

Measuring and improving the efficiency of urban public transport systems in France

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Abstract:

At a time of important concerns about global warming and other environmental problems, increased use of public transport is often suggested as a solution. In France and in many other countries, public transport is heavily subsidized and controlled by public authorities (Button, 2010, Holmgren, 2013). Subsidies and public control can be justified by theoretical grounds, for a level of optimum price and income structure of operators and financial deficits. The purpose of these subsidies and control is to ensure the dominance of public transport in the individuals' displacement, and also to ensure the efficiency of the sector. Thus, the evaluation of public transport efficiency is recently a significant magnitude because the organizing authorities of urban transport (transport authority) need to regularly improve the efficiency of public transport operators in order to attract more users when the services design and delivery in an increasingly competitive environment and with financial constraints and polluting transport modes such as cars. Public transport efficiency issues are widely discussed in the transportation literature (Karlaftis 2004, Barnum and Gleason 2007, Barnum, 2009, von Hirschhausen and Cullmann 2010, Agarwal et al., 2011, Barnum et al., 2011, and Jarboui et al. 2013, Holmgren, 2013, Button and Neiva, 2014, Georgiadis 2014, Bray, 2015, ...). Despite the large number of public transport efficiency studies, these researches tend to focus on measures of operators efficiency level, approaches diversification and outputs and inputs choices, while they are rarely interested in identifying inefficiency determinants. These studies dealing with the determinants of public transport inefficiency focused on exogenous explanations and variables. De Borger et al. (2002) and Jarboui (2012, 2013) found that the market organization, the contract design, the degree and nature of the regulation system and network characteristics are the inefficiency determinants in previous studies. In most cases, operators are unable to act on these exogenous determinants that are outside of its control to improve their efficiency. In fact, it is more interesting to focus on efficiency studies: firstly, on the inefficiency determinants, and second, on endogenous sources which enable operators to improve their efficiency levels.

In this paper, we adopt a parametric approach using the Stochastic Frontier Analysis (SFA) model of the production function, developed by Battese and Coelli (1995), for 200 urban public transport operators in France during 10 years (2004-2013). As an alternative approach to data envelopment analysis (DEA), the advantage of using SFA method is that it allows us not only to measure the technical efficiency, but also to know the random shocks effect on transport operators' production variation. For this reason, the essential concept of SFA is the decomposition of error term in two parts: a random component that represents the inefficiency effects on the stochastic frontier, and a symmetrical component that represents a random frontier variation between operators and includes the random error effects. Thus, the main attraction of the stochastic frontier approach is that it allows us to study the inefficiency determinants other than usually used inputs.

The efficiency evaluation is a well-known issue in the transport economics literature. Generally, most studies are aimed to measure the efficiency and to develop and apply methods to assess the transport

operator's efficiency. This paper comes to show that the efficiency evaluation is not limited to measure efficiency or explain operator returns to scale, but to highlight solutions to improve efficiency level through the identification of the inefficiency determinants. Using the stochastic frontier method, this article shows both the efficiency level of 200 public road transport operators by the discussion and representation of efficiency frontier of 200 French transport operators and explains the contribution of inputs in the evolution of efficiency level, and also identifies the inefficiency determinants other than the used inputs which is the major contribution in this paper. Thus, the inefficiency determinants' identification is important in the implementation of effective strategies and policies and allows to improve services delivery and quality. In this study, the public transport use represented by the trips made with a ticket (full price or reduced price) or a free ticket, also the correspondence rate, pricing, government pricing and investment are considered the inefficiency determinants of public transport operators. This article highlights the key role of these factors in explaining and improving efficiency. This article shows the key role of public intervention (as an exogenous factor) in the efficiency of transport operators through subsidies and optimized price. Therefore, these factors explain the distortion between the "observed production" and the "optimal production frontier".