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# Eliciting the regulation of an economic system: The case of the French rail industry

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## ABSTRACT

Based on the modern theory of regulation, the analysis aims to characterize the effective economic regulation of the French railway industry. The methodology consists in econometrically testing various scenarios of regulation and determining which of these best fits the data.

Using aggregate data on the overall passenger traffic for the incumbent French rail operator (RO), SNCF, the two behavioral hypotheses of reference which we consider – absence of regulation of the rail operator which acts as a pure monopoly, and price regulation of services supplied by the RO – are both statistically significant and do not subtract from each other. This result is certainly related to the fact that passenger services include both high speed train services, for which the RO has some entrepreneurial freedom, and regional transport services, which are regulated by local authorities. In any case however, as the presence of unobservable efforts exerted by the RO to improve its productivity is statistically relevant, one concludes that the RO is not fully and properly regulated. This emphasizes that the design of policy reforms must account for the incentives they create on the RO.

The analysis also shows that the most statistically significant scenarios are the ones in which the access tariff imposed by the infrastructure manager is such that the revenue generated by the access tariff is equal to the infrastructure spending. The pricing of the access to the infrastructure network therefore does not seem to be governed by economic principles, but more by budget considerations.

While data limitations does neither allow to understand all the facets of a complex reality, nor to claim a high level of precision in the measure of all the parameters of interest, we believe however that we provide an objective methodology to characterize the optimal economic policies for the railway sector, in particular because it yields realistic estimates of the main structural parameters. Indeed the empirical results suggest that the railway industry as a whole exhibits increasing returns to scale, which incidentally is not compatible with the presence of multiple firms. In addition, the elasticity of demand for railway transport is relatively high, an indication of the competitive constraints this mode of transport faces from other transport modes or induced traffic.

## 1. Introduction

This article builds on the modern theory of regulation and uses econometric methods to characterize the economic regulations which effectively apply to the French railway system. Based on a data set covering the last ten years, it undertakes a statistical comparison of different theoretical regulatory models to determine which one best supports the relationship between the main variables, i.e., price, traffic and cost, characterizing the railway system.

This subject is essential to understand the potential sources of

inefficiency in the system, and to eventually propose remedies, with the objective to implement an optimal economic regulation which takes into account the characteristics of the railway industry. In France, the subject has recently been the object of many reports and audits, which have analyzed the current organization of the complete system, its limitations, and the possible and preferred developments for the near future.<sup>1</sup> All these reports tend to point to several dysfunctions, which impede the development of an efficient railway transport sector and provide inadequate long-term incentives in network development. As an attempt to tackle those issues, the French State has recently

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<sup>1</sup> Most notably see the reports by the Inspection Générale des Finances – Conseil Général des Ponts et Chaussées (2007), the Ecole Polytechnique Fédérale de Lausanne (2007) and the Cour des Comptes (2008).

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prompted the creation of a railway regulator, whose missions and powers have yet to be defined more precisely. At this stage, it is rather hazardous to evaluate the interaction between the State-owned infrastructure manager (IM), the incumbent rail operator (RO) which is vertically separated from the IM and owned by the French State, and the newly created regulator.

Our objective here is to develop a quantitative analytical tool of the functioning of the complete railway system, based on the economic concepts of asymmetric information and regulation, as developed for instance by [Laffont and Tirole \(1993\)](#).<sup>2</sup> Using recent data on railway activity, this study measures structural fundamental parameters (like the aggregate elasticity of the demand for rail passenger transport services or the marginal cost of delivering these services), understands the underlying mechanisms and evaluates the actors' objectives. The model in particular explains the determination of the price of service in the railway industry, as a function of the different parameters linked to the structure of demand, costs and other constraints imposed by the State, the tariff structure set by the infrastructure manager and the competitive constraints exercised by other modes of transport. To the best of our knowledge, apart from the paper by [Meunier and Quinet \(2012\)](#), no quantitative evaluation of the French system, based on economic principles, has ever been proposed. Meunier and Quinet's model focuses however on the analysis of infrastructure pricing; we rather deal on the whole regulation of transport services offered to passengers. Note that, although the French situation provides the background for our analysis, the methodology could be easily tailored for other countries in order to account for the features of their industry structure.

Using aggregate data on the overall passenger traffic for the French rail operator SNCF, the two behavioral hypotheses of reference which we consider –absence of regulation of the RO, which acts as a pure monopoly, and price regulation in the final sector of the RO– are both statistically significant and do not subtract from each other. This result is certainly related to the fact that passenger services include both high speed train services, for which the RO has some entrepreneurial freedom, and regional transport services, which are regulated by local authorities. In any case however, the presence of unobservable efforts exerted by the RO to improve its productivity is statistically relevant in every scenario studied. In other words, the goodness-of-fit improves when one accounts for elements that cannot be directly or easily measurable like the ability of the manager, the organizational capacity or the know-how. Note that one can conclude that the RO is not fully regulated since no regulation applies on these supply variables. This emphasizes that the design of policy reforms should account for the incentives they create on the RO and should address the question of profit sharing between the State and SNCF, which is a mechanism to stimulate productivity.

In comparing different regulatory scenarios, the analysis also shows that the most statistically significant scenario is the one in which the access tariff imposed by the infrastructure manager is such that the revenue generated by the access tariff is equal to the infrastructure spending. In the recent debate on the organization of the French railway industry, one recurrent concern was the role of access pricing to provide the right economic signals to the RO. Our finding tends to show that access pricing is driven by budgetary concerns and not economic principles. In a world of bilateral monopoly, this gives rise to the double marginalization problem.

Having determined the best model to apprehend the regulation of the French railway system, we simulate the impact of changes in the level of access price. The simulations show that, with respect to a social welfare perspective, the access price should be decreased from its

current level. While it digs the deficit faced by the infrastructure manager, it is more than compensated by the increase in consumers' surplus and the rail operator's profit. This result suggests that the current debate among French policy-makers, which tends to favor an increase in the level of access price, is misguided.

Finally, the empirical results suggest that the railway industry as a whole exhibits increasing returns to scale, which is not compatible with the presence of multiple firms. In addition, the elasticity of demand for railway transport is relatively high, an indication of the competitive constraints exerted by other modes of transport.

The main limitation of our analysis comes from the limited data available. Our data are aggregated at the level of the complete system, which does not allow for a detailed analysis of different types of transport services, for example, and different authorities of regulation, be they national or regional. We can however separate the High Speed Train activity from the rest of services. In addition, we do not have the information necessary to study precisely the objectives and incentives of the infrastructure manager, or the impact of the state of the network on the quality of the transport service. While data limitation does neither allow to understand all the facets of a complex reality, nor to claim a high level of precision in the measure of all the parameters of interest, we believe however that we provide an objective methodology to characterize the optimal economic policies for the railway sector, in particular because it yields realistic estimates of the main structural parameters. Italy and Spain, for instance, have a political and regulatory organization of their railway sector that is similar to France's (at the time of this study). Our methodology could therefore be applied in these countries to determine how to improve the current regulation.

## 2. Data and descriptive statistics

The economic model developed below is applied to the whole activity of passenger transport services (passage activity herein) of SNCF, which includes annual passenger railway travel on high speed lines (the so-called HST traffic), the main lines and regional services (including Ile-de France which is the geographical area around Paris). The annual data exclude freight traffic, which represented 12% of SNCF's turnover in 2008, and covers the period 2001–2008.<sup>3</sup> [Table 1](#) below provides the means of the main variables used in the economic analysis, with their units, over the eight years of observation.

The passenger activity therefore includes two types of service, namely the regional traffic and the high-speed train (HST) traffic, which follow different logics. The HST traffic is not subject to a particular public intervention and seems, a priori, to respond to a purely commercial logic with a large entrepreneurial freedom. It is, however, necessary to keep in mind that SNCF is principally State-owned, and the French State can therefore exercise a certain control over the different decisions taken by this RO. The regional traffic, in contrast, is regulated as it is subject to negotiation between the rail operator and the local transport authority. The latter has the power to decide the price paid by, and the characteristics of the services offered to, final users. The logic should therefore be closer to that of a (local) planner who seeks to maximize the welfare of its constituency. These two logics must be kept in mind to determine the scenario which best corresponds to the observed data.

[Fig. 1](#) shows the change in total traffic and the capacity supplied over the period under investigation. We note that the level of traffic has strongly increased, at a rate faster than the capacity, which suggests that the rate of use of the capacity has improved.

The prices of the transport service and for the access to the network are respectively measured by the mean revenue per passenger-kilo-

<sup>2</sup> Our text contributes to the relatively short literature on the econometrics of regulation which comprises the articles by [Wolak \(1994\)](#), [Wunsch \(1994\)](#), [Gasmi et al. \(1995\)](#) and [Gagnepain and Ivaldi \(2002\)](#), [Brocas et al. \(2006\)](#) among others.

<sup>3</sup> In contrast, the data on the regulation of the infrastructure manager concern the complete network and activities.

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