

How the Quality of Cargo Railways Transportation Service effects the Competitiveness of Piauí state, Brazil

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ABSTRACT – Railway transportation is critical to facilitate the flow or acquirement of goods, mainly the ones with low added value and high volume. However, the availability and poor quality of Brazilian railway infrastructure affect dramatically the alternative of using this kind of transportation. This paper studies the situation of Piauí, a Brazilian state in reference of the rail transport. Using the study of multiple cases, it was discussed the obstacles to the use of the modal. The results indicate that the application of the railway system loads in Piauí, is restricted to the capital, Teresina, and basically in case of importation.

Keywords: International trade, Transport infrastructure, Developing country, Competitiveness.

1 Introduction

Railway transportation is an alternative to improve competitiveness among supply chains, especially in relation to the low value-added goods. Brazil is a country with continental dimensions, being a great producer of commodities such as iron ore, grain and fuel. These commodities are transported in significant quantities and have low added value, so it is logical the use of a modal with large cargo handling capacity like the railway transportation. However, its use is impaired in Brazil, due to the low availability of routes, the enforceability of a minimum number of operations, low speed, costs and lack of wagons [1].

It is important to regard that one way to evaluate a transportation system involves its cost of implementation, maintenance and operation. Rail Transport has a high cost of implementation and maintenance, even though operating costs are lower. On the other hand, road transport features low cost of implementation and maintenance, but with a higher operating cost.

The rail transport shows a low operating cost, because its huge carrying capacity, which makes the freight prices by ton/km more attractive. By way of illustration, a standard composition of wagons can carry the equivalent of 150 trucks of grain transport in a trip [2]. On the other hand, road transport accounts for over 60% of cargo transportation around Brazil, emits more greenhouse gases, it is more spent fuel, has a higher cost for long distances and also records alarming rates of accidents [3].

According to Leite, the use of road transport on large scale occurs due to precarious situation of the railway in Brazil and it became one of the major obstacles that results in high logistic costs, which are very significant components of the final prices of agricultural commodities [4].

The state of Piauí is a classic example of this problem. Located in the Northeastern Brazil, it has one of the smallest railway networks in the country because of it, the gain of competitiveness of local production chains is completely impaired due to the unviability and poor quality of the current infrastructure, which basically connects the capital of the state Teresina to port of Itaqui in Maranhão and port of Pecém in Ceará, besides the operations are restricted to imports.

This paper aims to discuss the present situation of railways in Piauí as well as to set out the limitations that the local business faces to import goods by this mean of transportation, which directly affects competitiveness.

2 Brazilian Railways: situation and issues

It is worth bearing in mind that the railway transport was originated in public administration, although during the 90s it was granted to private companies. About 95% of the railroad network migrated to the private sector in Brazil [5]. Estache et al. indicates that the privatization and restructuring were the main transport policies of developing countries, such as Argentina and Brazil [6].

The Brazilian railway transportation, accounts for 20.7% of all cargo transported from 1996 to the present days, this number has not changed [5]. It should be noticed that the Brazilian rail transport structure coexists with quality problems such as availability of wagon flow, scrapped machinery and Low speed average of transportation, as it can be seen in Table 1.

Table 1. Velocity Average (km/h)

Route	2006	2007	2008	2009	2010
Corridor São Luís	27.7	27.7	25.7	29.6	27.3
Corridor Nordeste	13.6	14.0	13.7	12.8	11.9
Corridor Vitória	18.4	18.7	18.5	13.7	13.7
Corridor Centro Oeste- SP	15.1	15.1	13.7	12.7	12.6
Corridor Nordeste - SP	16.4	16.3	15.5	14.9	14.9
Corridor Rio de Janeiro- Belo Horizonte	29.9	29.5	30.9	32.8	30.9
Corridor Rio de Janeiro- São Paulo	32.8	33.4	33.2	25.6	24.9
Corridor Santos	30.2	30.3	31.4	32.3	32.5
Corridor Corumbá - Santos	22.4	22.8	21.9	19.2	15.2
Corridor Paranaguá	27.3	30.1	32.0	31.1	30.4
Corridor São Francisco do Sul	34.4	33.3	35.6	36.3	35.1
Corridor Rio Grande	32.0	33.9	33.3	33.2	33.3
Corridor Imbituba	19.6	19.9	20.9	20.9	20.9

Source: Adapted [4]

This speed average in Brazil is approximately one third of the one registered in The USA. The locomotives operate at low speed mainly because problems with invasion of domain zone, which should have a minimum of 15 meters on each side [5].

It is important to highlight that the railway network in Brazil has been virtually the same since its creation, about 30,000 km, and the main Brazilian railway in 2002 does not exceed the lengths of 500km [7].

The development of the railroad in Brazil had its beginning in the 19th century with railway with a metric gauge (1.00m) more economical, and over the years, roads were built with international gouge (1,435) large or English standard (1.60m). This situation avoids the efficient unification of the national rail network [5]. Besides the differences in track gauges, there are more than 10,000 hot spots like passages in urban centers, railroad crossing, tracing of the roads, the time to cross and mutual traffic.

The railroads in Brazil are concentrated in the most economically developed areas. According to Oliveira and Zaberland 47% of the railroad are in Southeastern Brazil [7].

Among the developing countries known as BRICS (Brazil, Russia, India, China and South Africa), according to the Table 2, Brazil is the one with the worst performance in terms of railway density.

Table 2. Railway Transportation Density.

Product	Infrastructure km by km ²
India	19,5
South Africa	18,3
China	9,0
Russia	5,1
Brazil	3,5

Source: Adapted [5]

The Brazilian railway system was developed to connect the central and inland regions of the country with several coastal ports. This characteristic united to the modernization of the railway system by the concessionary, make the railways emerge as an alternative and as a support to the road transport of charge, as agricultural bulks, manufactured goods, general cargo and containers, among others. In this context, Brazilian railroads have strategic importance, especially in the integration of the national territory.

Currently the Brazilian rail system has exactly 30.051 km extension, distributed by the South, Southeast and Northeast, serving part of the Midwest and North [5]. The extension intended for the railway transport of cargo, consists of 12 network granted, being 11 of them to a private enterprise and 1 to a public company, it is equivalent to 28.614km [6].

3 Methodology

This article consists of a case study, where it is observed through several perspectives the role of rail transportation in Piauí, Brazil. So it was decided by the adoption of a multiple case study following the Cunningham guidelines [8].

A group of companies was selected to bring forth this paper in which a data collection was made through personal interview with executives involved in the process.

The selected companies were: a company that provides rail transport service in Northeast, three importers responsible for a percentage of 76.11% of imports in Piauí [9], and a fuel distributor. The companies were named: Alpha, Beta, Gamma, Sigma and Delta due to protect their identity. The companies were divided as shown in table 3.

Table 3. Enterprises.

Enterprise	Activity
Alpha	Railway Operator
Beta	Importer – Fertilizer Industry
Gamma	Importer – Bicycle Industry
Sigma	Importer – Metal Coils Industry
Delta	Fuel Distributor

Besides the interviews, it was taken into consideration the observation and analysis of documents, generating results that were compared and grouped according to the criteria of this research: sold material, mean of transport used, country of the goods origin, port of operation, freight price. Next, the information was stratified to understand the phenomenon in question.

4 The Situation of Railways in Piauí

Piauí is located in the Northeastern Brazil, presents a potential mineral resources in exploration and a great Cerrado area, which economic viability depends on the logistic flow condition.

Stressing that the railway of Piauí belonged to Federal railway network SA, a state-owned company created in 1957, which was privatized in 1997. The lease winning company was the North Eastern Railway Company, which holds the concession acquired at auction process, carried out in December 13th, 1997 starting operations in 1998.

Currently the company belongs to National Steel Company, being named Transnordestina Railway Logistics or FTL. The stretch managed by the company totals 4.207 kilometers of which 200 kilometers are in Piauí territory. The railway has a connection to the main ports of the Northeast, like Pecém, in Ceará and Itaqui, in Maranhão.

Transnordestina railway is being constructed and it will have 412 kilometers in the state of Piauí and aims to facilitate the extraction of iron ore reserves concentrated in the Southern state, which is also becoming the major producer of Brazilian soy [10].

5 Operator and Users of Railways in Piauí

5.1 Railway Operator

The Alpha Company has a terminal in Teresina that connects the cities of Sao Luis (Ma) and Fortaleza (Ce). The operator concentrates its import activities in Teresina, the capital of the state. Currently about 50% of the cargo handled at the terminal is fuel, other types of cargo transported are coils of steel, cement, and fertilizer. The transport operation is characterized as shown in Table 4.

Table 4. Railway Operator.

Destination Port	Time Average to Teresina/PI	Velocity Average	Age Machines Average	Diary Flow
Itaqui/MA	30 hours	15 km/h	60 years	4.200 tons per day
Pecém/CE	60 hours	15 km/h	60 years	4.200 tons per day

5.2 Importers and Fuel Distributor

Railways are mainly used in the state of Piauí to import and to transport fuel that comes from the Southeast by means of cabotage. The companies Beta, Gama and Sigma are the largest importers of fuel totaling 76.11 percent of total imports [9]. The company Delta is the largest customer of the railway, which carries a daily volume of 2.700 tons of fuel from Itaqui port in São Luís, brought by cabotage from other national ports. The Table 5 shows a summary of the four companies.

Table 5. Importers and Fuel Distributor.

Enterprise	Material Type	Origin Country	Modes of Transport	Port	Headquarter
Beta	1. Potassium Chloride; 2. Phosphate; 3. Ammonium sulfate; and 4. Sulfur.	Tunisia, Egypt, China, USA, Israel, Russia, Belarus, UAE, Algeria, Mexico, UK, and Oman	Truck	Itaqui/MA	Baixa Grande do Ribeiro e Uruçuí/PI
Gamma	Bicycle parts and accessories	China and Taiwan	Truck	Pecém/CE	Teresina/PI
Sigma	Metal coils	Ukraine, Russia, China, and Portugal	Train	Pecém/CE	Teresina/PI
Delta	Fuels	Brazil	Train	Itaqui/MA	Teresina/PI

Along with the Delta Company, only Sigma organization uses railway in its operations import coming from other countries to the port. With a monthly transport of 15.000 tons of metal coil. The Beta and Gamma companies prefer to use road transport because it offers a better performance/cost these cases.

5 Discussion and Conclusions

The following conclusion can be demonstrated through the empirical research with the businessmen of the companies concerned. There is a low availability of railways, their infrastructure condition and costs are barriers to their use.

Only the Sigma company operates with the railway transport in imports, the other companies claim that, even the road freight featuring a higher cost per ton, it has more availability, so a less waiting time which speeds up the arrival in Teresina, the destination.

Crucially, port operations involve the clearance process, which has a very high cost when the cargo has to remain on the premises. This way the railway transport has a hampered performance for Beta and Gamma companies' activities due to the lack of flow of locomotives, in addition to the slowness of the journey that lasts at least four days to run 700 kilometers in the stretch between Fortaleza and Teresina.

The claims for the delay are justified by the railway operator, because the high age of the machines, about sixty years and low speed in the stretch, associated with the maintenance condition of the tracks.

No export operation was noticed in the questionnaire held by the Alpha Company, in other words, there is no use of rail transport from the terminal in Teresina to other ports. It possibly happens due to the combination of the road transport with the railways modal and the long distances from possible exporters, all of these aspects hinder the cost viability.

With the finalization of Transnordestina railroad, Figure 1, it can be created many possibilities for future flows, despite questions about coverage on the initial project. The main advantage is because the rail will reach the Southern Piauí, an important productive region in the state, facilitating the flow of iron ore a soybean. The stretch of the railroad covering the state is about 412 km, with a total of 1.753km. The transport ministry says that 52% of the work are concluded [10].



Figure 1: Transnordestina Railway. Adapted [12]

In conclusion, the result of this study suggests that the available railway transport is restricted to geographic coverage of Teresina, capital of Piauí. This aspect restricts the possibilities of other regions in the state that have potential use of this mean of transportation to ship or receive goods.

There is an expectation of improvement in investments in railways, because the development depends on the transport infrastructure contribution. Brazil faces serious problems in this field that disrupt the progress of important sectors of economy, especially the transportation. Medium and long-term solutions need to be addressed urgently. This was a consensus among the experts present at the XIV National

Congress of Intermodal Cargo Transporters, held at the headquarter of the National Confederation of Transport [6].

The poor quality of rail transport in Piauí is linked to the performance of the transportation time, cost, low-flow and the geographic availability. The availability is a crucial factor. Brazil already has a low railway density per square kilometer, Piauí density is 0,795 km per square kilometer, it is far worse, because the poor condition of the railways, the speed reached is the worst in Brazil.

The results of this article should be observed considering its limitations, however, it is suggested that future researches must be carried out to add information in this field.

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