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Does liberalization of the railway industry lead to higher technical effectiveness?

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ABSTRACT

The European Commission places increasing pressure on EU member states and forces national governments to liberate railway transportation and enable new operators to enter the rail industry. From an economic perspective, liberalization should lead to higher train performance and result in increased passenger flow. Most research papers examine the impact of rail reform by measuring the railway undertaking's performance and focus on efficiency of the intermediate railway outputs such as passenger/freight train kilometer. However, this paper aims to estimate railway performance from the view of demand and thus concentrates on the number of passengers and volume of goods transported, i.e., factors that indicate the ultimate success of the liberalization process. Therefore, in our analysis, we focused on technical effectiveness, which was estimated by a data envelopment analysis (DEA). In the next step, we studied what factors determine this effectiveness indicator, and we examined the significance of IBM's Liberalization Index in the adopted model.

1. Introduction

Within the realm of transportation policy, the liberalization of freight and passenger transport is a main goal of the European Commission. The freight transportation industry has experienced huge progress since 2007, and the vertical separation of infrastructure management and operations guaranteed open and nondiscriminatory access to the network for new operators. In contrast, passenger transport was open to non-state railway undertakings (RUs) in just a few member states. Most national governments are still ordering public transportation through direct assignments to state-owned incumbents. In the liberalization process, public tenders generally appear to be a proper means of choosing a contractor and obviating corruption. From an economic perspective, it is generally believed that public procurements can conserve public money and ensure better quality because competition among the bidders forces them to submit the best possible offer to win a specific tender. These assumptions should be applicable to the railway industry as well, or at least they should according to the European Union, whose main goal is the creation of a genuine Single European Railway Area on three major pillars, in which the rail transport markets are opened to competition. Among the key competition enforcement priorities established by the EU is increased passenger flow, improved performance and lowered subsidies, all of which should be achieved through market liberalization (EU, 2013).

The question is whether and to what extent railway liberalization and competitive markets really increase the number of passengers and the volume of goods that are transported. There exists a wide literature focusing on efficiency measurements

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of certain railway undertakings operating in Europe. The majority of these articles examine the impact of liberalization on technical efficiency, focusing, for example, on intermediate railway outputs such as passenger/freight train kilometer. To our knowledge, only a few studies compare railway performance from the view of demand and simultaneously analyze data for entire European countries. Thus, the objective of this article and its contribution to the existing literature is the identification of a link between the liberalization of the freight/passenger railway industry and performance improvements of railways in European Union countries and an augmentation of further liberalization discussions. Thus, the first objective of this analysis is to evaluate technical effectiveness by using a data envelopment analysis. Such an analysis requires an appropriate input and output selection. With respect to the literature review, passenger numbers and train kilometers were selected as outputs, while variables capturing number of employees, length of electrified tracks, number of vehicles and overall track length were taken as inputs. In the second stage of the analysis, we regress the effectiveness score on possible explanatory factors including the liberalization factor measured by IBM's Liberalization Index. Unfortunately, the indicator capturing governmental subsidies was not available for the period examined and therefore remains uncharted.

2. Current state of railway liberalization in European Union member states

Before introducing the current state of liberalization, the liberalization of the passenger and freight railway industry needs to be differentiated. Rail freight transport has been completely liberalized in the EU for both national and international services since the beginning of 2007; this means that, in practice, any licensed EU railway company with the necessary safety certification can apply for capacity and offer national and international freight services by rail throughout the EU (European Commission, 2013). According to the European Commission (EC), liberalization has increased competition and the efficiency of rail freight transport and increased the competitiveness of new rail operators. Figure A in the appendix captures the average Rail Liberalization Index (LIB) compiled by IBM Global Services in conjunction with Christian Kirchner (2011), which describes the market opening status in the European rail markets of the enlarged EU, with the number of member states augmented by Norway and Switzerland. The LIB measures the relative degree of market opening of rail transport markets in the European Union, Switzerland and Norway (Pham, 2013). In 2007, there was a significant increase in timelines for all countries, which was caused by freight transport liberalization. Therefore, the effect of this action was the same in every country because liberalization was implemented by EU fiat. The highest LIB exceeds 800 points and includes the United Kingdom (UK), Sweden, the Netherlands, Germany, Denmark and Austria. These countries had previously taken steps towards opening their rail passenger markets prior to the adoption of any formal requirement at the EU level (EC, 2013b).

International rail passenger services have been liberalized since 1 January 2010; nevertheless, domestic rail passenger services have not yet been opened to EU-wide competition. Although the EC has announced proposals to that end, there is currently no order or legislation forcing governments to liberate domestic rail passenger markets.

One of our research objectives is to prove or disprove the existence of a link between passenger/freight liberalization and RU performance measured by technical effectiveness. To assess the extent of liberalization, we will use the aforementioned liberalization index developed by IBM. In addition to the LIB, the company also introduced the so-called COM index, which is designed to reflect competitive dynamics in rail transport markets (IBM, 2011). Although both indexes are highly correlated, there exists a certain difference in values based on various factors included in the calculation formulas. The LIB is defined as an index that quantifies the degree of liberalization of the national rail network, combining elements related to the liberalizing measures applied through laws and regulation (LEX) with elements related to open-access conditions and barriers in the rail market (ACE). The COM index then measures the development and the success of the liberalizing process in terms of the market share of the new rail entrants, the number of entrants or the global market share (ibid). Unfortunately, both indexes were calculated for only four specific years: 2002, 2004, 2007 and 2011. Therefore, the index for the six missing years was estimated through the averaging process, calculating the mean for the intervals between each consecutive report. Because of this process, the time series consists of 10 years from 2002 to 2011, over which 27[1] countries provide 270 observations.

3. Measuring rail effectiveness – literature review

Even though our research focuses on performance measurement for European railway markets, we can draw inspiration from studies analyzing individual railways companies. To answer the question as to whether rail liberalization automatically generates a high-performance rail industry, it is necessary to first create an appropriate measure of technical effectiveness. Lan and Lin (2006) established two distinctive performance measurements for non-storable goods, which are suitable for use in the transportation industry as well. The authors define the degree of optimal transformation of inputs into intermediate outputs as “technical efficiency,” while the degree of optimal transformation of inputs into final (consumption) outputs is defined as “technical effectiveness.” With respect to the research objectives, we will concentrate on the latter statistic because it is directly related to the demand indicators.

Nevertheless, a number of studies exist that examine the impact of rail reform on the cost function or the technical efficiency of particular rail undertakings operating in Europe. The authors of these studies analyze intermediate outputs in the

[1] Data include information from all EU member states except Cyprus, Malta and Croatia; however, the data set is extended to include Switzerland and Norway.