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Origin, development, and demise of the Empresa Nacional de Ferrocariles (ENFE) in Bolivia, 1965-1995

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After the nationalization of British railways, the Bolivian state sought to re-organize the railway sector. At the suggestion of the World Bank, ENFE was created in 1964 and started operations in 1965. The paper analyzes ENFE's creation and how it developed into the manager of a railway network, previously run independently by 4 private and 5 state companies. It studies the structure, growth, and modernization of ENFE in the context of state capitalism in Bolivia until the advent of the market driven neoliberalism of the early 1990s when it was privatized with the support of the World Bank in 1995. The paper highlights the importance of railways in the Bolivian economy, how ENFE fared with road competition, and met freight and passenger demand. The experience of ENFE, where possible, is compared with that of other state railway companies in Latin America. The main sources are ENFE annual reports, World Bank loan documents and correspondence from the World Bank Archives, transport studies, and a partial review of the press. The paper is the first research article on this important state-owned enterprise (SOE). It seeks to assess ENFEs' impact on Bolivian economic development and contribute with a study of an SOE to Bolivian economic history.

Introduction

Like the start of railways themselves, railway nationalization and the creation of a state-owned railway company arrived in Bolivia later than in the rest of Latin America.[1] While a laggard in railway development, Bolivia was a trailblazer in railway privatization. In 1996 it was the second country, together with the UK, to have all trains running in the main lines in private hands (Thomson, 1998, 152).

With only 3.300 km of track, the Bolivian railway system was small relative to other countries in the region. Nevertheless, for this mountainous, landlocked country of just over one million square kilometers (equivalent to the area of Spain and France), railroads were (and still

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[1] Railways arrived in Bolivia in 1889 trough private investment, making it the last Latin American country to have a railway connection, see list in Thomson and Angerstein (2000, 27). Similarly, nationalization and the creation of a state railway company in 1964 came much later than in Mexico (1937 and 1941), Argentina (1948 and 1956) and Uruguay (1949 and 1952).

are) a vital means of transportation and the best way to haul commodities like the minerals and agricultural products that made up almost half of export dollars. They are also Bolivia's lifeline to the Pacific and Atlantic oceans and thus to global trade networks. While railway systems started shrinking in most Latin American countries in the 1950s, in Bolivia they expanded. By 1980 Bolivia was the country with the third highest length of track in km per 1.000 inhabitants in Latin America, only after Argentina and Uruguay (Contreras 2022, 67).

This paper analyzes the development of the state railway company, ENFE, from its creation in November 1964 to its privatization in 1996. Hence it covers ENFE's actual operation during 1965 – 1995.[2] ENFE had three major loans in the seventies from the World Bank who became a key player in railroad development in Bolivia. Indeed, World Bank loans in other areas also supported ENFE in the eighties and in the early nineties the World Bank collaborated in crafting the privatization of all major state-owned enterprises amongst which was ENFE. The main sources used in this paper are ENFE annual reports, World Bank loan documents and correspondence from the World Bank Archives, transport studies, and a partial review of the press.

The paper is divided into six sections. We begin with a brief background of railway development before 1964 and provide context for railway nationalization and the creation of ENFE. The second part briefly covers the period 1965-1970 when ENFE was being established and highlights the organizational challenges it faced. The third part offers an overview of the development of ENFE's network and traces the evolution of freight and passenger traffic from 1965 to 1995. The fourth part analyses six key areas of ENFE: (a) track maintenance, (b) workshop and equipment maintenance, (c) rolling stock availability, (d) labor productivity, (e) financial performance, and (f) investment and technical assistance. Wherever possible we contrast and compare ENFE with other Latin American experiences. The fifth part asks the question: was ENFE up to the task? And did it enable or hamper Bolivian economic development? Finally, part six draws conclusions and identifies further areas of research.

1. Background and origins

Like in most Latin American countries, railway development in Bolivia was synonymous to economic modernization and their construction was paramount in the political discourse. Railways were a key component of nation building. It was silver mining that promoted railway construction in the nineteenth century and tin mining that fueled their growth in the twentieth century. The arrival of the railway constructed by the Antofagasta (Chili) and Bolivia Railway Co. (FCAB) to Uyuni from the Chilean border at Ollagüe in 1889 and its continuation to Oruro in 1892 marked the beginning of Bolivian railway development. It was also Bolivia's first connection to the Pacific (see Figure 1)

Railway development in Bolivia can be roughly divided into three periods that correspond to three different objectives. The first period (1889-1915) was export driven and sought to communicate Bolivia with the Pacific. In addition to the FCAB lines there were two other efforts to connect Bolivia to the Pacific. In 1901 the Bolivian government started the first state railway

[2] ENFE was privatized on December 15, 1995 and transferred to the private sector in March 1996 (Jemio 1994).

Figure 1. Railway map of Bolivia 1967

Source: ENFE 1967

from the port town of Guaqui in Lake Titicaca to La Paz. From Guaqui cargo was ferried across Lake Titicaca to Puno in Perú where it was transferred to the Peruvian Corporation railway to reach the port of Matarani. It was completed in 1904 and the Bolivian government sold the Guaqui-La Paz railway to the Peruvian Corporation in 1910 to cover debts and fund other railway construction. The third connection to the Pacific was the Arica-La Paz railway constructed by Chile under the 1904 Peace Treaty as part of the compensation for Bolivia's loss of access to the Pacific because of the War of the Pacific (1879-1883). This railway was completed in 1913 and was managed by Chile until 1928, when the Bolivian section was transferred to the Bolivian government. During this period other important railways were the: Oruro-Viacha line completed in 1913 (that arrived in La Paz in 1917), the Rio Mulato-Potosí line completed in 1912, the Uyuni-Atocha line completed in 1913, and the Machacamarca-Uncia line built by Patiño (1911-1921). The latter three were important feeder railways to the Oruro-Uyuni-Ollague line to Antofagasta, Chile. The Oruro-Viacha, Rio Mulato-Potosí and Uyuni-Atocha were constructed by the Bolivian Railway Co. (BRCo.) set up in 1908 to implement the Speyer Contract that sought to implement the National Railway program of President Montes (1904-1909 and 1913-1917). Finally, the government completed the line to Argentina by continuing the railway line from Atocha to Villazón (1915-1925).

The second period of railway development overlaps with the first and is roughly from 1905 to the early 1930s and was made up of railways focused mostly on internal communication that sought to appease different regional interests. Except for the Oruro-Cochabamba railway (1909-1917) built by the BRCo., the rest of the lines under this category were built by the government. In 1905 it started the construction of the La Paz-Yungas line to open the Yungas agricultural region and eventually reach Beni. In 1915 the government began the Potosi-Sucre line. Similarly, it started the Cochabamba-Santa Cruz railway in 1928 that sought to communicate Santa Cruz and integrate the eastern lowlands to the rest of the country.

The third period was from the Chaco War (1932-1935) to the nationalization of the FCAB and BRCo in 1964 and the creation of ENFE. During this period Bolivia developed its Eastern network around Santa Cruz. By means of bilateral treaties with Brazil and Argentina in exchange for oil, Bolivia financed the construction of the Santa Cruz-Corumba line (1938-1955) to Brazil and the Santa Cruz-Yacuiba line (1944-1957) to Argentina. Both lines were the ones that took longest to build and were amongst the expensive ones too (Contreras 2022).

After a period of steady growth in the 1950s, Bolivian railways entered a crisis. With the Stabilization Program of 1955 that sought to control inflation both freight and passenger traffic decreased, and railways started to lose money. In the case of the FCAB and BRCo, they were additionally affected because they no longer received dollars at a preferential exchange rate to buy supplies and make profit remittances to London. Moreover, there were more union demands for greater salaries to meet inflation, additional social benefits increased the wage bill, and it was the FCAB and BRCo were not allowed to reduce staff to meet the new traffic slump. As they were unable to get tariff increases to meet rising costs and could not resolve labor redundancies, the FCAB and BRCo stopped operating their lines in February 1959. The state intervened and managed the British railways through the Direcccion General de Ferrocarriles (DGF) from February 1959 to xxx 1962. The operation of the railways proved complex, deficits continued, and the labor situation worsened as unions virtually overran management. As a result, and at union request, the government negotiated a management contract with the FCAB for the private administrators to manage the railways on behalf of the government until the contract ran out at the

end in 1964. It is under this context that the FCAB and BRCo were nationalized and ENFE was created in October 1964 (Contreras 2022 and 2023).

2. The initial challenges and constitution of ENFE as a state railway company

The first challenge that ENFE faced in 1965 was to create a coherent organizational unit from two British companies (FCAB and BRCo) under the single management of FCAB since 1909, and 6 state controlled lines, each with their own organizational culture and operational modalities. Although the Bolivian state had railway lines under its property since 1904, there was no proper national railway company in Bolivia unlike other countries, for example Chile which had a formal state railway company, the Empresa de Ferrocarriles del Estado, since 1840 (Guajardo, 2007). Instead, each state railway line was run by a superintendent that reported to the DGF, with no formal authority to coordinate and avoid superpositions. Hence the task to constitute a central state railway enterprise was significant.

The absence of coordination and planning was such that, for example, El Alto and Viacha (23 km) were served by three different railway lines: one under the control of the Ferrocarril Guaqui La Paz of the Peruvian Corporation, another by the state Arica-La Paz railway and the third by the FCAB. La Paz and El Alto, on the other hand, were communicated by two railway lines: an electric 9 km electric railway used by the Guaqui-La Paz and an 18 km one used by the FCAB and the Arica-La Paz (SOFRERAIL 1962,15). Thus, there were immediate benefits from consolidation such as the common use of locomotives, rolling stock and of railway stations previously used by various companies, where work was optimized (ENFE, 1965 2).

From an organizational viewpoint, ENFE started by centralizing accounting and the management of internal supplies. A new accounting ledger was developed, and a new principal Storage Department was set up able to centralize purchases and improve the management and distribution of supplies (Mamani Flores 2021, 159-160). Since its creation on October 1964 ENFE was administered on a departmental basis. In 1969 there was a project of administrative rationalization and based on it, in 1970 the new Estatuto Orgánico (Statues) were approved based on a functional approach (ENFE 1969-70 10).

Operationally, there were two major changes: the line from La Paz to Chuspipata (67 km) on the La Paz -Yungas railway was closed because it was uneconomic to run (this was one of the SOFRERAIL recommendations); and, as pointed out above, ENFE received the line from Santa-Cruz to Corumbá, in July 1965 in a very poor state. Rail platforms were eroded, sleepers were in bad condition due to their poor quality and untimely renovation; over 70 km of rails needed to be changed. Power and rolling stock were no better: of the 29 locomotives, 13 were out of service, 11 were awaiting repairs and only 5 were available. All locomotives were powered by wood. Eight of the 13 passenger cars were out of service and many of the 244 wagons needed repair (ENDE, 1965, 122).

The startup and consolidation of ENFE had to be accomplished in a context where cargo had decreased significantly and there had been major labor unrest and discipline in the FCAB and BRCo. The reports of the erosion of managerial authority and the interference of union representatives in the daily running of the company were common since the early 1960s. This opinion was was widely shared among a Bolivian commission set up to analyze the FCAB and BRCo railways, World Bank personnel who visited Bolivia and the SOFRERAIL mission set up at the World Banks recommendation to analyze the railway situation in Bolivia. There was also

the issue of an excessive work force. Despite the reduction of workers in the FCAB and BRCo in the first half of the 1960s, labor productivity was low. Another challenge was redeploying personnel amongst the different lines previously managed by different companies. During 1965, 585 employees were retired and in 1966, another 314. Thus, the total labor force was reduced from 4.944 in 1965 to 4.630 in 1966. ENFE also benefited from the new labor legislation enacted by the new government that not only allowed it to reduce the number of unions from 40 to 9, but also enabled ENFE to let go of "extremists and professional anarcho-syndicalist" elements (Mamani Flores 2021, 160-1961). By 1967, however, the total labor force had increased to 4.768, of which 201 where medical staff (ENFE 1967, 119).

ENFE streamlined medical attention for its personnel and the 97 teachers and 2.455 students under the responsibility of the different railways lines it inherited where transferred to the Ministry of Education in 1966 (ENFE 1965, 46-47).

A major challenge to meet freight and passenger traffic was to enhance the locomotive and rolling stock deficit. This was accomplished by purchasing the first diesel locomotives from Japan in and diesel passenger ferrobuses from Germany in 1966.

The Bolivian government had requested the help of the World Bank in the early 1960s. It was not able to materialize until 1971 because first ENFE had to be created and secondly the indemnification of the nationalization of the FCAB and BRCo had to be settled and this was not accomplished until 1967.

The situation was complex, yet, as we will see in the following section ENFE met the challenges of responding to increased traffic and passengers. How this was achieved is addressed in section 4.

3. Overview of ENFE network development, freight, and passenger traffic, 1965-1995

ENFE started with 2.135 km of track, covering the mountainous, altiplano (high plateau) and valley regions of Bolivia, that was going to be known as the Western network. It was built on the railways of the FCAB, BRCo and the 6 state lines shown in Table 1. During the first year of operation, on July 1965, ENFE took over the Santa Cruz-Corumbá railway to the Brazilian border, previously managed by the Brazilian-Bolivian Railway Commission since its completion in 1955. And so, it inaugurated its Eastern network, centered around the city of Santa Cruz, in the lowlands. The Eastern network was expanded to include the Santa Cruz-Yacuiba line to Argentina in November 1968, managed by the Argentina-Bolivia Railway Commission since its completion in 1957. Thereafter, in the Western section, the Peruvian government nationalized the Peruvian Corporation and transferred the Guaqui-La Paz line in 1973 to the Bolivian government, who in turn assigned it to ENFE. Finally, in 1987, the Machacamarca-Uncía line originally owned by Patiño Mines was transferred from the Corporación Minera de Bolivia (COMIBOL) who managed it since the mining industry nationalization in 1952. ENFE further received the Santa Cruz-Yapacani line in the second half of the seventies that became part of the Eastern network. They had been constructed by the Mixed Bolivian Argentine commission in the early seventies (Table 1).

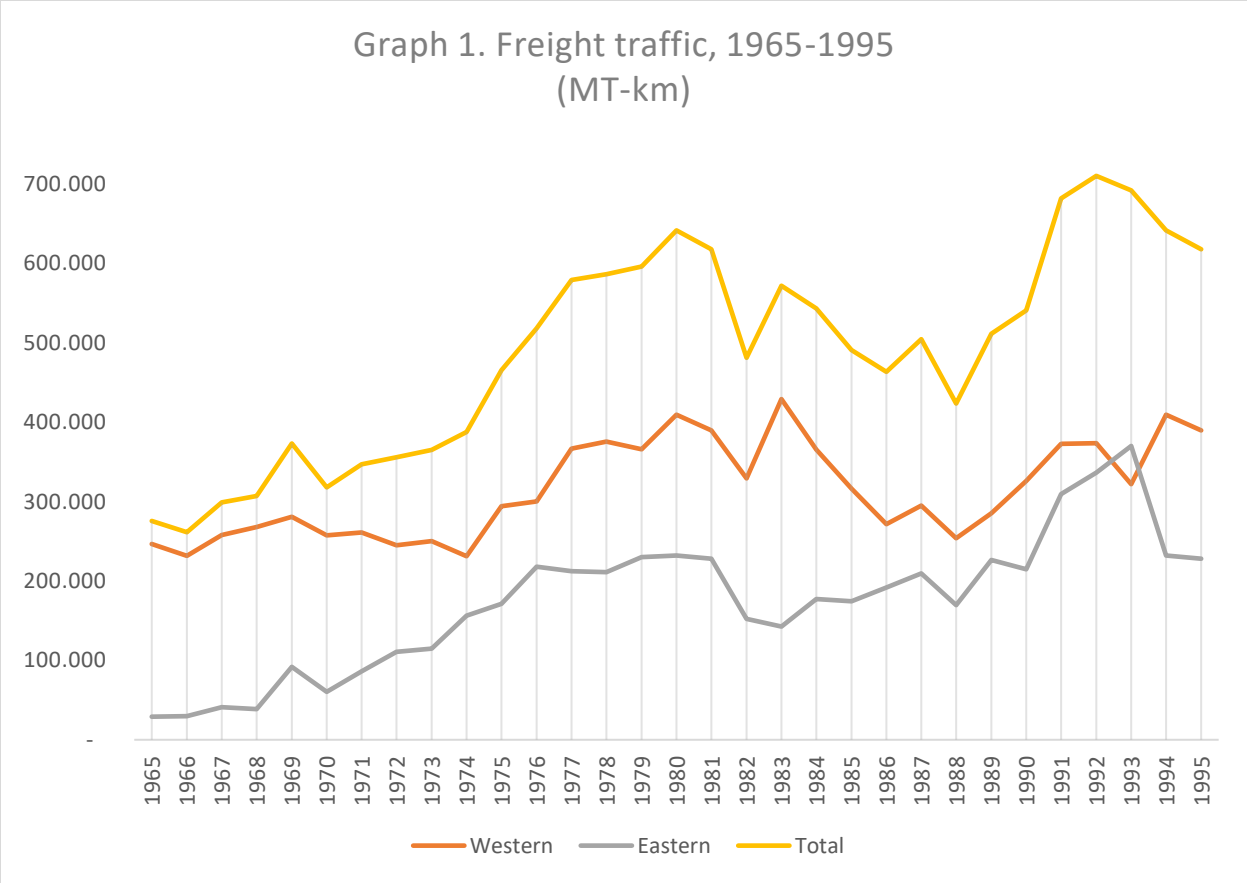
Table 1. Expansion of ENFE's network from its creation in 1964 to 1987

Year and month of incorporation	Western Section	Eastern Section
1964 (November)	Ex-FCAB **527 km** La Paz – Viacha (41 km) Oruro – Uyuni (313 km) Uyuni – Collage (173 km) Ex-BRCo **671 km** Oruro – Viacha (202 km) Oruro – Cochabamba (205 km) Rio Mulatos – Potosí (174 km) Uyuni – Atocha (90 km) State lines **937 km** La Paz – Charaña (241 km) La Paz – Chuspipata (67 km) Cochabamba – Tintin (179 km) Atocha – Villazón (198 km) Potosí – Sucre (174 km) Sucre – Tarabuco (78 km) **Total 2.135 km**	
1965 (July)		Santa Cruz – Corumbá (643 km)
1967 (November)		Santa Cruz – Yacuiba (539 km)
1973 (October)	Guaqui – La Paz (97 km)	
1976 (July)		Santa Cruz – Santa Rosa (95 km)
1978 (August)		Santa Rosa – Yapacani (100 km)
1987 (February)	Machacamarca – Uncía (106 km)	

Source: ENFE (1993)

The different geographic, construction and system characteristics between the Western and Eastern networks are best illustrated by the fact that while in 1992 in the Western network passenger trains carried 347 tons and freight trains 511 tons, in the Eastern network passenger trains carried 342 tons and freight trains 902 tons. This is because in the Eastern network there is only one node (Santa Cruz), rail tracks are straight, with wide curves and very low gradients (Banco de Inversión n.d., n.p.).

The Western and Eastern networks were never interconnected and continue to be so until today, because many feasibility studies of finishing the Cochabamba-Santa Cruz line have shown its economic unviability (Contreras 2022). The two systems could connect via a 600 km detour through Argentina.



Source: ENFE (1993)

As shown in graph 1, from 1965 to 1980 there was a steady increase of freight traffic with an annual growth rate of over 7% (Table 2). During the eighties, traffic declined, at a rate of 2.5% per annum. The 30% decline in 1982 was due to the economic crisis (WB 1986 11). Despite this overall decline, average yearly freight was 525.102 tons-km during the eighties and was higher than the average in the preceding decade. In the first half on 1990s, cargo increased again reaching an all-time high of 710,411 ton-km in 1992 before it started its final descent. Between 1990 and 1995 the annual rate of growth was modest (2.7%) yet average annual cargo was the highest during ENFE's existence and was 2.1 times greater than what it had been in ENFE's first five years (Table 2).

Overall, cargo in the Western system had a slow annual growth rate of 1.5% over 1965-1995 and it transported more cargo than the Eastern system, except for 1993 (Graph 1). The Eastern system, on the other hand, had a robust annual growth rate of 7.5% from 1965 to 1995. By 1995, it accounted for 37% of total cargo transported by ENFE, after a severe drop from 1993, when it accounted for 53%. Freight traffic on the Eastern network experienced, until 1981, considerable variations on a year-to-year basis, mostly brought about by movements in the sugar export markets.

So, as far as freight traffic is concerned, ENFE managed to increase output over the whole period, with the caveats outlined above.

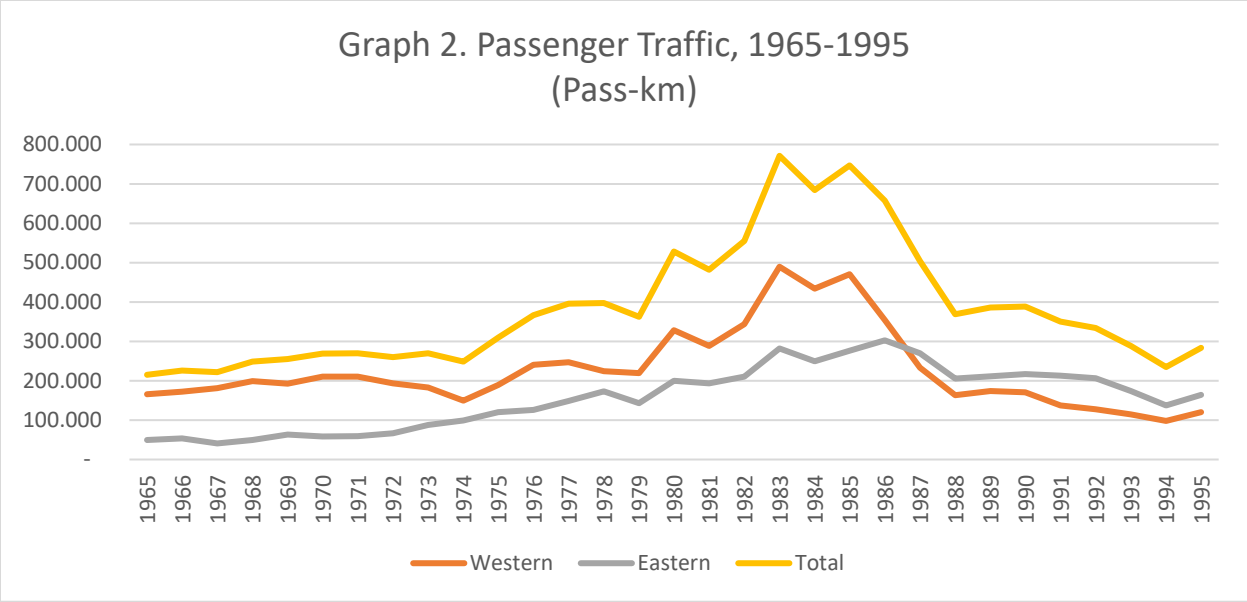
Table 2. Average annual freight transported by ENFE and growth rate, 1965-1995.

	Average	Standard Deviation	Rate of Growth
1965-1969	303,326	43,046	7.8%
1970-1979	452,004	110,295	7.2%
1980-1989	525,102	68,694	-2.5%
1990-1995	647,595	62,363	2.7%

Source: same as Graph 1.

Graph 2 traces the evolution of passenger traffic and shows the steady rise until 1983 and the subsequent decrease thereafter from which it never recovered. Notice too that after 1987, it's the Eastern system that transports the greatest share of passenger traffic in large part because of the absence of road transport competition in Santa Cruz.

Table 3 breaks down the passenger traffic into decades and we can see that average annual passenger traffic increased until 1980-1989 when it reached 568.239 km-passenger, thereafter there was a decrease at a rate of – 6.1% per annum, the largest negative growth rate ever. While the Western system transported less passenger-km in 1995 that in 1965, the Eastern system was able to increase from 49,291to 164,000 passenger-km during the same period. Overall, ENFE transported slightly more passenger-km in 1995 than in 1965 (215,169 vs. 284,0000).



Source: ENFE (1993)

Table 3. Annual average passengers transported by ENFE and rate of growth, 1965-1995

	Average	SD	Rate of Growth
1965-1969	233,317	17,598	4.4%
1970-1979	314,895	59,531	3.4%
1980-1989	568,239	141,709	-3.4%
1990-1995	313,240	54,718	-6.1%

Source: same as graph 2.

4. Key areas of ENFE's performance

Like many state railway companies, ENDE in the early seventies showed "poor operations with a low traffic density, poorly maintained and over-age equipment, lack of experienced management and a low standard of staff training, lack of commercial policy, an inadequate level and structure of tariffs, uneconomic lines and services, and excess staff." (Word Bank, 1972 i). In this section we will analyze these issues to see how ENFE addressed them and how it fared in the process.

(a) Track maintenance

In 1960, 76% of Bolivia's track was over 40 years old and 97% of sleepers where directly on the soil base without ballast (CEPAL 1965, 9). Sleepers were mostly wooden, interspersed with steel sleepers. Only in the Rio Mulatos-Potosi line 95% of sleepers were steel (SOFRERAIL 1962, 48). The poor quality of the track was the principal deficiency of the railroads which was mainly the result of insufficient maintenance (Wilbur Smith, 1981, vol 1 p. 164)

Sleeper renovation and ballasting were two main challenges faced by ENFE. Despite annual sleeper renovation efforts that were always under the programmed objectives, after a decade of operation 70% were rotten and needed to be replaced. Graded ballast, on the other hand,

was still practically nonexistent (WB 1975 Annex 5 p. 1). By the end of 1979, only 433 km (12%) of the total ENFE system of 3,643 had been rehabilitated and brought up to a standard permitting efficient operation (Wilbur Smith, 1981, vol 1 pp. 38 and 164). During 1980 to 1983, an additional 290 km were rehabilitated (WB 1986, 22). Track rehabilitation reduced the costs of track maintenance and train operations. Also, improving the condition of the track, reduced the risk of derailments and other accidents.

Another area where rehabilitation was required was in bridges. In the mid-seventies 36 bridges (with 112 spans) where purchased to replace existing ones on the Uyuni-Ollague line, but only 21 (with 50 spans) where in place by 1980 (WB 1980, 13).

Efforts to ballast the railway lines met with permanent supply problems and ENFE had to invest in equipment to its own. Ballast provision issues were a bane over the life of ENFE.

(b) Workshop and equipment maintenance

Maintenance of equipment was identified by the World Bank as "one of the weakest areas of ENFE" in 1970. "It was performed in too many shops: four on the Western System and two in the Eastern System. Workshops [were] old and facilities unsuitable to repair modern equipment. Additionally, labor lack[ed] basic training to carry out maintenance in an efficient and modern way, mainly in the field of diesel locomotives and railcars." Hence ENFE agreed to reduce workshops in both systems to three in 1976 and specialize Viacha for diesel locomotives and railcars, Uyuni and Roboré for passenger and freight cars (World Bank 1971 Annex 6 p. 2 and Annex 14 p. 3). However, workshop rationalization was only partially achieved and although modernized with new machine tools, infrastructure, and other equipment with the World Bank loans of 1975 and 1977 by 1990, the Japanese Cooperation Agency (JICA), once again highlighted the poor state of equipment in the workshops and the low inventories of spare parts. It underscored the absence of adequate maintenance (JICA, 1990).

Rehabilitation of motive power and rolling stock is fundamental to improve operations. The operational performance of ENFE was poor until 1975 because of delays in the rehabilitation of diesel locomotives, which adversely affected productivity indicators. The efficiency of diesel motive power declined to its lowest point since 1968 in October 1973, when the availability of locomotives was 44% in the Western Region. Freight car availability reached its lowest point (75% for the Western Region and 42% for the Eastern Region) in 1974 (WB 1980, 16).

(c) Locomotive and rolling stock availability

Table 4. ENFE locomotive power and rolling stock, selected years

	1965			1970			1975			1980			1990		
	West	East	Total	West	East	Total	West	East	Total	West	East	Total	West	East	Total
Steam locomotives in fleet	100	13	113	55	37	92	32	13	45	-	-	-	-	-	-
Steam locomotives in operation	60	5	**65**	32	22	**54**	17	6	**23**	-	-	-	-	-	-
Mainline diesel locomotives	-	-	-	20	5	**25**	20	1	**21**	36	18	**54**	33	18	**51**
Availability (%)	-	-	-	75	60		20	1		72	72		51	69	
Shunting diesel locomotives	-	-	-	4	-	4	4	5	9	7	2	9	4	2	6
Number of diesel railcars	-	-	-	10	2	**12**				8	6	**14**	8	6	**14**
Availability	-	-	-	56	56		70		70	57	55		57	41	
No. of passenger cars	140	13	**153**	130	68	**198**	89	13	**102**	103	68	**171**	100	35	**135**
Availability (%)							59	62	60	68	60		85	75	
No. of freight cars	1,284	144	1,428	1,359	484	1,843	922	235	1,157	1,483	810	2,293	1,519	754	2,273
No. of serviceable freight cars	-	-	-	-		**1,370**	841	152	**993**	1,207	623	**1,830**	1,203	636	**1,839**
Availability (%)	-	-	-	-		74	92	65	86	81	78	80	79	87	

Source: 1965: ENFE (1966); 1970: WB (1975, Table 1); 1975: (WB 1977, Table 2); 1980 ENFE (1981); 1990: ENFE (1991).

Table 4 shows the gradual increase of rolling stock in ENFE and the transition from steam in 1965 to a combination of steam and diesel traction in the 1970s. By 1968, 60% of the railway's lines were running under diesel and this represented 80% of the cargo (ENFE 1968, 41). The expectation was to eliminate the use of steam engines by 1977. Savings in fuel, maintenance, and labor yield expected to yield a return of 18% in the dieselization scheme (WB 1971, 14).

By 1980, ENFE was running fully with diesel locomotives, when it had 54 diesel locomotives. This not much change over the next decade. There is no major change in passenger cars, and it is thorough the ferrobusses (or diesel rail cars) that ENFE was able to face the increase in passenger traffic in the 70s and 80s. Freight cars also increased slightly. From around 1400 in the 1965 to 1800 in 1890 and 1990.

ENFE made up for its lack of sufficient rolling stock by borrowing from neighboring countries. In the second half of the 1960s.[3] This practice continued in the 1970s and 1980s. In the seventies, for example, the Eastern Region was able to compensate for the shortage of motive power by renting locomotives from Brazil and Argentina. An average of six rented locomotives were in operation in the Eastern Region between 1973 and 1977, and both regions rented freight cars from neighboring railways. Rented cars carried over 70% of the ton-km in 1974, and the cost was over US$1.0 million, but, with the delivery of the new cars purchased under the first loan, the cost of rentals decreased to US$400,000 in 1975 in spite
of the increase in traffic volumes. (WB 1980 16)

(d) Labor

As pointed out, ENFE started with excess staff in 1965 and one of its permanent challenges was to meet the staff reduction agreements it made with the World Bank. Original staff reduction agreed targets in the first World Bank loan in 1971 required reducing the staff from 6,200 to 5,500 by 1975. They could not be met and were revised in 1975, and the revised target, which required reductions to 6,000 by 1978, was achieved by the middle of that year (WB 1980, 22). Subsequently, the target was to reduce staff to 5,740 in 1981 yet in 1983, the number of employees was still 13% above the agreed target (WB 1986 13).

Labor costs amounted to 55% of operation expenditures in 1966 and 1977 (ENFE 1967, 16; 1978, 33) and hence were an important item in the overall production costs. Table 5 summarizes ENFE's different efforts at streamlining its labor force, with mixed results. Ultimately, union pressure ended up making them unapplicable or only partially implemented. ENFE had also to accommodate new employees every time it was assigned new railways to run. Notice that in most cases resources for retiring older personnel and dismissing the redundant ones was met by World Bank loans.

[3] During 1965 rentals amounted to $us 197.000 (ENFE 1965 74). In 1966 the expenditure in renting locomotives and interchanging freight cars amounted to $us 239.000 (ENFE 1966, 46). In 1967, seven locomotives were rented from the FCAB Chile for a yearly rent of 11,520 pounds, cars for $us 66.000 and other companies $us 147.400 (ENFE 1967 62)

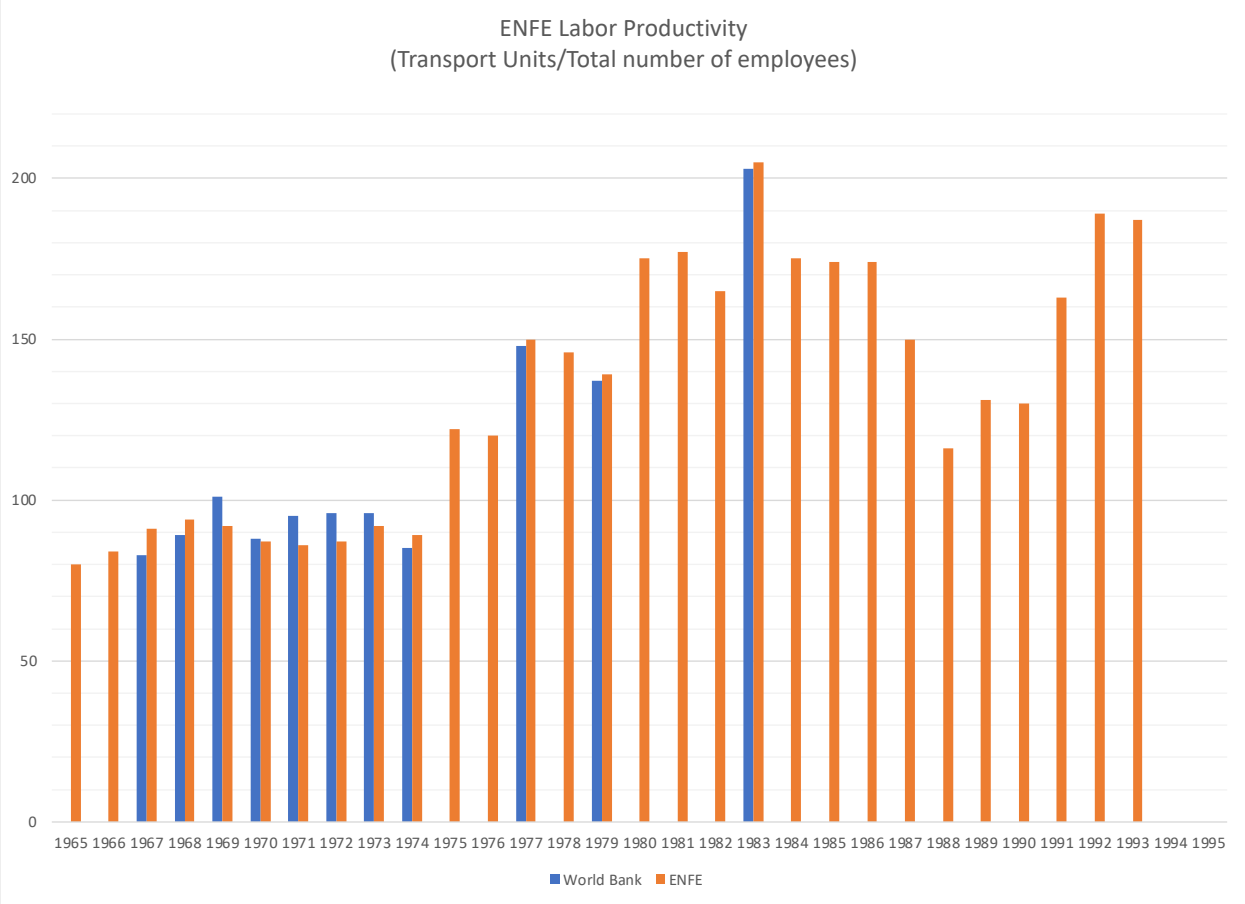
Table 5. ENFE labor reduction programs, 1969-1993

Year	Purpose	Result
1969	Reduction of 100 managerial positions	Union political and social pressure increased 300 new employees
1973	Rationalization of 150 salary levels to 36	Wage bill was increased
1976	SOFRERAIL developed a human resource rationalization plan to reduce 500 employees over 5 years	Union pressure resisted and instead 211 temporary employees were incorporated to the permanent workforce in 1979. The workforce in the Eastern network was increased on account of the new diesel locomotives
1981-1982	ENFE presented a rationalization plan to reduce 990 positions with a $us 7 million loan from the World Bank ($us 5.5 million for redundancy payments and $us 1.5 million to pay arrears to the Railway Social Security)	990 positions where reduced but effects were neutralized by re hiring of employees allegedly removed for "political" reasons. Moreover, railway workers from the Santa Cruz-Yapacani line were absorbed into the ENFE wage bill.
1986	Absorption of 153 workers from the Ferrocarril Machacamarca Uncia (FCMU) to ENFE	Increase wage bill and no increase in production as the FCMU was not operational.
1991	ENFE committed to reduce 2.000 employees: 1.000 into retirement and 1.000 redundant. Government assigned $us 10 million from Structural Agreement Credit (SAC) from the World Bank	By 1992, 1.400 workers were removed.
1993	Improve productivity	1.606 employees retired and their social benefits amounting to Bs. 36 million were covered by the SAC. Wage bill was reduced by 32%.

Source: Banco de Inversion (n.d, n.p).

ENFE staff productivity, measured in traffic units (passenger-km plus ton-km) per employee, was around 90.000 in the second half of the 1960s and was low relative to other meter gauge railways (East Africa: 125.000, Belgrano line in Argentina: 115.000) (WB 1971 8). As shown in graph 3 labor productivity increased from 1974 to 1983 as labor was redeployed and traffic increased. And, by 1975 it had reached 125.000 traffic units per employee and so overcame the productivity benchmarks of both East Africa and the Belgrano line in Argentina set by the World Bank in 1971. By 1993, however, ENFE's staff productivity of 187.000 was once again below that of the Belgrano line which by then had reached 624.000 (Thompson 1997, 14).

Graph 3



Source: 1965-1993 ENFE (1990), World Bank estimates taken from World Bank (1972, 1975, 1980 and 1986).

According to the Transport Survey, in 1981, employee productivity was low, "partly due to a lack of technical training and partly a result of continuing employment of over-aged staff on strenuous manual work." Hence it was argued that "better incentives to employees, coupled with more accurate measures of the performance of the different workshops and teams" would improve employee productivity (Wilbur Smith, 1981, vol. 2 323).

ENFE's labor productivity compared to Argentina's state railway company, Empresa de Ferrocarriles del Estado Argentino (EFEA), is summarized in table 6. Although lower than EFEA's, ENFE's relative productivity improved from 1965 to 1974, when it was about half the labor productivity of EFEA, to the early eighties when it hovered between 80% and 90% of EFEA's.

Table 6. Labor productivity in ENFE and EFEA, selected years (in 000 traffic units per employee)

Year	ENFE (Bolivia)	EFEA (Argentina)	Ratio ENFE/EFE
1965	80	175	0.46
1969	92	189	0.49

1970	87	181	0.48
1974	89	187	0.48
1980	175	217	0.81
1983	205	222	0.92
1986	174	208	0.84

Source: ENFE (1990), EFE: Muller (2016, 6).

(e) Financial performance

By 1971 ENFE faced a deficit of $us 4 million which was only partially covered by the government. This was the result of increased highway competition for internal traffic; a decrease in real terms of revenues per ton-km (because of tariffs were not increased sufficiently since 1959); rising costs; and poor operating performance (Word Bank, 1972 i)

To measure financial performance, we use the working ratio which compares the operating expenses to the operating revenues. So, a working ratio below one indicates that operating expenses are below operating revenues, which would be viewed as positive. Working ratios above one, on the other hand, signify that operating expenses are more than operating revenues and hence the enterprise is facing an operational loss. In the case of ENFE, for example, poor financial performance was due in part because tariffs were low and could not keep up with local inflation (WB 1980, 18).

Table 6. Working ratio (operating expenses / operating revenues), 1961-1995

Year	West	East	ENFE (1965-1979)	Year	West	East	ENFE
1961	1.35	-	1.35	1980	-	-	0.94
1962	1.31	-	1.31	1981	-	-	0.73
1963	1.48	-	1.48	1982	-	-	0.74
1964	1.53	-	1.53	1983	-	-	0.70
1965	1.16	0.97	1.15	1984	-	-	1.39
1966	1.12	1.34	1.14	1985	0.98	0.88	0.94
1967	1.05	1.20	1.07	1986	0.98	0.95	0.97
1968	1.10	1.05	1.09	1987	98	0.98	0.98
1969	0.97	0.80	0.93	1988	1.04	0.97	1.01
1970	1.00	1.13	1.03	1989	-	-	-
1971	1.20	1.06	1.17	1990	0.95	0.98	0.96
1972	-	-	1.12	1991	-	-	-
1973	-	-	1.22	1992	-	-	1.26
1974	-	-	1.18	1993	-	-	-
1975	-	-	0.79	1994	-	-	1.05
1976	-	-	0.79	1995	-	-	1.30
1977	-	-	0.72				
1978	-	-	0.87				
1979	-	-	0.90				

Source: 1961-1964: ENFE (1966, 27); 1965: ENFE (1967, 34): 1966-1971: World Bank (1972, Annex 18); 1972-1973: World Bank (1975, Table 7); 1974-1976: World Bank (1977, Table 9); 1997-1998: World Bank (1980, 18); 1979-1983: World Bank (1986, 13); 1984: World Bank (1986, Annex 10, 4); 1985-1990: Calculated by the author from ENFE annual reports; 1992, 1994-1995: World Bank (1997, 7).

Table 6 suggests that the creation of ENFE improved the financial situation of railways in Bolivia. The working ratio before ENFE's creation ranged from 1.31 to 1.53 during 1961 to 1964. In the second half of the sixties the working ratio ranged from 0.91 to 1.15. This was because tariffs did not keep up with inflation. A new tariff system with higher unit revenues was finally introduced in 1972 (World Bank 1980, 18).

ENFE's financial situation demonstrated positive results (working ratio below 1.0) between 1975 and 1983. The World Bank summarized the situation thus:

> ENFE's finances were affected by events outside its control. Increases in operating costs, resulting mainly from the Government's policies of raising both real wages and the number of ENFE's employees, were not accompanied by similar increases in revenues. Tariffs were

not raised for almost two years (from 1978 to 1980), while domestic inflation accelerated. The situation was aggravated by a disappointing level of traffic, caused by the depressed economic activity of Bolivia and by traffic interruptions during the unusually heavy rainy seasons.

By late 1980, the financial situation of ENFE was considered so severe that the project was placed in the problem projects' category, and a significant action program for improvement was agreed by ENFE and the Government. This program was implemented fully in January 1981. lt basically consisted of a 40% increase in tariffs, retirement of about 600 staff members and provision of additional Government grants to pay off some of ENFE's financial obligations. (WB 1986 14)

Thereafter there was an improvement until 1992, when once again the working ration was over 1.0. However, had been restructured to reflect marginal cost pricing more effectively and to achieve strategic market orientation. ENFE has enjoyed a quasi-monopolistic position in certain markets, but its position has increasingly been eroded by
competition from the road sector (WB 1992, 63).

As shown in table 7, ENFE's working ratios were well below its counterparts in both Uruguay and Argentina. Indeed, in the early eighties the World Bank commented that ENFE's working ratios were "more favorable than those of many other South American Railways."[4]

Table 7. Comparative working ratios: ENFE, AFE (Uruguay) and EFEA (Argentina) (10-year averages)

Decades	ENFE	AFE	EFEA
1960-1969	1.06*	2.93	1.88
1970-1979	0.98	2.63	1.88
1980-1989	1.04	3.18	2.18
1990-1999	1.14**	3.04	

Source: ENFE: Table 6; AFE and EFEA: Bertino, Diaz and Moreira (2019, 146).
*1965-1969
**1990-1995

ENFE received net transfers from the government of $us 5.5 million in 1991, $us 5.9 million in 1993 and $us 15.1 million in 1996, the year it was transferred to the private sector (Jemio 1994).

[4] Supervision Mission Back-to-Office and Full Report, January 26, 1984, Railway Project (03) - Bolivia - Loan 1422 - P006128 - General Correspondence - Volume 21, Folder 1170980, WB IBRD/IDA LAC, World Bank Archives, Washington, DC, USA.

(f) Investments and technical assistance

Railways were an important part of Bolivia's total transport investment in the seventies. As shown in Table 8, they represented approximately a quarter of total transport investment. Railway investment was made up of investment by ENFE and the Bolivian Argentine Joint Commission. In the first half of the 1990s, investment in ENFE amounted to only 8% of total transport investment.

Table 8. Railway investment as a percentage of total transport investment

Years	Railways	ENFE
1973-1975	18.8%*	13.2%
1976-1979	28.2%*	24.6%
1992-1994	8.0%	8.0%

*Includes investment by the Bolivian-Argentinian Joint Commission, responsible for the new railroad construction north of Santa Cruz.

Source: 1973-1979: Wilbur Smith and Associates (1981, Vol 1 p. 137); 1992-1994 World Bank (1992, iv)

Railway investment between 1988-1991 averaged $us 9 million and the government planned to maintain the level at around $us 11 million annually for the 1992-1994 period "reflecting the vital role of the railways along the export corridors of the country where no transport alterative exist" (World Bank 1992, 63).

Public railway investment focused on rehabilitating particular lines and refurbishing and maintaining the railway's rolling stock. The two largest projects were the restoration of the Ipias-Roboré line ($US 18.6 in 1987), the purchasing of equipment and spare parts (almost $US 11.7 million between 1987 and 1989), and locomotive reparations (a total of $US 11.0 million spent during the 1988-91 period). Public projects in railways from 1992 to 1994 would continue the trend of previous years. Thus, the portfolio focused on restoring lines ($US13 million) and overhauling spare parts and locomotives ($US15.0 million) (World Bank 1992, 64).

As can be seen in Table 9, railway development in Bolivia was dependent on foreign aid and supplier credit. The World Bank, financed ENFE with just over $us 100 million and the remaining $us 70 million were supplier credit for the purchase of locomotives, rolling stock and spare parts from Germany, Japan, and Brazil. There was also technical cooperation from the World Bank, UNDP, the Japanese International Cooperation Agency (JICA), the the Canadian Railway Company. Brazil also financed a feasibility study for the Cochabamba-Santa Cruz railway in 1975.

Table 9. Summary of technical cooperation and external funds to the railway sector and ENFE, 1962-1991

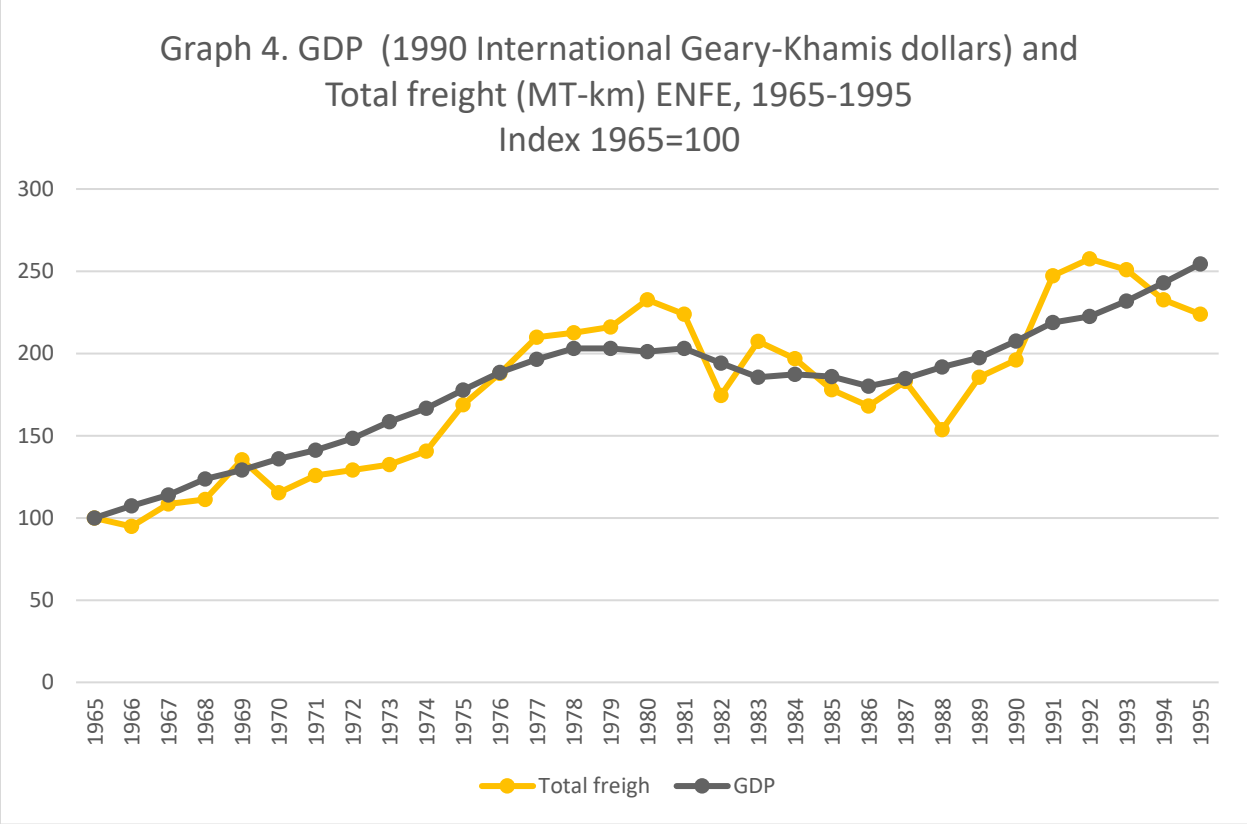
Year	Source and purpose	**$us** (in millions)
1962	World Bank grant – SOFRERAIL report about Bolivian railways and the integration of the various lines	n.d.
1966	Japan – rolling stock: 20 diesel electric locomotives, 9 diesel hydraulic locomotives, 2 trenes automotores, 20 wagons, 80 flat-cars and a supply of spare parts	10,00
1966	Germany – 10 ferrobuses and spare parts	1,10
1967-1969	UNDP – transportation study	
1970-1975	UNDP – technical assistance administered by the World Bank to improve overall management and define financial, operational, and technical areas for railway rehabilitation through ENFE.	2,32
1972 Effectiveness: February 1973 Procurement: 1974-1976	World Bank 1: 1. Investment to rehabilitate equipment and facilities 2. Improvement in operations: carrying more traffic and reducing unit costs 3. Training of personnel: labor and supervisors through the implementation of sound railway management programs	8,00
1975 Effectiveness: August 1975 Procurement: 1976-1978	World Bank 2: 1. Track rehabilitation, 26-line bridges for Uyuni-Ollague line and equipment for ballast 2. Rehabilitation of locomotives and freight wagons 3. Technical assistance to improve operations and management	28,70
1975	Brazil – Feasibility study of the Cochabamba-Santa Cruz railway interconnection.	6,10
1975	Brazil – 17 diesel locomotives	7,70
1976	Japan – 17diesel locomotives	12,50
1977 Effectiveness: September 1977 Procurement: ?	World Bank 3: 1. Track rehabilitation, purchase of telecommunication equipment and rolling stock 2. Continuation of improvement of workshops 3. Technical assistance integral transport study	35,00
1986-1987	World Bank – Reconstruction Import Credit I and II 1. Supplies and spare parts for ENFE 2. Revision of tariffs	12,0
1988 Effectiveness: February 1990	World Bank – Export Corridors 1. Improve ENFE's marketing and management capabilities 2. Improvements to the track and freight terminal on the La Paz-Arica (Chile) railway line 3. Rehabilitation of the rail line Santa Cruz **–** Quijarro and construction of a freight terminal in Santa Cruz	11,3
1988-1994	Germany – KfW- repair of locomotive and purchase spare parts	10,4
1991	Canadian Railway Company – technical assistance to develop strategies for greater market orientation and to strengthen overall management.	n.d.
1991	JICA – Japanese International Cooperation Agency – Elaboration of a Master Plan to rehabilitate and modernize ENFE, 1990-2020	n.d.
1993-1995	Germany – KFW – Locomotive reparation, purchase of spare parts and equipment for workshops	16,5
Total		**175,62**

Source: Contreras (2022).

By 1995, ENFE had an external debt of $us 37 million in 1995 (Jemio 1994).

5. Was ENFE up to the task?

Having analyzed ENDEs performance in terms of freight and passenger traffic, labor productivity, financial performance, amongst others, how can we gauge whether ENFE was able to be a partner in Bolivia's economic development? Rather than a complex counterfactual analysis, a comparison of ENDE's fright with GDP provides an important insight.



Source: ENFE cargo from ENFE (1993); GDP from Herranz-Loncán and Peres-Cajías (2016).

As shown in graph 4, ENFE's total cargo lagged GDP from 1965 to 1997 (except for 1969). Thereafter, there were periods when ENFE's total cargo lead GDP (1977-1981, 1983-1984 and 1991-1993). Overall, however, ENFE was able to respond to GDP growth as demonstrated by the total freight curve as it weaves around the GDP curve in the graph. Indeed, the correlation coefficient is 0.925.

From the above we can conclude that ENFE responded well to GDP and therefore was able to accompany Bolivia's economic development.

6. Conclusions

The creation of ENFE surely falls into the model of "lifesaving nationalizations" where the state buys out companies that were no longer sustainable for the private sector (Guajardo 2013 16). And like many nationalizations of this type, it inherited infrastructure in poor state and rolling stock that was old and in disrepair.

The history of ENFE is that of an SOE that played a vital part in the transport history of Bolivia. It was an enterprise wrought with the typical contradictions of state railways: tensions between economic efficiency, through market orientation, and the political mandates of the different governments to keep tariffs down and increase personnel or maintain redundant staff. The issue is how and whether ENFE was able to overcome them. We have strived to demonstrate that for the most part it was able to do so.

With all its limitations, ENFE responded to the needs of the Bolivian economy. ENFE was able to modernize its rolling stock, slightly increase its numbers and overcome the deficits it faced by renting rolling stock from neighboring countries. As has been argued, it had a quasi-monopoly in certain areas and was not as subjected to road competition in part because road development in Bolivia was slow. Its working ratios were much better than those of other Latin American railway companies and although its labor productivity improved over its lifetime it was still lower than that of neighboring countries, this was in part due to the low railway density. Over the thirty-year period under study ENFE's freight traffic doubled and passenger traffic increased slightly. This was not the case, for example, in the first thirty years since the nationalization of Argentina's railways where freight traffic halved, and long-distance traffic decreased significantly (Waddell 2016, 193). By the mid-nineties, however, ENFE had deficits that had to be covered by the Central Government and in the prevailing neoliberal atmosphere reigning at the time it was privatized in 1996. The results of that process are still subject to further analysis, but what has transpired so far suggests that the privatization process was both necessary and successful (Contreras, 2022).

This paper seeks to augment the scant literature on state railways in Latina America. And given what we have argued, to some degree it strengthens Santamaria Garcia's (2022) proposition that the latest studies posit that "public railway management in Latin America has been relatively rational and plausibly efficient."

This paper has relied heavily on sources from the World Bank, because of the role the Bank played in ENFE's development in the seventies and early eighties. This is a blessing in disguise. On the one hand it does provide much information and rich analysis that otherwise would not be available given that ENFE's archives are either non-existent or inaccessible. On the other hand, looking at ENFE solely through the eyes of the largest multilateral development bank, may lead to a one-sided view. So, wherever possible, we have strived to provide other points of view and, in the case of the JICA diagnostic of 1990, we see that many of the themes raised by the World Bank are echoed by JICA. We must pursue more sources for the late eighties and early nineties in ENFE annual reports (if they do exist!) and other studies.

What is pending is an analysis of the public perception of the service ENFE provided both in passenger and freight traffic. How well did it serve its stakeholders? What was their opinion of the service offered? This can be sought in the media and therefore grater research in the newspapers is necessary. What little we have done already signals dissatisfaction by exporters with the freight services it offered in 1990 and an early call that it be privatized.

References

Agencia de Cooperación Internacional del Japón (JICA). 1991. Estudio del plan maestro sobre la modernización y rehabilitación de la Empresa Nacional de Ferrocarriles de la Republica de Bolivia. Informe Final. La Paz: mimeo.

Banco de Inversión. No date. Capitalización de ENFE. Anexo - 2. Typescript.

Bertino, Magdalena, Gastón Díaz y Cecilia Moreira. 2019. Creación y trayectoria de la Administración de Ferrocarriles del Estado (AFE) en Uruguay. In Teresita Gómez y Javier Vidal Olivares (comp.) *Los ferrocarriles en América Latina. Historia y legado (siglos XIX y XX)*. Buenos Aires, EUDEBA. 119-153.

CEPAL. 1965. El transporte en América Latina. New York: Naciones Unidas.

Contreras, Manuel. 2022. Visión global del desarrollo ferroviario en Bolivia, 1900-2015. De los Andes al Oriente. In Paula Peña Hasbún (ed.) *Al Atlántico por el Oriente. El tren y el progreso en Santa Cruz*. Santa Cruz: Biblioteca del Museo de Historia, UAGRM -Plural editores, pp. 63-96.

----------. 2023. From Vanguard to Rear guard: Railway Workers and the Challenges of the Bolivian National Revolution, 1912-1964. Manuscript in preparation.

Empresa Nacional de Ferrocarriles (ENFE). 1966. Informe anual. Gestión 1965. La Paz: Ferroestado.

----------. 1967. Memoria anual 1966. La Paz: Ferroestado.

----------. 1968. Memoria 1967. La Paz: s.e.

----------. 1969. Memoria 1968. La Paz: s.e.

----------. 1971. Memoria 1969-1970. La Paz, s.e.

----------. 1972. Memoria y estadística 1971. La Paz

----------. 1973. Memoria y estadística 1972.

----------. 1978. Memoria anual 1977.

----------. 1982. Memoria y anuario estadístico ferroviario 1981. La Paz.

----------. 1994. Estadística 1993. La Paz.

Guajardo Soto, Guillermo. 2007. *Tecnología, Estado y ferrocarriles en Chile, 1850-1950*. México: Fundación de los Ferrocarriles Españoles - Centro de Investigaciones Interdisciplinarias en Ciencias y Humanidades de la Universidad Nacional Autónoma de México

----------. 2013. Empresas públicas en América Latina: Historia, conceptos, casos y perspectivas. *Revista de Gestión Pública*, II (1): 5-24.

Herranz-Loncán, Alfonso and José Alejandro Peres-Cajías. 2016. Tracing the Reversal of Fortune in the Americas. Bolivian GDP per capita since the mid-nineteenth century. *Cliometrica*, 10 (1): 99-128.

Jemio M., Luis Carlos. 1994. Situación de las Empresas Públicas al Momento de su Capitalización Documento preparado para ser presentado en el Seminario: Luces y Sombras de la Capitalización.

Mamani Flores, Zenón. 2021. *La nacionalización de los ferrocarriles bolivianos 1956-1968*. La Paz: UMSA - Instituto de Investigaciones Históricas.

Müller, Alberto. 2012. Racionalización en el ferrocarril estatal argentino. ¿Qué se logró? Paper presented at the Sixth Railway History.

Santamaría García, Antonio. 2022. Reviewing Latin American railway historiography: New trends and research avenues. *The Journal of Transport History*. 43(3): 479–502.

SOFRERAIL. 1962. Informe misión de estudios cerca de los ferrocarriles bolivianos. La Paz, mimeo.

Thompson, Louis S. 1997. World Bank Support for Developing Railways of the World. *Japan Railway and Transport Review*. June: 4-15.

Thomson, Ian. 1998. La evolución del papel del Estado en la regulación del transporte terrestre. *Revista de la CEPAL*. 64: 151-163.

Thomson, Ian and Dietrich Angerstein. 2000. *Historia del ferrocarril en Chile*. Santiago Chile: Dirección de Bibliotecas Archivos y Museos Centro de Investigaciones Diego Barros Arana.

Waddell, Jorge E. 2016. De la nacionalización a los planes de modernización. 1946-1976. In Justo LOpez, Mario, Jorge E. Waddell and Juan Pablo Martínez (comp.) *Historia del ferrocarril en Argentina*. Buenos Aires: Lenguaje Claro Editora, pp. 152-197.

Wilbur Smith and Associates. 1981. Bolivia National Transport Study. 5 vols.

World Bank. 1972. Bolivia. Appraisal of Railway Project. Report. PTR-11a. Washington, DC.

----------. 1975. Bolivia. Appraisal of a Second Railway Project. Report no. 741-BO. Washington, DC.

----------. 1977. Bolivia. Appraisal of a Third Railway Project. Report no. 1466b-BO. Washington, DC.

----------. 1980. Project Performance Audit Report. Bolivia First and Second Railway Projects (Credit 346-BO and Loan 1121-BO). Report no. 3268. Washington, DC.

----------. 1986 a. Project Completion Report. Bolivia Third Railway Project (Loan 1422 BO). Report no. 6109. Washington, DC.

----------. 1989. Staff Appraisal Report. Bolivia. Export Corridors Project. Report no. 7700-BO. Washington, DC.

----------. 1992. Bolivia. Public Sector Investment Program Review. Report no. 11124-BO. Washington, DC.