Omega 46 (2014) 74–85

Contents lists available at ScienceDirect

Omega

journal homepage: www.elsevier.com/locate/omega

Applications

Applying data envelopment analysis on accounting data to assess and optimize the efficiency of Greek local governments

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ARTICLE INFO

Article history:
Received 1 May 2013
Accepted 13 February 2014
Processed by B. Lev
Available online 25 February 2014

Keywords:
Local governments
Efficiency
Data envelopment analysis
Accrual accounting data

ABSTRACT

The efficiency and effectiveness of local governments has become one of the main points of interest in public sector administration, as decision and policy making gradually move from the central to the local level. This paper introduces an efficiency analysis framework based on accrual accounting data obtained from the local governments' financial statements. Data envelopment analysis is used to obtain efficiency estimates, which are analyzed through a second stage regression against a set of efficiency explanatory factors. Furthermore, the optimal reallocation of the municipalities' inputs and outputs is explored to provide policy recommendations that a central government could implement in a budget reduction context. Detailed empirical results are presented from a panel data set of Greek municipalities over the period 2002–2009.

1. Introduction

During the past 30 years there has been a significant change in public sector management [29]. The new doctrine demands for efficiency, effectiveness, and economy considerations in public sector administration. Undoubtedly, local governments are organizations that would largely benefit from adhering to this threefold framework. The implementation of decentralized policies where a considerable amount of public spending and decision making has been assigned to local governments [2] has raised the relevance of local government's expenditures high in the agenda of public administration. Within a context where rising taxes is politically costly and legal limitations to increasing indebtedness exist, the assessment of local governments' efficiency and value for money service provision to citizens have attracted considerable interest.

Past studies have extensively used frontier techniques (data envelopment analysis, free disposal hull, stochastic frontier analysis) to analyze the technical and cost efficiency of local governments in different countries (for a recent overview see [32]). The relevant literature can be divided into two broad streams [21]. The first involves studies that evaluate efficiency in a general way by covering all, or at least several, services provided by local governments (see [3] for a review), whereas a second stream of studies concentrates on particular services and municipal/regional activities (e.g., [9,36,41,49,50]). Our study falls into the first such category, the main merit of which is that the analysis produces a specific efficiency coefficient representing the global evaluation of the different services provided by each municipality [27].

Efficiency is usually measured in an input–output context, in which the services that local governments provide (outputs) are assessed against the means that they employ (inputs). Therefore when measuring efficiency the most significant task is the proper definition of inputs and outputs [44]. Unfortunately though, in many cases "the general problems inherent in the definition of inputs and outputs for the public sector", or the "lack of better local government data" affect the quality of the selected outputs [19, p.154]. Moreover, output measures usually encountered in the local government efficiency literature such as sewerage and water services or the length of urban and rural road networks, do not take into account the substantial differences in quality that may exist across local governments. Even more, quality differences may arise as a result of variations in stated preferences for local public services [48]. Therefore the methodology adopted to develop a local government output indicator as a single measure of municipal performance is not unanimous in the literature.

In this context, the use of sophisticated accounting systems could be particularly useful. Compared to traditional cash accounting, accrual accounting systems reveal in a more comprehensive and multifaceted way the financial condition of local governments.

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http://dx.doi.org/10.1016/j.omega.2014.02.004
0305-0483

Such information could be also useful beyond the analysis of the financial performance of local governments. In particular, the existence of detailed accrual accounting data on the value (rather than the volume) of different types of assets owned by local governments as well as local governments' cost-revenue structure, offer useful information on the efficient use of public funds for providing services to citizens. In this study, we explore this possibility in the context of efficiency analysis for local governments and demonstrate that it can provide meaningful findings, which are in accordance with those of past studies that relied on (harder to collect) volume data. In the adopted accounting-based framework, a municipality is assumed to be efficient if it is able to provide services of value to its citizens (proxied by the value of the assets used to provide the services and the expenditures made to support them), while utilizing the minimum financial resources to fund these services (acquired either from the citizens or from the central government).

On the basis of this approach, we employ a non-parametric frontier technique, namely data envelopment analysis (DEA), to analyze the efficiency of local governments using publicly available information derived from accrual-based annual financial statements. Contrary to earlier studies that base their efficiency conclusions on a variety of quantitative output parameters of non-monetary nature (e.g., library services, environmental services, recreation services, etc.), we take an innovative stance and we develop an easy to apply approach with minimum operational requirements based on publicly available financial data. Furthermore, in order to analyze efficiency results in more depth, we perform a second-stage regression of VRS efficiency scores against a set of explanatory variables based on a truncated regression model fitted with the double-bootstrap algorithm of Simar and Wilson [42]. The variables used in this second step of the analysis refer to a set of financial ratios that correspond to the fiscal and economic aspects of the municipalities' operation as well as municipality characteristics.

Finally, the optimal reallocation of the municipalities' inputs and outputs is explored to provide policy recommendations that a central government could implement in a budget reduction context. In contrast to federation countries (e.g., USA, Germany, Switzerland, etc.) where the finances of local governments put emphasis on local tax mobilization, Greek municipalities rely heavily on obtaining financing from the central government. De Mello [22] argues that such reliance may deepen the imbalances at the central government level, unless fiscal discipline is imposed at the local level, combined with expertise that local governments should possess to manage efficiently an increased volume of resources. In the context of the recent economic recession this issue has gained global interest. As noted by Glaeser [26], the US federal government followed a radical approach by increasing the transfers to states and local governments, aiming towards guarding against a downturn that could be caused by local governments increasing taxes to finance their expenditures. However, Glaeser [26] argues that such interventions should be designed taking into account the value they create at the local level, taking also into consideration the redistribution and incentives rationales that should underlie inter-governmental transfers. On the other hand, the intensifying imbalances at the central government level that Greece and other European countries are facing due to the ongoing crisis, has resulted in a need to reconsider the level of transfers to local governments by imposing stringent constraints, adopting policies that are not only restricted to a closer monitoring of local fiscal balances, but they also extend to budgetary cuts. These examples from the USA and Europe clearly indicate that the economic recession has re-defined the economic relationships between the local and central governments, thus highlighting the need to re-assess the way inter-governmental transfers are planned and provided. In the present study we address this crucial issue from the perspective of the local governments technical efficiency, through the use of a resource allocation model that facilitates the organization and distribution of the transfers to local governments in a way that ensures their total amount is decreased, without reducing efficiency at the local level.

The approach developed is applied to a large sample of Greek municipalities over the period 2002–2009 involving 2017 municipality-year observations. Nevertheless, the proposed approach is applicable to other countries that apply accrual accounting as well. As accrual accounting adoption is the recent trend, at least at the European level [39], this study could have significant implications for policy makers from different countries. Moreover, the proposed modeling approach provides policy makers with the possibility of conducting sensitivity analysis from a capital budgeting point of view in the framework discussed above. This is especially important for Greece that has to meet the commitments imposed by the very tight fiscal consolidation program that has been agreed between the Greek government, the International Monetary Fund, and the European Union.[1] Furthermore, the implementation of the resource reallocation model for the time period of the analysis provides interesting managerial and policy-making insights into the efficiency effects of reducing the grants provided to the local governments in a recession environment, as well as the relationship between the reduction in inter-governmental transfers and the management of the costs of the services provided to citizens.

The rest of the paper is organized as follows. The next section provides a short description of the characteristics of local governments in Greece. Section 3 is devoted to the description of the methodology, whereas Section 4 is devoted to the empirical analysis and the discussion of the obtained results. Finally, Section 5 concludes the paper and discusses some future research directions.

2. Characteristics of Greek municipalities

Even though Greece is a small country (in terms of size and population), it has a relatively large number of municipalities. At the end of 2010 there were about 900 municipalities with heterogeneous characteristics in terms of population, geographical size, and support received from the central government through state subsidies [12]. Municipalities in Greece provide a plethora of traditional local government services such as the local registry, refuse collection, development and maintenance of local infrastructure, cultural activities and events. Moreover, recently they have also assumed several other responsibilities due to the decentralization policy followed by the central government such as education, child care, transportation, and health services. Municipality revenues include taxes, fees and subsidies. As for taxes, even though Greek municipalities have a relative flexibility in levying them, they are forbidden to institute their own taxes. As for fees and charges, they can only be varied between certain levels and they can only be used for specific purposes. Finally, municipalities are beneficiaries of state subsidies that cover both operating and investment needs and are mainly financed by specific types of governmental revenues (e.g., a percentage of income tax, tax duties, etc.), which according to legislation are attributable exclusively to municipalities. Municipalities are subject to the restrictive expenditure control mechanisms that govern the public sector financials and their financial autonomy is rather

[1] According to the medium-term fiscal strategy (MTFS) for Greece, the cuts in state transfers to local governments will by at least €150 million in 2011 followed by additional cuts of at least €300 million in each year from 2012 to 2015. These reductions will be achieved primarily through cuts in the expenses of local governments and increase in local governments' own revenues from tolls, fees, rights and other revenue streams [31, p. 156].