

Apparently, the effect of this intramodal competition design on the tariff levels has not been large yet. Although concessionaires must register their prices under the DGT and the SCT may intervene if 'no effective competition' exists, no major complaints have been forwarded by the shippers at the moment. Prices have increased with respect to past years, but since services and quality have also done so, it is difficult to perceive a generalized negative response. Over the competitive tracks neither the authorized (maximum) tariffs nor the effective ones seem to differ too much among concessionaires, although detailed information on this topic is difficult to obtain. Since the definition of 'effective

competition' refers to a lack of two or more rivals in the route, the risk of collusive practices could have been underestimated and its potential harm should be evaluated in the medium-term. With respect to the non-competitive routes, both the SCT and the competition agency retain a clear watchdog role and, since intermodal competition from the trucking industry is strong, no actions have been taken so far.

#### 4.2.2. *Conflicts on defining the access rights*

Although trackage and haulage rights were included in the concessions to favor competition among the operators, they could also pose several difficulties if they are not flexible enough. The 1995 LRSF law ruled that the prices of these rights were to be bilaterally negotiated between private operators, although the SCT should intervene if no agreement was reached before a year or if the concessionaires requested it. This had not happened and in June 1999 a final agreement over this issue in the most conflictive case, between TFM and FerroMex, was reached.

The huge difference in the bids made by each concessionaire and, particularly the lack of a detailed methodology on how to translate these differences into the access prices was the major controversial issue that had prevented a previous agreement. The regulations developed by the LRSF were not very detailed and only requested the inclusion of the maintenance and operating costs, the incremental costs associated to the other firm's operation, depreciation and a reasonable profit for the provider of access. Since 1999, the DGT seems to be working on a detailed methodology to implement these prices if needed, although they could possibly lack enough detailed information to cope with this task. In the future, the problems could re-emerge, not only with the short lines and FerroSur, but also with the others, since the law also provided the possibility that concessionaires could negotiate additional trackage and haulage rights. In this case, the authorities could intervene only to review the agreements entered into.

In general, the Mexican concessions cover a long period of time over which the transportation circumstances and economic environment may vary significantly. Thus, the transported cargo volume may in the future permit the coexistence of more than one carrier. Therefore, a more flexible mechanism for the assignment of trackage and haulage rights could be needed. Such mechanism should not discourage investment but rather allow the imposition of trackage and haulage rights whenever necessary and in the absence of effective competition.

To overcome such eventuality, the 1995 law allows the SCT to grant concessions to third parties, in order to provide transportation services (cargo or passengers) over a licensed track, but only after the end of the specific exclusivity period (30 years for main lines, 18 for short ones) or whenever monopolistic practices have been engaged into by the concessionaire (previous opinion from the competition agency is required). In this case, the trackage or haulage

Table 6

Some results of the Brazilian privatizations (source: Campos and Alexander, 1999) (Privatization year is assigned index 100. Output is measured in ton-kilometers (TK). Labor productivity is defined as TK per employee. Average revenue is defined as freight revenue per TK)

	1994	1995	1996	1997	1998
<b>Malha Oeste—FNV</b>					
Output	134	113	100	103	110
Labor productivity	91	76	100	190	316
Average revenue	113	107	100	85	84
<b>Malha Centro-Leste—FCA</b>					
Output	116	106	100	89	119
Labor productivity	107	87	100	185	340
Average revenue	194	109	100	97	80
<b>Malha Sudeste—MRS</b>					
Output	110	108	100	111	115
Labor productivity	70	81	100	204	208
Average revenue	229	118	100	100	101
<b>Malha Sul—FSA</b>					
Output	133	110	101	100	123
Labor productivity	43	35	42	100	102
Average revenue	194	114	100	100	90
<b>Malha Tereza Cristina—FTC</b>					
Output	60	74	60	100	111
Labor productivity	45	46	67	100	177
Average revenue	115	114	105	100	71
<b>Malha Nordeste—CFN</b>					
Output	144	109	102	80	100
Labor productivity	85	-	-	-	100
Average revenue	275	206	147	140	100
<b>Malha Paulista—Ferroban</b>					
Output	162	150	130	125	100
Labor productivity	67	69	94	95	100
Average revenue	117	108	114	104	100

rights which can be imposed do not include the right to serve intermediate points at the route subject to those rights and shall apply only for the transportation of a product or products for which feasible alternative transportation does not exist and for which the petition was made.

#### 4.2.3. *The operation of Mexico City's terminal*

A final source of potential access conflict among private operators is the ownership of Terminal Ferroviaria Valle de Mexico (TFVM), the concessionaire of Mexico City's complex 20-station network. The corporate governance of TFVM is rather peculiar, since it is jointly owned by the three main rail concessionaires (a 25% stake each). The remaining 25% (currently held by government) belongs to the future suburban rail operator. The owners are simultaneously the customers of TFVM, to whom they pay the services (not for access rights and slots, which are determined by a central traffic control). The firm apparently operates, since April 1998, with total commercial autonomy and exquisite neutrality with respect to the owners.

However, although this organizational form intended to avoid monopolistic access in the country's most densely used network, it also creates a long-run internal instability risk. A potential problem, for example, is the owners' asym-

metry (in terms of traffic volume, number of connections with the Mexico City's network and even in the price paid for their concessions). Even so, they all have the same voting power and a majority of 75% is required for all decisions. If, for example, cargo volume discounts are introduced in the future, this could create fears of discrimination and trigger conflict.

Finally, TFVM is now self-financing through its operational revenues. No additional equity was needed from owners apart from the initial disbursements and profits emerged just 8 months after starting operations, thanks to cost control and improved performance. In the future, if additional capital if needed, the owners might seek to renegotiate their stakes.

## 5. Discussion: what are the lessons to be learned?

This paper has described the main features of the two most important railway restructuring processes that have recently happened in Latin America, a region where, with few exceptions, the reforms have gone further than elsewhere in the world in terms of private participation. The Brazilian and Mexican cases represent rail industries similar to several medium-size European countries, that were completely dominated by a major government-owned monopoly before the restructuring and opted by a wide scale concessioning process as the main mechanism of reform. The changes have sought to increase private operators' participation in the sector while retaining a crucial regulatory role for the government.

Table 6, which compares some performance indicators across the Brazilian concessions, suggests that operating results (output and productivity) improved in general after the privatization year, although it is difficult to attribute this effect to purely technical, operational improvements or to newly-generated demand. The same could be said in the Mexican case, where, despite the availability of less information, it is known that in 1998 and 1999, total volume of freight handled by the overall rail system increased by 21.5% with respect to 1997 figures. Although in all cases the concessionaires' financial position immediately after taking over was very weak, one of the most important lessons from Brazil and Mexico is that concessioning can reverse the deteriorating trend of the industry. Domestic and foreign companies in Brazil and Mexico demonstrated that even a narrow private capital sector can be quickly mobilized under long-term concessioning contracts. This may be the only alternative when governments need funds to pour in the transport sector without compromising too much other sources of public expenditure or when legal restraints preclude other forms of private participation.

However, the long-term viability of concessioning or any other privatization approach depends on surviving the initial years of difficult economic conditions, which are highly affected by many competitive factors new to the industry

and the quality of management of the resulting concessionaires. It is probably too early to make such a judgment on the Brazilian and Mexican cases and, in general, these success factors cannot be predicted in advance with certainty. What the cases suggest is that they can be partly anticipated from the form under which the auctions and the transfer of railways to private hands take place. In Brazil, many shippers cross-participated in different winning consortia, thus creating incentives to collusive or predatory behaviors. In Mexico, the design of the concessions relied too much in bilateral negotiations among the concessionaires. Therefore, the regulatory role of the government after the restructuring process is always embedded in such process.

As a consequence, the third lesson is that changes should be addressed with clear rules, in an open, contestable, simple, and easily understood way. Unless it is effectively managed, the design of concessions, for example, can become a contentious and politicized aspect of the privatization process and can slow it down or even derail it. Railway concessions are always difficult to value. Unclear or conflicting criteria may engender miscalculations on the part of bidders. The idea is that getting it right is more important than getting it done. As shown in Mexican case, if a first round bid is unrealistic, a second round may be needed or the government may need to sweeten the concession by assuming additional liability or be investing in concession prior to privatization. Concessioning is not necessarily a one-shot process. In addition, not all private sector ventures succeed, even under the best of circumstances. Hence, it is important to have a fallback plan for re-concessioning should the first attempt fail.

Finally, and in particular reference to post-privatization problems such as access prices or track-usage rights, the main lesson to be learned here is that they derive from the privatization model. Both Mexico and Brazil opted for horizontal separation schemes that limited and controlled the

number of interconnections among the concessionaires. They showed that access issues and charging principles can be setup in concession contracts, proving that, in principle, these complicated issues can be addressed through ex-ante negotiations. The role of the government could be then limited to arbitrage. However, this solution might not work when capacity is limited and congestion relevant, something that only occurs in few areas in Brazil and Mexico, but not in other parts of the world.

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