

Cost efficiency in the university: A departmental evaluation model

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Abstract

This article presents a model for the analysis of cost efficiency within the framework of data envelopment analysis models. It calculates the cost excess, separating a unit of production from its optimal or frontier levels, and, at the same time, breaks these excesses down into three explanatory factors: (a) technical inefficiency, which depends on the quality of the factors consumed, the type of organization and the factor of human behaviour; (b) the availability of the fixed factors along with their level of utilization and the factors mix; and finally (c) the scale or size of the unit of production. The empirical application is carried out on the departments of the Autonomous University of Barcelona. The results show that departmental costs could be reduced on average by more than 13.46% in the long term.

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1. Introduction

The environment in which Spanish universities operate has changed significantly since 2001, when the Organic Law for Universities introduced reforms into the sector. Quality improvement became a priority requirement, and this, combined with the budgetary constraints already faced by the universities for some years, has resulted in a new and more complex framework for universities to operate in. Henceforth they will require new administrative instruments capable of providing institutions with

tools for allocating scarce economic resources more efficiently among departments. At the same time, such instruments should also prove useful in providing university administrators with unequivocal criteria for evaluating, and subsequently improving, the performance of the operational units, which in this case are the departments.

In this study, we propose an instrument for departmental evaluation in terms of costs that can be used to determine improvement targets both in costs and production and in quality levels. The instrument presented is a new model of cost efficiency based on Data Envelopment Analysis (DEA) methodology initially developed by Charnes, Cooper, and Rhodes (1978). The specific objectives of this model are to determine: (a) the overall

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deviation in costs of each department under analysis, understood as the difference between the observed cost and the optimal long-term cost assuming an optimal scale; (b) the factors into which this deviation can be sub-divided, distinguishing between technical inefficiency, the incorrect allocation of factors, the level of utilization of the available fixed factors or the appropriateness of the scale adopted; (c) targets for the different inputs and outputs that would lead to cost efficiency in the departments; and (d) which inefficiencies can be corrected in the short term, and which in the long term.

One of the main advantages of frontier models is their ability to evaluate the overall efficiency of a group of units on the basis of the inputs consumed and the outputs produced. For this reason, they are particularly appropriate for application to sectors with complex productive processes, such as universities, where there is a lack of information about output prices indicating the criteria for evaluating the performance of each decision making unit (DMU). In such circumstances, frontier models offer a valuable, objective tool for evaluating the public sector, which is further supported by extensive literature (see, for example, Bifulco & Bretschneider, 2001; Drake & Simper, 2003; Grosskopf, Margaritis, & Valdmanis, 1995; Pedraja-Chaparro & Salinas-Jimenez, 1996; Ray, 1991).

However, merely estimating technical efficiency as a criterion of evaluation and control is not generally sufficient in the public sector, even though administrators in the sector have traditionally neglected the conventional monetary evaluation criteria of the market economy, such as profit and profitability. The public nature of the sector does not necessarily mean that economic criteria should not or cannot be employed. In this respect, governments are increasingly administering the public sector more efficiently, effectively and economically, regardless of their political allegiances. Their aim is to cut public spending without eliminating services or prejudicing quality. The use of monetary-based criteria in the public sector generally implies an analysis from the cost perspective, since selling prices are seldom involved and, if so, they are usually pre-established. The increasing demand for control and efficiency in the administration of monetary resources has thrown doubt on technical efficiency as the most appropriate evaluation criterion. In fact, it is now well known that

certain behaviors that are economically undesirable—since they do not minimize costs—and can be considered technically efficient. Thus, this paper presents a model of cost efficiency in preference to one based exclusively on measuring technical efficiency.

DEA models constitute an excellent instrument for university evaluation that is supported in various studies, although the objectives of these studies generally differ from ours. Among the authors that have written about it we can mention Beasley (1990, 1995), Athanassopoulos and Shale (1997), Sarrico, Hogan, Dyson, and Athanassopoulos (1997), Johnes and Johnes (1993), Madden, Savage, and Kemp (1997), Ahn (1987), Glass, McKillop, and O'Rourke (1998), Emrouznejad and Thanassoulis (2005), Caballero, Galache, Gómez, Molina, and Torrico (2001, 2004), Post and Spronk (1999), Li and Reeves (1999), Korhonen (2000) and Korhonen, Tainio, and Wallenius (2001).

The remainder of this article is organized as follows. The second section describes the evaluation model on which this work is focused. The characteristics of the sample and a description of the variables are presented in Section 3. The following section outlines the most relevant results obtained in our application of the model to all the departments in the Autonomous University of Barcelona (UAB). Finally, the most significant conclusions are presented.

2. The model

With the aim of making the theoretical model as general an application as possible, we will consider the case of $k = 1, \dots, K$ university departments. The productive process of a department k is characterized by the production of a group of $i = 1, \dots, I$ outputs $y_k = (y_{k,1}, \dots, y_{k,I})$ with quality levels in $q = 1, \dots, Q$ dimensions $Q_{k,q} = (Q_{k,1}, \dots, Q_{k,Q})$ starting from $f = 1, \dots, F$ inputs adjustable in the long term $x_{k,f} = (x_{k,1}, \dots, x_{k,F})$ and $v = 1, \dots, V$ inputs adjustable in the short term $x_{k,v} = (x_{k,1}, \dots, x_{k,V})$ and input prices $w_{k,f} = (w_{k,1}, \dots, w_{k,F})$ and $w_{k,v} = (w_{k,1}, \dots, w_{k,V})$, respectively. Consequently, the observed total costs of a department k for a level of production (y_k) and of quality ($Q_{k,q}$), is represented by

$$TC_k = \sum_{v=1}^V w_{k,v} x_{k,v} + \sum_{f=1}^F w_{k,f} x_{k,f}.$$

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