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Economic evaluation of current conditions of competition and efficiency of automotive and rail systems in Colombia

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ABSTRACT

This study uses microeconomic data from the transportation systems of land cargo in Colombia: rail and trucking, to determine their degree of allocative efficiency through the non-parametric method Data Envelopment Analysis DEA. The average overall efficiency found was 74.4% for trains and 20.56% for trucks. These figures indicate that rail is more efficient in the allocation of resources. This means that trains in Colombia use their input better than trucks to maximize their production, given the costs and technological characteristics of each system. This is a signal for the design of a public policy for investment in transportation infrastructure that seeks to raise the competitiveness of Colombian exports, investing not only in roads but in complementary systems such as railways too.

1. Introduction

Colombia is currently undergoing a delay in transportation infrastructure. First, the large cities and industrial areas are far from seaports, its process of geographical configuration is due to the as occurred colonization in the 19th century and the strategy of import-substitution model in the 20th century. Second, the characteristics of the Colombian landscape composed of rugged mountains, flood valleys, geological fault lines, among others, make the topography an obstacle for the competitiveness and productivity of the country against the rest of the world. Accompanied by a design of development and investment policies for transport infrastructure with a regional vision, in lieu of a national vision, aligned then are a set of factors that led Colombia to today's backlog in its transportation infrastructure, thus harming a cross-sectional productive apparatus (Banco Mundial, 2006).

On the other hand, Colombia is immersed in a process of internationalization with the goal of transforming its productive structure toward an economy that produces goods and services with an increased added value, a process that allows the country to engage in international markets. The signing of free-trade treaties invites the State to identify those bottlenecks that prevent Colombian products from arriving with competitive prices to these markets. The strategy addressed has been granting large transport infrastructure projects, the great majority roads, leaving aside complementary systems such as railways (Bamrud, 2010).

The transportation infrastructure is a key factor in economic development, more than a consequential relationship. Throughout history the Colombian State has developed its transport policy in a planning framework of short and medium term, which has not allowed for construction of infrastructure that boosts trade flow. Roadways receives a little more than 80% of the private and public investment, the market is regulated by means of a table of minimum freight price, such as the presence of barriers to entry.[1] Atypical working conditions that in recent years led to friction between the cargo generators and the trucking sector, manifesting itself in national strikes, that in the absence of alternative transport systems that could put pressure on their early resolution, instead ended by immobilizing the flow of cargo by weeks, seriously affecting the entire logistics chain with lack of inventories, loss of the product, and price increases (Restrepo, 2008).

All the factors mentioned above: infrastructure in poor condition, absence of multi-modal systems, public policies for investment planning in the short and medium term, thinking regional, have Colombia with very high export costs. In Fig. 1 are compared the costs of export a container by country. For Colombia more than half correspond to transportation costs, which together with tax, customs and trade transaction costs, weaken the competitiveness of exports.

The need to carry out a plan to develop infrastructure was confronted by the Mexican government, when it signed the NAFTA trade treaty with its neighboring Canada and the United States. Then, proceeded to carry out an analysis of competition and efficiency of systems in their current state, to determine what

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[1] Import quotas for cargo vehicles.

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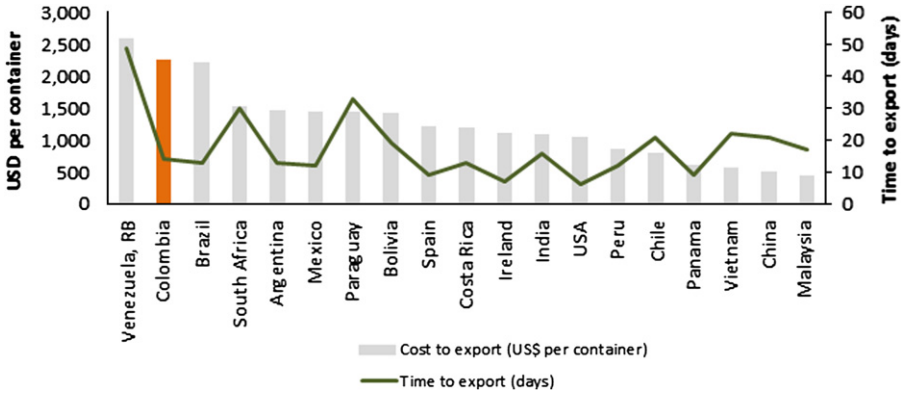

Fig. 1. Comparative export costs and times.
Source: (World Bank, 2012).

should be the focus of public policies for investment in infrastructure. As a result of this study were found indicators of a steady progress in railway system in front of a slow and erratic growth roadway system, which provided clear signs of what should be the priority (López et al., 2004).

The transport sector in Colombia requires changes, it is necessary to resolve their structural problems and to promote their adaptation toward a market that is increasingly competitive and globalized. A study like this is needed to determine if the current policy of investment in transport infrastructure, which was focused on the vast majority roads in detriment of rail, matches the findings of level of competition and efficiency of both systems. It is necessary to determine which are the characteristics of trucks and rail systems, every one of its peculiarities, its advantages and disadvantages, which are translated into an analysis of competition where price and an analysis of allocative efficiency in both transport systems is built using the methodology non-parametric analysis of data envelopment DEA as the most appropriate given the data acquired.

The document is divided as follows: Section 2, an analysis of competition and characteristics of the trucking and railroad; Section 3, methodology used, where the following are some essential theoretical aspects about Data Envelopment Analysis used in this study. Section 4, where we show a review of studies associated with the transport in the Colombian economy, through a review of literature on the topic, at national and international level. Section 5 discriminates the process of data collection, statistical analysis, correlation and empirical results under DEA and its interpretation. Finally, a section with the conclusions and some suggestions arising from the work carried out.

2. Analysis of competition

Colombia counts with 164,000 km of roads, of which only 10% corresponds to primary network. From the main grid only 9.82% are in very good conditions, 31.09% in good conditions, and a large percentage of the other 59.12% are in fair, poor and very bad conditions according to the National Highway Institute — INVIAS. The road network is concentrated mostly in the Andean region, where the three biggest cities are located, Bogotá, Medellín and Cali, without a backbone or transverse to dual carriageway to interconnect the cities with the ports or between them. Nearly two thirds of the network is in a bad status, in places geographically unstable, which makes its maintenance and operation extremely hard on standard conditions. More than 80% of cargo flow is carried away by these means, in detriment of taking advantage of benefits offered by the other modes. The State allocates almost entirely all transport investment resources on roads (Ministerio de Transporte, 2009).

Recently, they are making an aggressive project award of dual carriageway, such as "Ruta del Sol" which will communicate Bogotá with the Atlantic ports; "Túnel de la línea" on Buenaventura — Bogotá road, which shall communicate the capital with the port on the Pacific Ocean and the city of Cali; "Autopistas de la Montaña", which will connect Medellin with the two highways mentioned above and the port of Urabá.

On the other hand, the country's rail network is deployed over 3458 Km, both cross-sectional shape, such as longitudinal, in particular following the valley of Magdalena river. Of these 3458 km, 1991 are left, 1322 are inactive and 145 are a private network. This network is currently in an advanced state of deterioration as well as lagging technologically. Some sections are incomplete or missing, which was formerly the main mode of transport, today by several variables and determinants, ended relegated and dismantled, in general because of problems in the design of concession agreements, where the State was who bore the majority of risk investment, the contractor was limited to make profits of the system until it went bankrupt.

From a technical point of view, the railway has certain advantages and disadvantages if it is likened with roadway trucking systems. The railroad has a greater capacity; their equipment's had a greater useful life, and allows systematization in the operation and control in comparison with trucks. A technical aspect is key to understanding the difference between both, and that is that there is a much lower friction among wheel of the train and the railroad, versus that of the rim of the truck and the road; while a train has a resistance of progress from 4 to 5 pounds per ton, a truck faces a resistance of between 25 and 30 pounds per ton.[2] As a result, a railroad consumes much less energy, and therefore less fuel than a truck; while the train consumes on average 0.00102 gallons per ton, a truck requires 0.0048, i.e., 4.7 times more. On the subject of load capacity, each train car can be loaded with 60 t, versus 35 on an articulated lorry type CS.

But the configuration of the Colombian landscape-type mountainous country in the main cities, introduces a disadvantage for the rail, and perhaps an explanation to why the migration from one mode to another. The rail does not allow slopes of more than 2.5%, the curves radius may not be pronounced, and the distance between the rails on which the train operates, must be equal to avoid derailments; in contrast, the trucks are more flexible in this aspect in circumventing holes, taking alternative ways, in summary provide more flexibility in the operation (A. de G. Ingeniería, 2008).

[2] Both faced in a flat terrain and rectum.