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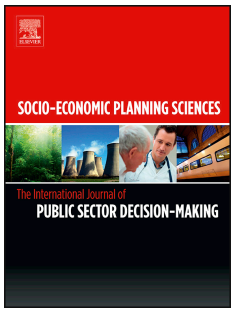

Industry cost efficiency in data envelopment analysis

Giovanni Cesaroni

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Industry cost efficiency in data envelopment analysis

Giovanni Cesaroni *

Abstract

In data envelopment analysis (DEA) and with a variable returns-to-scale (VRS) technology, we implement Baumol et al.'s [1] concept of "cost minimizing industry structure", which features reallocation of outputs and a variable number of firms. The characterization of this type of optimal allocation adds to the literature on structural efficiency, which so far has not dealt with it in such a general framework. At the theoretical level, we both determine a decomposition of the industry measure, which establishes the relationship between group and individual measures, and provide its rigorous economic interpretation based on the ray average cost. Moreover, our framework allows to highlight the relationship between the industry measure and different returns-to-scale characterizations of the technology. At the applicative level we devise an algorithm to solve the related non-linear programming problem, thus providing the decision maker with a method to compute the optimal industry structure and the corresponding efficiency components. Empirical illustration is given with reference to the Italian local-public-transit sector employing a multiple input and output technology.

Keywords: Dea, Structural efficiency, Industrial organization, Ray average cost, Scale economies.

1. Introduction

Farrell [2, pp. 261-262] defined the *structural efficiency of an industry* as the technical efficiency of its constituent firms measured by the output-weighted average of the individual efficiencies. This notion was extended by Førsund and Hjalmarsson [3], who proposed to evaluate the technical efficiency of the average firm by means of a parametric production function, and generalized to multiple-output production by Ylvinger [4], who employed DEA models to obtain technical efficiency measures based on the determination of input/output shadow prices under the assumptions of constant returns to scale (CRS) and no "reallocation of inputs across firms". In this vein, one very important contribution is that of Li and Cheng [5], which analyzes the output-oriented technical efficiency of the industry by making explicit the relationship between the production technology of the group and that of an individual unit, while allowing for the

* Giovanni Cesaroni is senior economist at the Prime Minister's Office, Department for economic policy, via della Mercede, 9 - 00187 Rome, Italy. E-mail address: g.cesaroni@governo.it (Giovanni Cesaroni).