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ABSTRACT

This article aims to analyse the operational performance of rail freight in two large geographical countries, the United States and Brazil, using the tool Data Envelopment Analysis (DEA). In this context, because the two countries have great potential to use efficiently the relative advantage that come from this mode of transport, the question that arises is: Which country has better operating performance, considering the different market structures of each ? The result of modelling DEA using CCR and some assumptions made in the model, together with the literature review of rail, allowed to obtain the answer to this question.
Keywords: Railroad, freight transportation, efficiency.

1. INTRODUCTION

The railway industry plays an important role on the freight loads market. It has as a relative advantage to other ways of transportation the fact of having the capacity to carry a variety of products and volumes over long distances at a lower cost. Traditionally, this industry is in the investment agenda of many countries because it allows regional integration, efficient flow of goods, transport with lower CO_2 emissions and higher economic growth.
According to Thompson (2010) in the world exists 900,000 kilometers of railways, shipping 11.4 billion tons (8845 billion tons per kilometers) and approximately 7.1 million employees in the industry. These numbers vary with world economic growth, since the shipping industry is extremely sensitive to market conditions which countries are found.
Brazil relies today, with a railway network of 29,487 km in length, distributed by the South, Southeast, Northeast and part of the Midwest and north of the country (Lang, 2007). Under a concession basis to private companies regulated economically by the State, the rail industry achieved advancements in operational performance and increase in rail traffic. But as a continental country, where the cargo transport of long distance is more efficient, still has a great potential to grow and be even more productive.
The United States on the other hand, does not operate under a concession basis with state regulatory action, but in a competitive market structure, with the state only regulating certain issues such as the security in the industry. This openness of the railway market enabled the country an extraordinary growth since its privatization in the 1980s.
This article aims to analyze the two countries abovementioned from operational perspective, by using the tool Data Envelopment Analysis (DEA). The motivation for analyzing Brazil and the United States was based on the following facts: i) the two countries are continental,

having therefore great potential for the use of rail as the primary mode of transporting cargo ii) have distinct market structures with different State regulatory levels actions, which can be crucial for different degrees of operational performance iii) both countries carry bulk transportation, despite U.S. are not restricted to only this type of loading and finally iv) it is considered the United States a possible benchmark for Brazil.

Given the reasons above, the use of DEA to analyze the operational efficiency starts from the presupposition that the United States, as a country that is characterized with a competitive market structure in the rail industry, has a more satisfactory operating performance than Brazil, which in turn, is characterized by an economic model of concessions, in which each company basically acts as a regional monopoly.

This matter will be considered and answered throughout the article, which is divided into the following sections: Section 2, where is presented a brief history of market models from Brazil and United States. Section 3, the DEA in Rail Transport, which is being exposed a literature review of the DEA related railway transport. Then, Section 4 presents the concepts of DEA. In sections 5 and 6 are presented model variables and the modeling itself with the results. Finally, in Section 7 is the conclusion made with considerations and justifications for the model output.

2. THE RAIL FREIGHT MARKETS IN BRAZIL AND THE UNITED STATES

According to McCullough (2007), there are two formal aspects related to economic efficiency:

1. Productive Efficiency that occurs when an economy can not produce more of a good or service without producing less of another.
2. Allocative Efficiency that occurs when an economy can not increase the satisfaction of a consumer without reducing the enjoyment of others.

Given the two formal aspects of economic efficiency, it can be said that this derives from operational efficiency, i.e. factors such as resource allocation and technology directly impact the productive allocation and allocative. In turn, the different market structures strongly influence the allocation of resources, investment in technology and the supply of demand.

In this context, the efficiency of rail transport is due largely to the market structure adopted in the industry. Historically, the rail industry was consolidated with a monopolistic structure due to the distinctive features of this type of market structure. But due to numerous deficiencies that led to the scrapping of many railroads, the market models adopted by various countries were changed.

> "Concerns about the cost characteristics of the industry, with up to 80 per cent of infrastructure costs being fixed in the short run and the presence of indivisibilities and economies of scale in the longer run, together with the potential for exploitation of situational monopoly, led to government controls on entry, exit, prices, technology, operating practices, inter-company relationships and ownership on the grounds that fully competitive organization of the industry was both undesirable and

> unfeasible.... In recent years, there has been increasing dissatisfaction with the traditional public utility regulation of the industry, not least because of the declining market share and worsening financial performance of railways. There has thus been increasing interest in privatization and deregulation as a potential solution to these problems. Privatization and deregulation have been seen as promoting efficiency and innovation, by freeing railways from government control and by removing subsidies. At the same time, governments have been keen to reduce public expenditure by transferring the financing of rail investment to the private sector" (Nash, Toner, 1997).

The focus of this research is to analyze the operational efficiency of Brazil and United States of America (USA), but for this it is necessary to understand the structural economic context that these two countries are. In both countries, the rail industry was initially modeled on monopoly market. In the USA the rail industry was characterized as exclusive private property owner and this model lasted until 1980, when the government noted the real need to deregulate the sector that was in crisis, with poor financial results, scrapping and bankruptcy ten large companies in the 70s. Already in Brazil, the monopolistic model remained until 1992, when it initiated the privatization, since unlike the USA, the station was owned by the State and as fixed costs are very high in this industry, the government was powerless in keeping them.

After sector deregulation, each country adopted a type of market structure. In the USA, there was the opening of the market and the regulator has to intervene only to resolve disputes rather than impose restrictions on market forces. The industry organization has also changed, no longer vertically integrated operations and management was separated from infrastructure. As a result of deregulation, there was a phenomenal increase in industry productivity. As part of these remarkable increases in productivity, deregulation allowed the industry to focus on selling part of the lines scrapped for railways lesser extent, reduced staff, introduced technological improvements; redefined its role towards service provider, and its operation became extremely safe. In 1997, the industry has become more competitive: the rates were reduced by 30% and market share increased 20% since 1980 (Krohn, 1997).

In 2006, rail cargo sector produced more than 1.77 trillion ton-miles, and generated revenue of $ 54 billion. Seven major rail systems are responsible for 93% of total industry revenue, although the rail industry is composed of more than 550 operators. (FRA, 2011). According to Posner (2008), the competition between the railways occurs in parallel, imperfectly competing for the same market, which allows each operator to make a profit in a particular niche.

Brazil denationalized the railroad industry adopting the concession model. According to the National Transportation Confederation, the privatization of the rail network was effected through public auctions, in order to give the private sector the right to exploitation of public rail cargo. The concession agreements do not require pre-defined investment to utilities, but only that they meet performance goals as: increased production of service and reducing the rate of accidents. Although these contracts are established as the Grantor has major responsibilities as the regulation, supervision and monitoring of the implementation of concession agreements and management of operational assets linked to ensure the economic-financial balance.

In general, the privatization of the railway system was positive. Currently, the Brazilian railway system has 29,487 km in length, distributed by the South, Southeast, Northeast and part of the Midwest and North. Were granted 12 meshes with 28,143 km, equivalent to 95% of the system (LANG, 2007). As main results arising from the privatization process, it cites gains in operating performance given meshes, which can be seen mainly due to increased staff productivity, locomotives and wagons, as well as in reducing the time immobilization, the number of accidents and the costs of production (CNT, 2009).

However, some problems have arisen with respect to regulating the implementation of the grant system. The small numbers of companies present in this industry, culminating in oligopolistic situation, cause a number of limitations to competition in the market, for example, the market power exercised by these companies. And yet, there are some situations of regional monopolies, which use its railroad system to load only your products which ultimately limit the performance of other competitors who need to use their tracks.

In general, the two models adopted by countries brought advantages and disadvantages. The oligopolistic model in Brazil appeared more efficient than the monopolist, but there are still some limitations ranging from differentiated tariffs for use of the product, to contracts where the service user agrees not to export to "customers" of the company concessionaire of the railway (Silveira, 2002), which is characterized in market power. In the USA, the competitive market leads to an improvement in the quality of services and tariffs, however, there is pressure from some parts to regulate the market again, since some shippers claim that their rates are very low, in addition, there were several mergers (of 33 railroads "Class I" went towards 7) that can lead to abuses of market power (OECD, 2009).

3. THE DATA ENVELOPMENT ANALYSIS (DEA) MODEL IN RAIL FREIGHT

The country's economic development is linked to the growth of various sectors such as trade and industry, which account for a large share of GDP. For this growth to occur, cargo transport has a key role, because this is one of the major forces that enable trade relations. In this sense, as it represents a role in the economies, the study of the efficiency of freight transport, and more specifically for rail freight, is the focus of several authors. In order to delve a little deeper on this issue we conducted a literature review of the efficiency of rail freight using the Data Envelopment Analysis tool. Below, we introduce some of the work performed, without claiming to be exhaustive.

Himola (2010) used the Multi-stage DEA model to analyze the operational and financial efficiency of the countries railways. Operating performance was calculated using four input variables - the number of cars, the mileage of the mesh, the number of locomotives and number of employees - and two output variables - the Tons per Kilometer (tku) and Ton. Already financial efficiency was calculated using as input variables, the output variables of the modeling of operational efficiency (tku and ton). The outputs variables were the revenue and the amount of freight.

Yu and Lin (2007) used the Multi-activity Network Data Envelopment Analysis model (MNDEA) to analyze the operational efficiency of freight and passengers together. The inputs variables considered were: the number of employees, the length of the railway network, the number of passenger cars and freight cars number. The outputs considered were: passenger-train-km and freight train-km.

Paiva Jr. (2000) used classical methods of DEA (CCR, BCC, Additive and Multiplicative) to analyze the operational efficiency of the railroads. For this, the inputs variables were: the length of the railway network, the number of locomotives, the number of cars, the number of employees and the number of passenger cars. Already the outputs analyzed were: tku, tons of cargo, passenger-km and passenger numbers.

Paixão and Khoury (2008) applied the CCR model to analyze the operational efficiency of Brazilian railroads. The inputs variables used were: the number of employees, the number of freight cars and locomotives number. The output variable consisted was tku on display. In this study, were considered only data from cargo transport, excluding the data analysis of passenger

4. DATA ENVELOPMENT ANALYSIS (DEA)

DEA models have originally been proposed by Charnes et al. (1978) to determine the efficiency of productive units, known as Decision-Making Units (DMU). These models

take into account the resources used by the DMUs and the results they obtain. DEA models optimize the efficiency index of each individual DMU in order to estimate an efficient piecewise linear frontier. These DMUs become the benchmarks for the inefficient ones.

The two best-known DEA models are CCR (Charnes et al. 1978) and BCC (Banker et al. 1984). Traditionally, two different orientations are possible for these models when looking for the efficient frontier: input orientation and output orientation. The first one aims to promote DMU efficiency by an equiproportional reduction of the inputs levels. On the other hand, the aim of output orientation is to promote DMU efficiency by an equiproportional increase of the output levels.

There are two equivalent mathematical formulations for each DEA model. The first one is called “the multipliers model” and the second one is “the envelope model”. There is a dual relationship between these two models. From the multipliers model we obtain the efficiency index and the multipliers (weights) for each variable. From the envelopment model we also obtain the efficiency index. Moreover, this model also provides benchmarks and targets for each inefficient DMU.

Their proprieties must be known in order to model in DEA and interpret their results correctly. Two of the most important properties are as follows:

1. In any DEA model, every DMU that presents the best output j/input i ratio is necessarily efficient. This requires the causal relation between each output and each input to

be checked in any DEA formulation. If this relation does not exist, meaningless results may appear. In other words, a badly formulated model might show a DMU to be efficient, for instance, based on its coffee production (output) in relation to its rice growing area (input), which is obviously nonsensical.

2. The main property of the CCR model is the proportionality between inputs and outputs at the frontier. This means that any increase (decrease) in the value of the inputs corresponds to a proportional increase (decrease) in the value of the outputs.

Beside the two properties, we need to verify the adequacy of the information as needed allows the models to evaluate the efficiencies of production units in various areas of interest. Thus, the treatment of inputs and outputs should be smooth and used the time to make the choices (Estellita-Lins e Angulo-Meza, 2000).

Some terms like productivity, efficiency and drive decision-taker (DMU) are widely used in DEA and why it is necessary a more detailed explanation.
The productivity of a unit of decision taker is the ratio between the value of goods produced and the resources used (Coelli et al. 1998). In the simplest form, where there is a single resource and a single product, productivity is the ratio between output and input. However, for the most part, the number of input variables and output variables is greater than 1. Thus, it is necessary to adapt the model to more generally, calculating the productivity of each DMU dividing a linear combination of products by a linear combination of resources. Efficiency is the ratio of what could be produced and what was actually produced. Given that Farrell (1957) suggested some treatments that have proved suitable for calculating the efficiency.
Based on Farrell (1957), there was a way of trying to measure the productive efficiency through data envelopment analysis (DEA). This technique was developed by Charnes, Cooper and Rhodes (1978), choosing the beacon unit as the one that has the best performance.
The Data envelopment analysis (DEA) makes no assumptions to determine the functional efficiency of the DMU. The efficient DMU is the one that performs best on the relationship between their inputs and outputs. The way this is done can be considered a measure of excellence therefore to better use the DMU as a reference, making all other units be compared to it.
This approach is unlike other techniques, where one unit which has a performance very superior to the other can possibly be eliminated from the sample, because it is considered an outlier and thus distort the model application.
For the development of a model with more than one inlet and more than one output, Farrell (1957) introduced the concept of efficiency in the following formulation:

$$\mathrm{EF} = \frac{\sum_j u_j Y_{jk}}{\sum_i v_i X_{ik}}$$

where:

Y_{jk} output from j unity k;

X_{ik} input i from unity k;

u_j e v_i represent the weights of each output of each input je i respectively. These weights must somehow be determined.

There are two classic DEA models: CCR (of Charnes, Cooper and Rhodes) and BCC (of Banker, Charnes and Cooper). The DEA-CCR due to Charnes, Cooper and Rhodes (Charnes et al., 1978) exhibit constant returns to scale, while the DEA-BCC model of Banker, Charnes and Cooper (Banker et al., 1984) show returns to scale variables. The CCR model is also known as CRS (constant returns to scale) and BCC by VRS (variable returns to scale).

In the CCR model, it is assumed that any change in entry (inputs) generates a proportional change in outputs (products) and vice versa. This makes this model be widely used to measure the efficiency of production lines, equipment maintenance and quality control.

In BCC model, this proportionality between variables does not exist, making this type of model more suitable for competitions or rankings in order of preference.

In DEA models, it is necessary to define the type of guidance you want to use, the guidelines are most used as inputs and outputs. If the model is input oriented, the goal is to minimize the raw material, ie produce the same amount with fewer inputs. Moreover, output is the guidance in the template used when the objective is to maximize the outputs, keeping inputs unchanged.

Another factor that should be considered in modeling DEA is the use of weights. Initially the model calculates total freedom with the weight of each variable in order to find efficient DMUs in the best way possible. Thus, it is necessary to use weights restrictions when the study variables do not possess the same degree of relevance in relation to the model (Allen et al. 1997). For more information about using weights in DEA models, see Soares de Mello et al. (2008), and Cooper et al. (2009).

In addition to the above factors, we can confront the DMU's inefficient with efficient, i.e., set targets for the inefficient DMU's to become efficient. These efficient DMUs become the benchmarks. These targets indicate the strengths and weaknesses of inefficient DMUs, and, more precisely, the need to evolve to meet the "best performers".

4.1 DEA-CCR input oriented model

The CCR model with input orientation works with constant returns to scale, i.e., any variation in entry (inputs) results in a proportional change in the products (outputs).

Instead of using an equal weighting for all DMUs, the model allows the choice of weights for each variable, the way that is most favorable, since these weights when applied to other DMUs do not generate a ratio greater than unity. The formulation of these conditions is presented in the following optimization problem:

$$MaxEffo = \left(\frac{\sum_{i=1}^{s} u_i y_{io}}{\sum_{j=1}^{y} v_i x_{io}} \right)$$

Subject to:

$$\left(\frac{\sum_{i=1}^{s} u_i y_{ik}}{\sum_{j=1}^{y} v_j x_{jk}} \right) \leq 1, k = 1,2,....,n$$

$$u_i e v_j \geq 0, \forall j, i$$

Where:

$Effo$ - DMU's efficiency

r – number of total of inputs

s – number of total of outputs

n – number of DMUs

u_j e v_i - weigh of each outputs e inputs;

y_{i0}, x_{j0} - inputs i and outputs j

of DMU k, k = 1, ..., n;

y_{i0}, x_{j0} - inputs i and outputs j from DMUo.

This fractional programming problem can be transformed into a linear programming problem (LPP), forcing the denominator of the objective function to be equal to a constant, usually equal to one.

4.2 DEA-CCR output-oriented model

When the model is instructed to output the focus is in production, namely, it is desirable to produce the largest possible number of products without changing the amount of raw material.

In this type of guidance, the efficiency of the DMU is measured by a criterion H_0, that derived from $Effo$ which used in the input orientation. In the formula for calculating the efficiency-oriented model output, $Effo$ can assume values greater than unity. Therefore, an inversion takes place, carried by the formula:

$$H_0 = \frac{1}{Effo}$$

The CCR model with the output orientation is presented by the following formulation.

$$MaxEffo = \left(\frac{\sum_{i=1}^{y} v_i x_{io}}{\sum_{j=1}^{s} u_j y_{jo}} \right)$$

Subject to:

$$\frac{\sum_{i=1}^{y} v_i x_{ik}}{\sum_{j=1}^{s} u_j y_{jk}} \geq 1 \quad k = 1,2,...,n$$

u_j and $v_i \geq 0 \ \forall j,i$

The formulation presented below represents the CCR-DEA model-driven outputs after linearized.

Min h0 = $\sum_{i=1}^{r} v_i x_{i0}$

Subject to:

$$\sum_{j=1}^{s} u_j y_{jo} = 1$$

$$\sum_{j=1}^{s} u_j y_{jk} - \sum_{i=1}^{r} v_i x_{ik} \leq 0$$, k=1,...,n

u_j and $v_i \geq 0 \ \forall j,i$

5. MODELS AND VARIABLES

To achieve the objective of measuring the efficiency of trucking concessionaires, it was necessary to first define the possible variables to be analyzed and relate each of the companies that hurt part of the analysis. Among the possible variables initially considered were included: the total length of lines in km, quantity transported in tons, numbers of employees working in companies, number of loaded wagons and other economic variables.

When making the choice of variables, it is necessary to define and adapt the two realities, because the type of transport used in the U.S. is quite close to that of Brazil, but there are significant differences, which makes it necessary to delimit the search in order to not lose comparability between the DMUs. Thus, we adopted the focus of the analysis on operational efficiency and therefore economic variables were initially discarded. The variable "number of employees" could be analyzed for the amount of payroll for each of the sections, but it was not used in the research by lack of access to information homogeneous. Besides the variables was necessary to adapt the DMUs, as in Brazil each section is operated by a concessionaire, while in the U.S., the sections are divided by states and each company operates in several states. Thus, it was necessary to understand the type of product carried in each region. As in Brazil, the main cargo is bulk; we performed a filter of DMUs, which included only U.S. states that carry bulk cargoes in order to maintain comparability of DMUs.

6. RESULTS

The initial goal was to measure and verify the efficiency of companies and compare if the competitive American system would be more efficient than the Brazilian, but as this was not possible then we choose to evaluate Americans stretches and not companies.

To make this evaluation and comparison was chosen a model that considers three variables:

- Extension of the line in kilometers - Input;
- Number of staff employed to operate the stretch - Input;
- Amount of cargo transported in stretch (tons) – Output.

It is noteworthy that several variables were considered for the model, but some were dropped because there was no reliable information or would require transformations or conversions so that they become comparable across countries.

After defining the variables to be used, it was necessary to decide which of the DEA models would be more appropriate to our study. Given the type of variables that would be worked CCR model was chosen with the output orientation because it has constant returns to scale and if we observe the variables chosen, it is clear that with an increase in the extent or number of employees is expected to increase there the amount of freight transported. This is because a higher line extension covers a larger area of operation and thus higher demand and a larger number of employees make the company have a capacity to carry more. The orientation is justified because it is expected to load more cargo with less resource use. In Table I we have 8 Brazilian companies and 21 Americans and the values of each variable.

Table I – DMU`s and values of each variable

DMU`s	Extension of the lines (km)	Employees	Amount of cargo (ton)
1-ALLMS	7304	2669	26072900
2-ALLMP	1989	623	4916700
3-ALLMN	500	766	10071700
4-ALLMO	1945	499	2778300
5- Centro-Atlântica Railway	8066	2985	17454900
6- Vitória Minas Railway	905	3807	73842700
7-MRS	1674	3671	110915400
8-Estrada de Ferro Carajás	892	2189	96267100
9-California	8537,33	8968	52075000
10-New Mexico	2956,28	1569	12138000
11-Nevada	1918,28	669	1880000
12-Utah	2185,42	1798	16602000
13-Colorado	4319,36	2734	27256000
14-Wyoming	2993,29	2655	473603000
15-Montana	5106,3	2560	44204000
16-Texas	16744,56	15691	82428000
17-Oklahoma	5270,45	1772	16917000
18-Kansas	7869,47	5089	22625000
19-Nebraska	5173,89	11282	29974000
20-South Dakota	2801,79	660	16526000
21-North Dakota	592,54	1656	31089000
22-Minnesota	7286,91	4222	67382000
23-Indiana	7201,61	5427	41863448
24-Kentucky	4116,58	4182	76773000
25-Ohio	8506,75	7261	50287000
26-West Virginia	3590	2822	99014722

27-Virginia	5169	5247	34553000
28-Pennsylvania	8003	6490	48850000
29-Alaska	814,3	379	6551000

In Table II are presented two models, one where there is no restriction on the weights and a second where it is considered that the variable length of the passage should be more important than the number of employees, for cargo transport in a broader or area of expertise is more important than operational standpoint than the number of employees.

Table II – Efficiency to each DMU in the both models

DMU	Without weight restriction	With weight restriction	DMU	Without weight restriction	With weight restriction
1	0.0548	0.0312	16	0.2111	0.2111
2	0.0442	0.0224	17	0.2335	0.2086
3	0.1273	0.1273	18	0.2049	0.2008
4	0.0312	0.0136	19	0.2166	0.2166
5	0.0328	0.0188	20	0.3204	0.2369
6	0.5157	0.5157	21	0.5116	0.5116
7	0.4188	0.4188	22	0.2695	0.2498
8	0.6821	0.6821	23	0.2232	0.2195
9	0.2186	0.2186	24	0.2979	0.2979
10	0.2234	0.2120	25	0.2188	0.2180
11	0.1958	0.1887	26	0.3767	0.3642
12	0.2318	0.2297	27	0.2222	0.2222
13	0.2359	0.2261	28	0.2222	0.2202
14	1.0000	1.0000	29	0.2769	0.2455
15	0.2768	0.2488			

When looking at Table II it is clear that the DMU 14, which refers to the section within the state Wyoming is the only efficient one, because its carried loads far exceed all other DMUs, so that only 3 others are beyond 0.5 efficiency. The second most efficient DMU is the Carajás Railroad which has a small extension and makes transportation of big loads, due to the road being Iron seeping across the Carajas mine production.

The aim of the study was to understand whether the Americans stretches would be more efficient than the Brazilians and the best way to do this would be to calculate an average of the DMUs in each country. 6.3 will be presented in the tables of the average DMU `s.

Table III – Average of each country

	Without weight restriction	With weight restriction
Brazil	0.2384	0.2287
USA	0.2947	0.2832

Assessing the Table III it can be noticed that the American stretches are slightly more efficient than the Brazilian and this because 3 Brazilians stretches are quite efficient and elevate this average: Railroad Victoria Mines, MRS and Railroad Carajás. Of the 3 DMU `s MRS is the second in most loads carried, second only to Wyoming, while the other 2 have a line extension well below, making them very efficient.

7. CONCLUSION

The focus of this study was to analyze the operational efficiency of the railway companies that have sections in Brazil and the United States and it was necessary to understand the structural economic context in which these two states are and which model is used in each. It was noticed that in the U.S., there is a model where there is competition between companies operating in the stretch, while in Brazil the stretch is passed and fully operated by a single company, which is replaced by the regional monopoly.

Given this we analyzed the operational efficiency of the individual companies and realize that the most efficient firms are those that have Brazilian bond with Vale, which is one of the major ore companies in the world and transports their own load, therefore carrying a large amount of cargo.

In the U.S. the stretch with greater efficiency is Wyoming. This is due to delimitation of the study, which was assessed only loading commodities in bulk and, in this context, according to Federal Railroad Administration, with the opening of the Powder River Basin in Wyoming in the late 1970s, shipments of coal with low sulfur content have grown dramatically with the goal of helping American businesses of electricity to meet the standards of the Clean Air taxes. Thus, the largest rail movements of coal are from Powder River Basin for generating plants in Illinois and Texas.

When comparing the efficiency of American stretches with the Brazilians, the average efficiencies are very close, but the Americans stretches are more efficient, perhaps due to the competitive model, where several businesses operate and hence a greater volume of cargo is also transported.

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